The Kingdom of Tonga

FOURTH REPORT

REVIEW OF TONGA

NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

A review of the status, trends and threats to Tonga's unique biodiversity since the inception of its own NBSAP in 2006. The review also covers the status of the implementation of objectives and action plans, sectors and cross sector collaboration. Finally, an appraisal of Tonga's progress towards achieving the 2010 CBD targets and its contribution to the Strategic plan is followed by recommendations on best ways forward to achieve its national goals and objectives in the near future.

GEF

Convention on Biological Diversity

UNEP

TONGA
Ministry of Environment and Climate Change

EXECUTIVE SUMMARY

TYPE OF ACTION:

Review Tonga National Biodiversity Strategy and Action Plan (NBSAP) and prepare Tonga's Fourth National Report of the Convention on Biological Diversity (CBD).

OBJECTIVES:

The main objective is to draw attention to the following:

1. The current status, trends and threats facing Tonga's unique biodiversity;
2. Determine the status of implementation of the NBSAP strategies and action plan;
3. Determine collaboration amongst stakeholders in implementing the objectives and strategies of the NBSAP; and
4. Assess Tonga's progress and contribution towards achieving CBD 2010 targets and strategic plan and determine best alternatives to achieving 2010 national targets.

RESULTS:

1. The status, trends and threats to species and ecosystems of the four sectors - namely; forest, marine, agriculture, terrestrial fauna and flora are highlighted below:

Forest Ecosystem

Tonga's forest ecosystems, as at 31 December 2009, are estimated at 8,729 ha or 12.6% of the total land mass. It consists of woodlands (6,460 ha – 74%), plantation forests (502 ha – 6%) and mangrove/wetlands (1,767 ha – 20%). The

2009 statistics represents a 26% decrease in the total area of the forest ecosystems from the 2006 level, as recorded in the stocktake for the NBSAP. The woodland, plantation forests and mangrove forests all experienced a downward trend of 13%, 10% and 3%, respectively. The major daily threat facing the woodland forests is agricultural expansion, which is confirmed by the 6% (3,093 ha) increase in agricultural land, from 2006 level. The main cause of this is attributed to lack of an integrated land use system. Occasional threats imposed by natural disaster are increasingly threatening in recent years. The decline in the plantation forests area is likely due to over estimation of the area in the 2004 biodiversity stocktake. The major enemy of the mangroves and wetland forests is its continued conversion into residential area.

Tonga's number of described plant species had increased by 25%, from 463 to 581(IUCN Red List 2004 and 2008). Only five species have been assessed by IUCN, of which four have been declared threatened. Their status remains the same. Of the 60 plant species that were nationally identified in the 2006 NBSAP as threatened, 31 have shown improvement, 28 remain at the same level and one has worsened. Twenty five more species were identified during the review as threatened. Limitation of funds is the major obstacle facing a plan for conservation of species. In addition, there is a lack of policy on which species to be conserved, how many to be propagated, and what to do with plant species. Uncontrolled utilization of plants for timber, medicine, firewood and for cultural purposes is the major cause of declining populations.

Marine Ecosystem

There are more marine species recorded in 2010, in comparison with 2006 when the last stocktake was undertaken. One reef fish was found to be endemic, increasing the total of endemic species to two. There was no trend detected in terms of richness of species due to a lack of data; however, a decrease in the amount of catch both offshore and inshore is indicative of an overall decrease in abundance of fish. Based on the latest reef-fish assessment conducted by SPC under PROCFish (2009), results indicate that there is a decrease in the reef fish abundance (on average between 20 - 40%) and sizes (50% less than actual size for most reef-fish species) including coral cover percentage (20-30% decrease on live coral cover especially back-reef). The status of mangrove ecosystems is expected to improve due to a number of youth replanting programs around the lagoon edge, sponsored through GEF Small Grant and other funding agencies.

The threats to the marine species and ecosystems remained the same as those identified in the NBSAP, except for the tsunami that hit Niuatoputapu in early 2010. This was the first time Tonga has experienced great devastation from this natural phenomenon. As a result of the tsunami, reef materials and marine species were taken ashore. Coastal forest, crops and properties were totally obliterated as the waves surged onshore for almost a kilometer in places. Nine people lost their lives in this event.

Agriculture Ecosystem

The review revealed a reverse in the proportions of agricultural species recorded in the NBSAP priority list, of 51% for root crops and 22% for fruit trees. The review recorded a stunning increase in fruit trees to 61% of the total agricultural species, whileroot crops dropped off to 20%. This trend is attributed to the introduction of improved varieties of fruit trees from North Queensland, Australia. The effect of commercial farming and monoculture in root crops is negative with root crops becoming more critically endangered than fruit trees.

The threats to agriculture remain the same as those identified in the NBSAP although climate change is a challenge for the future. The effect of a tsunami like the one that that hit Niuatoputapu could be devastating, and such events are a dawning threat for the future. It is evident therefore that agriculture in Tonga would be exposed to more variety of threats in the future and the survival of its species will depend on the resilience and adaptability of its ecosystem and species, which relies heavily on diversity.

Species Conservation

The recovery of species from threats facing them depends heavily on existing and ongoing conservation activities. There are two methods of species conservation common to all sectors: in-situ programs, where threatened species are raised in the wild; and ex-situ programs, where threatened species are raised in a controlled environment, away from the wild.

Most of marine programs are ex-situ, involving giant clams, sea cucumber, live corals and other marine species. Agriculture and Forestry are both involved in in-situ and ex-situ propagation programs. The planting of trees along tax allotment boundaries and the legal requirement for a certain number of coconuts per tax allotment are examples of these in-situ programs. These type of programs need to be enforced to curtail the reduction in our biodiversity.

Ex-situ conservation of the Malau – a megapode bird species found in Niuafo'ou - has been ongoing since 60 eggs were buried at volcanically heated sites on Late Island, and an additional 35 eggs and chicks were introduced to Fonualei Island in June 1993. Sightings of Malau were confirmed on Fonualei in 2003 and it is estimated this population has doubled from its original size; while no sightings were confirmed in Late in 2004, under similar survey. This result reflects a successful propagation of the Malau species, which was carried under the Brehm Fund for International Bird Conservation based in Germany.

2. Status of the implementation of the NBSAP objectives

The overall level of achievement of NBSAP's objectives is below average.

Only 27% of the 37 NBSAP objectives recorded an achievement of over 50% of the desired indicators (green status). Some 43% of the objectives achieved between 25% and 50% of the indicators (yellow status). The remaining 30% of the objectives achieved less than 25% of the indicators (red status).

Factors that influenced the results were lack of 1) coordination, 2) national direction, 3) holistic legislation and policies and 4) funding. Improvement in these factors is crucial for Tonga's progress towards achieving its national objectives and its contribution to the global targets.

3. Mainstreaming of Biodiversity Considerations

Mainstreaming of biodiversity considerations appears to be much stronger at the youth and community level with the successful incorporation of basic environmental and biodiversity principles into the school curriculum and the increased involvement of community groups in the implementation of biodiversity related activities. However, mainstreaming seems to be weak and vulnerable in the policy making sectors of the Government where power and responsibilities are overlapping. That weakness is characterized by lack of coordination, a national policy on biodiversity or finance, as well asother factors that affect the performance of the government sectors.

The cross cutting nature of biodiversity works better in the private than in the government sectors. This is due to the absence of policy restrictions in the private sector, thus providing the ideal flexible environment that is required for the implementation of the biodiversity objectives. This flexible environment is further reinforced by the availability of financial resources from GEF and other funding agencies to ensure more efficient and effective implementation.

4. Progress towards CBD 2010 Targets and Strategic Plan

Tonga's progress towards CBD 2010 Targets and Strategic Plan is 17%. In determining the extent of Tonga's progress towards the achievement of the CBD 2010 objectives, an attempt was made to establish the linkage between the national (NBSAP)and the CBD 2010 targets. Only 49% of the 37 national objectives found a match in the framework of the CBD 2010 objectives. Fifty percent of the matched objectives achieved less than 25% of the desired indicators (red status). Thirty three percent achieved 25 to 50% (yellow status) and only 17% of the matched objectives achieved more than 50% of the indicators and considered a direct contribution to global targets (green status).

WAY FORWARD:

Tonga's progress can improve significantly if the following issues are addressed immediately:

1. Include a specific policy statement on biodiversity in the National Plan;
2. Implement holistic or umbrella legislation to encourage cross sectoral colloborations;
3. Ministry of Environment and Climate Change (MECC) to 'step up' its coordinating role;
4. Improve Government funding; and
5. Introduce a structured capacity building targeting the five sectors of Fishery, Forestry, Agriculture, Environment and NGOs.

To improve the efficiency and effectiveness of implementation, the following recommendations are to be further considered.

Firstly, the implementation and monitoring structure that was recommended by 2006 NBSAP is considered to be too remote and it needs to be amended to be closer to operational level. Two prominent features of the proposed modified structure are:

A. The establishment of a new committee - namely Biodiversity Advisory Committee (BAC) - to advise the Minister on biodiversity matters through the CEO of MECC. BAC will be chaired by the CEO of MECC with the other committee members to be the heads of each of the five implementing bodies. The specific roles of BAC are to endorse policies, coordinate biodiversity activities, prioritize and approve projects, seeks financial support and monitor progress. BAC takes over the roles of the National Environment Council.

B. The confirmation of the five main pillars of biodiversity development as forestry, fisheries, agriculture, MECC and civil society. The first four pillars carry the facilitating responsibilities and some degree of project implementation. The latter takes charge of project implementation and act as linkage between the facilitators and the communities.

Secondly, there is a need for the GEF Small Grant and international donors' agencies to allow government sectors that are directly involved with implementation activities to access its funding scheme through BAC endorsement.

ACRONYMS

BAC	Biodiversity Advisory Committee
CEPF	Critical Ecosystem Partynership Fund
CBD	Convention on Biodiversity
COP	Conference of the Parties
DoFo	Department of Forests
DoFi	Division of Fisheries
ECF	Environment Consultants Fiji
FAO	Food and Agriculture Organization
FD	Forestry Division
FRA	Forest Resources Assessment
GEF	Global Environment Facility
GTZ	German Technical Cooperation
IBA	Important Bird Area
IUCN	International Union for the Conservation of Nature and Natural Resources
MAFF	Ministry of Agriculture, Food and Forests
MAFFF	Ministry of Agriculture and Food, Forests and Fisheries
MAF	Ministry of Agriculture and Food
MoFo	Ministry of Forests
MECC	Ministry of Environment and Climate Change
MLSNRE	Ministry of Lands, Survey Natural Resources and Environment
MLSNR	Ministry of Lands, Survey and Natural Resources
MoT	Ministry of Tourism
NECC	National Environment Coordinating Committee
NGO	Non Government Organization
POWPA	Programmes of Works on Protected Areas
SPC	Secretariat of the Pacific Community
TCC	Tonga Chamber of Commerce
TCDT	Tonga Community Development Trust
TTL	Tonga Timber Limited
TWB	Tonga Water Board
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

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This report was made possible by participation of stakeholders, implementers of the NBSAP objectives and assistance from international organizations. This opportunity is taken to thank the following organizations and individuals for their contributions in producing Tonga's Fourth National Report:

This report was funded by the Global Environment Facility (GEF) as an enabling activity with the United Nations Environment Program (UNEP). GEF Small Grant has been instrumental in supporting Tonga's efforts in meeting its targets, by funding most of the community biodiversity projects.

Sincere thanks are extended to the staff of the Biodiversity Division of our Ministry of Environment & Climate Change for coordinating the preparation of this report.

Lastly, we would like to thank the Geocare & Petroleum Consult Ltd who were contracted to draft this report.

FOREWORD

Tonga became party of the Convention of Biological Diversity (CBD) on May 1998. In ratifying this convention, Tonga reaffirmed its commitment to and support of the conservation, sustainable use and the equitable sharing benefits from the use of its biodiversity. Amongst its obligations, under Article 6, Tonga was required to develop national strategies and plans which set out how it intends to fulfill its obligations.

The work on Tonga's National Biodiversity Strategy and Action Plan (NBSAP) began in 2002. In June 2006, after a series of workshops, extensive public consultations and stocktaking exercises, the report was finally completed and launched. The report relied on the best information available at the time based on the expertise, knowledge and experience of Tonga scientists, environmental specialists, resource managers, users and owners. The main aim of the report was threefold:

1. To guide Government Ministries, as well as civil society organizations, NGOs and individuals in environmental management and conservation.
2. To inform Tonga's traditional development partners and other funding organizations who may be interested in contributing to its implementation.
3. To inform, educate and remind all Tongans to value and have pride in their natural heritage, and to encourage them to contribute to its conservation and sustainable management.

The NBSAP identified eight theme areas that are considered crucial to survival of species in Tonga's unique biodiversity. Objectives and Targets were set against these theme areas and an Action Plan was established to achieve these targets by 2010. A National Environment Coordinating Committee (NECC) was set up to oversee the formulation and implementation of the strategies and action plan.

1. Forestry Ecosystem	6. Local Community and Civil Society
2. Marine & Coastal Ecosystem	7. Access and Benefit Sharing from the genetic resources
3. Species Conservation	8. Mainstreaming biodiversity Conservation
4. Agro Biodiversity	9. Financial Resources and Mechanisms

Eight theme areas - NBSAP

After more than three years since its finalisation, the NBSAP is required to be reviewed, mainly to see whether it has achieved its aims and to report on progress and status of implemention of the goals and objectives in the eight thematic Areas. This work is to be completed by an independent contractor in accordance with the approved Term of Reference (TOR), which can be seen in Annex B.

Other requirements include an analysis of the sectoral and cross sectoral collaboration amongst sectors, followed by an assessment of Tonga's contribution to the global goals and objectives and the Strategic Plan.

Finally, the review is also required to suggest a plan for improved performance in implementing Tonga's national goals and objectives into the future.

Accodingly, the report is separated into four chapters, as follows:

CHAPTER I: Assessment of status of Tonga's species, trends and threats

CHAPTER II: Current Status of National Biodiversity Strategies and Actiion Plans

CHAPTER III: Sectoral and Cross Sectoral intergration or mainstreaming of biodiversity considerations

CHAPTER IV - CONCLUSIONS: Progress Towards the 2010 Target and implementation of the Strategic Plan

In response the contractor agreed to the TOR, with minor variation to the Terrestrial fauna aspect, which it was agreed would be done mainly through literature review.

The proposal was accepted and the review began in late January 2010.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I: Overview of Biodiversity Status, Trends and Threats

1.1. Introduction – Overview of Biodiversity Status and Trends

This chapter focuses on providing a general overview of Tonga's biological biodiversity, its status, trends and threats against its survival. The aim is to concentrate on the species of fauna and flora identified in the National Biodiversity Strategy and Action Plan (NBSAP) including any new ones that this review may reveal.

This chapter is structured as follows, to align with the approach adopted by the Biodiversity Conservation Action Plan, which deals with forest, coastal and marine, agricultural biodiversity and Species Conservation:

- Section 1.1 gives an overview of biodiversity status and trends;
- Section 1.2 deals with general threats facing biodiversity in the country;
- Sections 1.3 to 1.6 deal with species biodiversity in the four thematic areas identified in Tonga's NBSAP - Forestry, Coastal and Marine, Agriculture and Species Conservation; and
- Section 1.9 deals with implication of biodiversity loss from an economic perspective and the impact on human well being.

1.1.1. Factors Affecting Tonga's Unique Biodiversity

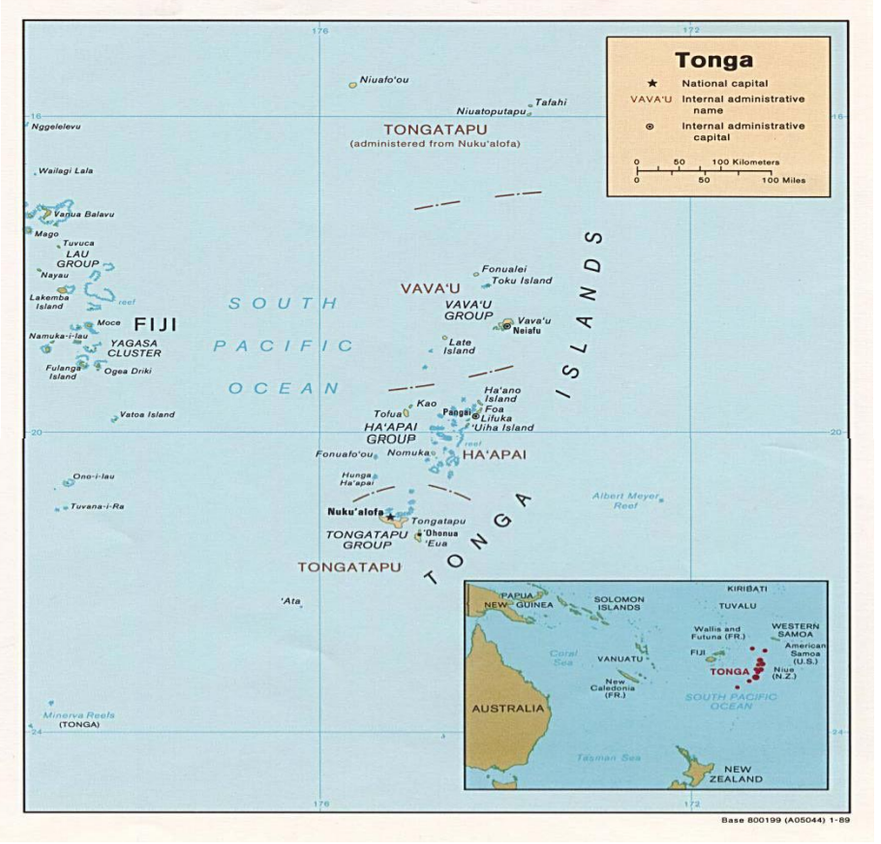
1.1.1.1. Geography

The Kingdom of Tonga is a small South Pacific nation comprising of 171 islands, of which about 37 are inhabited. There are four main groups of islands; Tongatapu, Ha'apai, Vava'u and Niuas. The Tonga Group of islands consisted of both volcanic and coral islands**.** The islands spread out between latitude 16^{o}S to 24^{o}S, and longitude 176^{o}W to174.5^{o}W (Fig 1a). The total land area is only about 700 square kilometers but the territorial waters cover about 700, 000 square kilometers. The following factors contribute to Tonga's unique biodiversity.

1.1.1.2. Geological Setting

The Tonga islands were formed as a result of collision and the subsequent underthrusting of the Pacific Plate beneath the Indo-Australian plate, in mid Eocene (45 Ma). This development is still ongoing and has resulted in the formation of a complex pattern of subduction, island arc volcanism, rifting and backarc basin formation. The subduction of the Pacific Plate underneath the Australia-Indian Plate has resulted in the formation of two large submarine ridges at the edge of the overlying Indo-Australian plate, which are aligned parallel to each other in a NNE direction (Fig 1b). The western ridge contains Tonga's volcanic islands and a centre of frequent submarine volcanic activities. The eastern ridge has no active volcanoes but contains the three main coral islands of the Tonga Group. From south to north they are: the main island group of Tongatapu, about 150kms to the north is the island group of Ha'apai, a similar distance further north is the island group of Vava'u, and further north still are the islands of the Niua groups. To the east of the twin ridges, and in a parallel trend, is the Tonga Trench, which is the second deepest trench in the world behind the Marianas Trench.

Figure 1a: Location Map

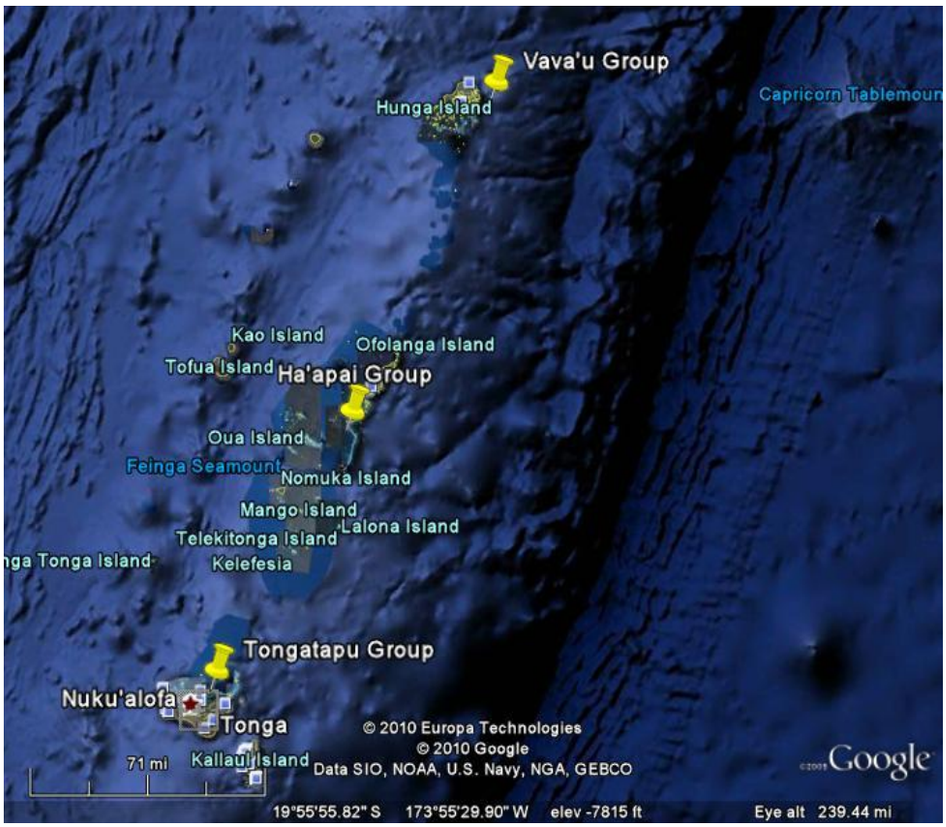


1.1.1.3. Topography

The geological development of the Tonga Group of islands resulted in two main types of topography: the high altitude volcanic islands of the western ridge and the low lying coral islands of the eastern ridge. The low lying islands are vulnerable to flooding and storm surges during cyclone season, at the coastal zones. The volcanic islands are mostly uninhabited due to their rough terrain and unwelcoming landing places.

The coral islands of Tongatapu, Ha'apai and Vava'u have experienced differential uplift in geological times as a result of the formation of a major graben structure caused by subduction of large structures along the Tonga Trench. The northern block, where the Vava'u group is situated, is uplifted higher than that of Tongatapu at the south, while Ha'apai in the middle is the least uplifted of the two blocks and appears submerged. This geological development has left these three island groups with different degrees of vulnerabilities in term of sea level rise and tsunami impact.

Figure 1b: Showing the two ridges, Tonga Trench and the 3 main island groups of the Tonga Group of islands



1.1.1.4. Climate

Tonga's climate is tropical characterized by the contrast between wet seasons (November – April) and dry seasons (May-Oct). About 60-70% of rain falls during the wet season.

Temperatures appear to show some dependence on latitude. The northern group of islands has higher average temperature (27^{o}C) than the southern group (24^{o}C). The lowest temperature on record is 8.7^{o}C, measured on September 1994 in Fua'amotu, Tongatapu. Temperatures of 15^{o}C or lower are usually measured during the dry season and are more frequent in southern Tonga than in the north.

Winds over Tonga are dominated by the south-east trades all year round. The wind tends to be strongest during the period of May to October especially in the northern Tonga, while little variation of the east to south-east winds occurs throughout the year in southern Tonga. Wind speed ranges around 12-15 knots.

Tropical cyclones are confined to the wet season (November - April) which is also known as the cyclone season. During the cyclone season of 2002-2003 (which was also an El Nino year) about five cyclones affected Tonga and caused severe damage to southern Tongatapu.

During a normal year rainfall in the dry zone of Tonga - mainly the Ha'apai group of islands and southern Tonga – is lower than normal during the dry season, especially towards the latter part of the season. The persistence of prolonged drought in Tonga is associated with El Nino event which also results in below average rainfall for Tonga. The 1997/1998 El Nino event caused drought conditions in Tonga especially affecting Tongatapu and Ha'apai groups.

Flooding in Tonga is not common but when it occurs it is mainly due to prolonged heavy downpour, storm tides and heavy sea swell. This flooding often occurs during the wet season (November - April). The areas mainly affected are the coastal low-lying areas, mainly the southern Tonga and the Ha'apai group of islands.

1.1.1.5. Soil and Agriculture

Aside from climatic influences on biodiversity, soil has also played a central role in shaping Tonga's biodiversity. The soil in Tonga is a mixture of weathered coral and layers of volcanic ash which makes the soil very fertile and highly productive. The soil is suitable to variety of crops and vegetables as well as pastoral farming.

Table 1: Classification of Land Use in Tonga (2006 and 2009)

Island group	Land Use	2006		2009		Movement
		Area (ha)	%	Area (ha)	%	Area (ha)
Tongatapu	Woodland	862.0		618.7	2	(243.3)
	Coconut (grassland, shrubland and cropland)			22,339.7	82	-
	Mangroves and wetland (saline and estuarine)			1,318.7	5	-
	Other			2,808.9	11	-
	Total	**26,844.0**		**27,086.0**	**100**	**-**
Vava'u	Woodland			1,133.4	9	-
	Coconut (grassland, shrubland and cropland)			10,078.6	79	-
	Mangroves and wetland (saline and estuarine)			372.9	3	-
	Other			1,112.8	9	-
	Total			**12,697.7**	**100**	**-**
'Eua	Woodland	3,827.0		1,454.3	17	(2,372.7)
	Coniferous plantation			371.7	4	
	Non-coniferous plantation	800.0		129.8	2	(298.5)
	Coconut (grassland, shrubland and cropland)			6,552.5	74	-
	Other			300.3	3	-
	Total	**8,900.0**		**8,808.6**	**100**	**-**
Ha'apai	Woodland			2,450.4	19	-
	Coconut (grassland, shrubland and cropland)			8,198.7	63	-
	Other			2,329.6	18	-
	Total			**12,978.7**	**100**	**-**
Niuas	Woodland			801.9	11	-
	Coconut (grassland, shrubland and cropland)			3,923.9	55	-
	Wetland			75.5	1	-
	Other			2,314.9	33	-
	Total			**7,116.2**	**100**	**-**
Total	Woodland	8,000.0	11.5	6,458.7	9.4	(1,541.3)
	Coniferous plantation			371.7	0.5	
	Non-coniferous plantation	800.0	1.2	129.8	0.2	(298.5)
	Coconut (grassland, shrubland and cropland)	48,000.0	69.5	51,093.4	74.4	3,093.4
	Mangroves and wetland (saline and estuarine)	2,963.0	4.3	1,767.1	2.6	(1,195.9)
	Other	9,337.0	13.5	8,866.5	12.9	(470.5)
	Total	**69,100.0**	**100**	**68,687.2**	**100**	(412.8)

Sources: 2006 figures (2006 NBSAP); 2009 figures (Draft National Forest Policy 2009).

The old fashioned way of farming was very conservative and in rhythm with the environment. Land was left fallow for a period of no less than three - five years. Farmers were doing rotational farming using small plots within their eight acres of allocated land. The advancement of technology and introduction of the plough and other heavy machinery has seen a period where forest trees can be easily pushed aside in exchange for agriculture. The introduction of single crops like watermelon and pumpkin to the agricultural sector has further added to the threat forests are facing with high tech agriculture.

This agricultural encroachment is continuing to result in the destruction of forest habitats, replaced by an agricultural habitat (Table 1). This has been proven to be an imbalanced exchange because the cost is detrimental to the forest ecosystem where species diversity is much wider, compared to a much lesser and narrower diversity in an agricultural plot. The balance between this exchange is required urgently for the conservation and increase in diversity of species in future. A land use plan and policies are required to be developed to assist this balancing process.

1.1.2. Species Diversity

Tonga's unique biodiversity is in many ways related to its own geological formation, geographical location, landmass and climatic conditions. The island group is remotely positioned in the Pacific Ocean and far from any continental landmass. As a result, there is limited exchange and its flora and fauna is limited in its diversity.

Tonga's small landmass of only about 700 square kilometers spread over 700, 000 square kilometers of territorial waters makes conservation a challenge. Most of these islands are uninhabited and contain the majority of Tonga's natural forest. On the other hand, the eastern ridge contains a chain of coral islands which are mostly low lying and accessible to human settlement. These island groups contain most of the population of Tonga and the impact of man on the environment is most obvious on these islands. The effect of man on the limited land and environmental habitats vary from habitat loss to habitat degradation. The forests are fragmented and almost absent in these islands due to encroachment of agriculture and demand for other development activities.

The species diversity is affected by the isolation of the islands by a large amount of water which has encouraged endemism and genetic erosion. This is evident in the forest of the volcanic islands (such as Kao and Tofua) which are flourishing in abundance but with low diversity.

The geographic distribution of the islands in a north-south direction, from latitude 16^{o}S to 24^{o}S, creates climatic and temperature differences between the islands. The northern group has an average temperature which is about 4^{o}C hotter than the Tongatapu group at the south. In addition, the amount of rain is greater in the north, at the Vava'u group than at Tongatapu. These climatic factors further influenced the distribution of species in the island group.

1.1.2.1. Terrestrial Fauna and Flora

Information on flora and fauna of Tonga is dispersed and figures have been found to conflict with each other. In order to start a baseline for this review, the IUCN 2008 Red List has been taken to be the baseline in determining trends and the status of species described in the Tonga's NBSAP.

According to the IUCN 2008 Red List, Tonga supports a total of 2264 species of fauna and flora (Table 2). Out of the 357 assessed species, six were found to be endemic (Table 3). A comparison between the 2008 IUCN Red List and 2006 NBSAP Red List are presented on Table 10 and Annex 2

Table 2: Estimated Number of Described and Assessed Species of Tonga

Taxonomic Group	Sub group	Estimated number of species described*	Number of Species Assessed
Plants	Mosses	6	0
	Ferns	35	0
	Cycads	1	1
	Conifers	1	1
	Dicots	128	3
	Monocots	137	0
	Algae	51	0
	Fungi	219	0
Total Plants		**581**	**5**
Birds		**45**	**45**
Mammals		**23**	**23**
Reptiles		**16**	**3**
Amphibians		**0**	**0**
Fish	Marine Fish	1139	53
	Fresh-water Fish	3	0
Total Fish		**1142**	**53**
Invertebrates	Insecta	125	0
	Arachnids	16	0
	Hard Corals	218	218
	Molluscs (Bivalves and Gastropods)	98	5
	Crustaceans	unknown	1
	Hydrozoa	unknown	4
	Other Invertebrates	unknown	0
Totals Invertebrates		**457**	**228**
Totals		**2264**	**357**

Source: Page 2 of **"The Pacific islands: An analysis of the status of species as listed on the 2008 IUCN Red List of Threatened Species"**

Tonga supports 581 plants and is a home for 45 birds, 23 mammals and 16 reptiles (Table 2). There are 1139 marine fish and three freshwater fish, making the total for fish species equal to 1142. About 457 species of invertebrates were described of which about 15% are threatened. About 80% of the plant species, 65% of reptiles and less than 5% of birds and mammals are threatened.

Table 3: Assessed Endemic Species of Tonga

REPTILIA	*Tachygia*	*Microlepsis*
CONIFEROPSIDA	*Podocarpus*	*Pallidus*
MAGNOLIOPSIDA	*Aglaia*	*Heterotricha*
ACTINOPTERYGII	*Epinephelus*	*Cholorocephalus*
AVES	*Megapodius*	*Pritchardii*
AVES	*Pachycephala*	*jacquinoti*

Source: 2008 IUCN Red List of Threatened Species

Tonga currently supports 45 species of land and freshwater birds with one endemic (Table 3) - the Tongan whistler (*Pachycephala jacquinoti*) in the Vava'u Group (Rinke 1986b, Stattersfield et al. 1998). More than 100,000 sooty terns (*Sterna juscata*) are thought to breed in the volcanic crater on Fonualei Island in the Vava'u Group (Jenkins 1980). The Niuafo'ou megapode (*Megapodius pritchardii*) is restricted to the island of Niuafo'ou where it buries its eggs in the warm sands near volcanic ducts. All other species of megapode in Polynesia have been extirpated, and the nearest extant species is in Vanuatu, 1,600 km west.

The population of reptiles in Tonga consists of 16 known species. One assessed reptile has been declared as extinct on the IUCN 2008 Red List - the Tonga Ground Skink, *Tachygia microlepis.*

1.1.2.2. Forest

A population increase in Tonga has resulted in more natural forest being cleared in the inhabited islands and establishment of plantations on uninhabited volcanic islands. The volcanic islands of Late (17 km^2) and Tofua (55.4 km^2) contain some of the best remaining high diversity native forest and still support large populations of birds and reptiles (Steadman 1998).

The natural forests and trees of Tonga are still threatened by the expansion in agricultural activities. Of the total land area of 69,100 ha (Table 1), about 8,000 ha or 12% was considered to be covered by woodland (forest) in 2006 (NBSAP). The woodland cover is down to 9% or 6,460 ha in 2009 (National Forest Policy 2009). Agricultural lands have increased from 70% or 48,000 ha in 2006 to 75% or 51,100 ha in 2009, of which 74% is covered with coconuts. Forest Plantation area has decreased from 1.2% to 0.7% while mangroves followed at a similar trend from 4.3% in 2006 to 2.6% in 2009.

1.1.2.3. Medicinal and Cultural

The full determination of the 581 described plant species of Tonga as medicinal, cultural or both is yet to be carried out. The 2006 NBSAP Red List of Threatened Species consisted of 60 species including all of the top five medicinal and cultural plants that were listed by Fusimalohi (1998) and Whistler (1992). 55% of those species are used for medicine and other purposes. 38% are used for cultural and other purposes and 33% for timber and other purposes (Table 10).

Twenty five new species were identified as threatened during the review, of which 60% are used for medicine and other purposes, 44% are used for timber and other purposes, and 32% for cultural and other purposes.

Figure 2: Integration of species conservation with plantation forest development (Cyathea lunurata and pine)

Source: Tonga Timber Limited

1.1.2.4. Coastal and Marine

Tonga's Exclusive Economic Zone (EEZ) has a total area of about 700,000 km^2. Much of the deep water animal species are less known, indicating much scope for future investigation. However, those at coastal zone and reefs are well known.

There have been 38 species identified under pelagic fish (Bone and Marshall 1992, Castro and Huber, 2000, Bell et al, King 1995) to be found at both deep sea and coastal zone. Also recorded were 12 species of whales and six species of marine turtles. Humpback whales and bottlenose whales are considered endangered and together with hawksbill turtles are all protected under Tongan legislation. Other turtle species are fished seasonally with a minimum size specified. King (1992) reported that snapper and grouper are susceptible to overfishing because they are sought after for export and may require some sustainable measure to be in place.

Research suggested that tunas, sea turtles and other deep water predators concentrate in hotspots, found at intermediate latitudes close to coral reef habitats, shelf breaks and seamounts. The protection of some of these ecosystems would be crucial in conserving biodiversity at these hot spots, especially at spawning times.

Coral reefs are common and widely distributed around the islands. There are three types recognized: fringing, barrier and submerged reefs. They offer the best choice for fishing due to the variety and abundance of fishes in this environment. However, their proximity to land has seen this ecosystem suffering from over exploitation. The common reef fishes were recorded at about 158 species, 150 species of Molluscs, 33 species of Echinoderms and 26 species of Crustaceans (Thaman, 1996).

1.1.2.5. Agro-Diversity

Tonga's agro-biodiversity comprises of the following groupings: root crops, fruit trees, food tree crops, vegetables and livestock. Root crops – yams, taro, cassava and kumara - form the main source of carbohydrate in a Tongan diet. The most important food trees are pawpaw and breadfruit. There are different varieties of these and they are part of a Tongan stable diet when they are in season. There are about 153 agricultural species identified under this review of which seven are labeled critically endangered, 104 as rare and 42 considered abundant.

1.1.3. Tonga's Ecosystem Diversity

The health of Tonga's biodiversity relies heavily on the state of its ecosystem and habitats. Table 4 shows the ecosystem diversity of Tonga.

Table 4: The Ecosystem Diversity of Tonga

Ecosystem	Tongatapu(ha)	'Eua(ha)	Niuas(ha)	Vava'u(ha)	Ha'apai(ha)
Coastal & Marine Ecosystem					
Mangroves	884			316	
Rocks(terraces)	145			42	1581
Beach (Sand)	55	14		12	185
Saline Wetland	124				
Estuary & Mudflat	17			2	
Reef flat	12840	511		9952	4719
TOTAL AREA	**14,063***	**525***		**10,323***	**6,485***
Agricultural Ecosystem					
Crop Plantation	8,507	6,552	3,923	10,078	8,198
Grassland	1480				
Coconut	8695				
Scrub	3673				
TOTAL AREA	**22,355**	**6,552**	**3,923**	**10078**	**8,198**

Forestry Ecosystem					
Tropical Rainforest	618	1,454	801	1,133	2,450
Reserve	44				
TOTAL AREA	**618**	**1,454**	**801**	**1,133**	**2,450**
Wetland Ecosystem					
Swamp	1318	0		372	0
mudflats			75		0
Water body		0			
TOTAL AREA	**1,318**	**0**	**75**	**372**	**0**

Source: Ministry of Land, Survey and Natural Resources (MLSNR)

1.2. Overview of Threats to Tonga's Biodiversity

The main threats to biodiversity are briefly discussed below followed by sections on forests, coastal and marine, agriculture, and species conservation. Detailed descriptions of the status of each ecosystem and threats facing species in each of them are also given.

1.2.1. Habitat Loss

Agriculture is mainly to be blamed for large loss in forest habitats. The dependency on agricultural products for consumption and export has been the main driving force in destruction and fragmentation of forest. This has in turn resulted in disappearance of species and in terms of forest isolation, species are restricted in their natural dispersal, which consequently increases their vulnerability to genetic erosion.

Removal of mangroves for housing and firewood is another form of habitat loss. In the area around the main town of Nuku'alofa urbanization is the main cause, as the town expands towards swampy areas and edges of the lagoon.

1.2.2. Habitat Degradation

The lagoon on the main island of Tongatapu is a habitat and a spawning place for some marine organisms. This ecosystem is systematically degraded due to unsustainable land use (deforestation) and use of fertilizers and pesticides. Run off from surrounding farms pollute the lagoon.

Unauthorized encroachment and reclaimation of land, which includes removal of part of the ecosystem, contributes to the degradation of coastal and lagoon ecosystems. Removal of mangroves and the creation of direct access to the lagoon encourages direct littering and allows pollution from septic tanks leakages. Mining of coral for export and over exploitation and use of destructive fisheries methods (dynamite and drugs) on marine resources further degrades the marine ecosystem. Release of ballast water and waste oil from ships is another form of pollution which may also introduce invasive species to the marine ecosystem.

1.2.3. Over Exploitation of Biological Resources

The clearing of forest for agricultural purposes has resulted in removal of some species of medicinal plants that have been for years keeping the local population healthy. This is further aggravated by people cutting portions of the plant when all they need is a bit of the bark or some leaves. To save a later trip back to the forest, it has been observed that people tend to take more than they need. As a result, some of these plants are at edge of extinction and require urgent action in replanting or ex situ conservation.

There is evidence of overfishing around the reef flats, slope and nearby barrier reefs. This is reflected in decrease in number of species in this environment. Fishing is now carried out further out to the seas and at submerged reefs and seamounts. This trend is indirectly emphasized by the rising cost of reef fish in the local market.

1.2.4. Type of Fishing Methods

The three types of dangerous fishing methods are: dynamite, poison and fine net. All these types of fishing are not selective but tend to kill all sizes of fishes. Killing juveniles does not help the replenishment process thus pushing some of this resource into endangered levels.

1.2.5. Pollution

The use of pesticide and weed killing chemicals is a common practice in agriculture in Tonga. This will eventually affect groundwater. At times heavy rain removes this poisonous chemical as runoff towards low lying areas and the lagoon, contaminating and killing a variety of species in these areas.

People residing at lagoon edges contribute to the degradation of this ecosystem due to littering, chemical wastage and septic leakages.

1.2.6. Urbanisation

The migration of people from the other island groups into the main island (Tongatapu) is causing a lot of pressure on Tongatapu's ecosystems. This is evident in Nuku'alofa, the capital of Tonga, where there is great demand for land. Such migration commonly leads to build up of squatter settlement at marginal lands, at swampy and edge of lagoon areas. This leads to pollution and further degradation of the swampy and lagoon ecosystem.

1.2.7. Tropical Cyclone and Tsunami

Tropical cyclones are increasing in intensity in the Pacific Ocean (Figure 4). This may be related to the climate change phenomenon.

The tsunami of November 2009 that hit the island of Niuatoputapu was unexpected and took the people at the coastline by surprise. It caused heavy damage to reef, fishes, properties and farmland near the coastline. The damage extended almost a kilometer inland in some places. Nine people lost their lives in this event and hundreds were left homeless. The lateral reach of the waves was about 1 km in the eastern side of the island and an average width of about 500 m on the western side (leeward).

1.2.8. Lack of Awareness and Education

Lack of knowledge of the role that biodiversity plays in the well being of man is believed to be the cause of most unsustainable practices and 'no care' attitude that people direct towards the environment. Tongan culture is influenced to a large extent by religion. A belief that resources are god given and in infinite form is well ingrained in some people's mind. Education and teaching the concept of a world with limited resources using simple examples – for example, in looking for resources, one has to spend more hours in the same area today, where they were found in abundance in the past - would be ideal to change people's attitude towards sustainable utilization of resources. At the grassroots level, science needs to be simplified.

Another important area is introducing the concept of conservation of both environment and biodiversity through schools' curriculum, as an excellent way of developing the correct attitudes in the younger generation. An educated generation is the key to conservation and sustainable utilization of resources in the future.

1.2.9. Diseases

Diseases can be introduced as a result of ecosystem loss. The destruction of a forest ecosystem in exchange for an agriculture ecosystem is an example of this. Diseases can be kept under control ecologically by species feeding upon each other. This balance can be struck in a forest ecosystem. Destroying this balanced ecosystem in exchange for a one plant agriculture ecosystem, can lead to one species becoming dominant over another. This species may attack the crop and become a pest. This is a common occurrence after a period of successful introduction of a new crop. For example, the successful squash crop in Tonga was eventually attacked by disease which led to a decline in export.

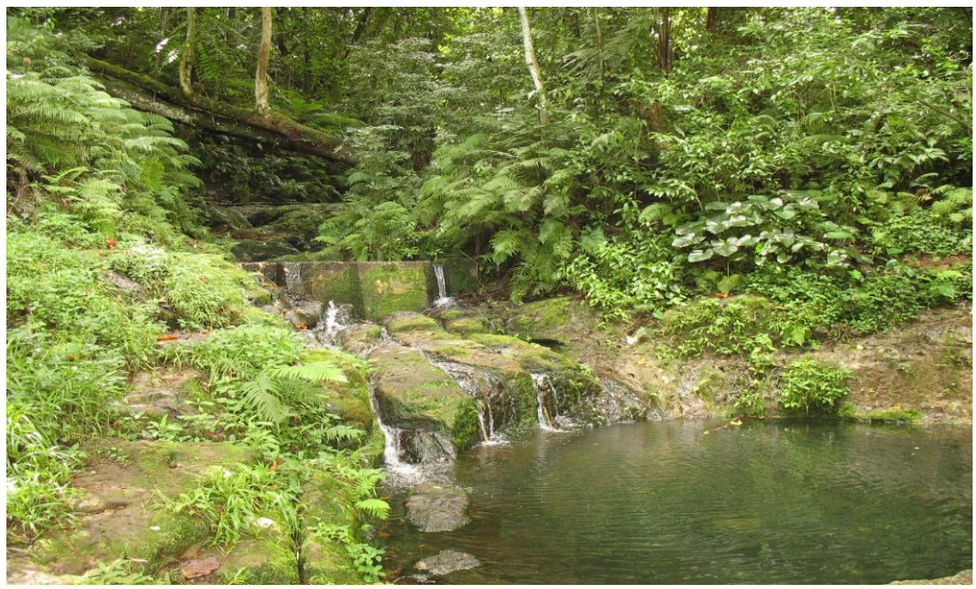
1.3. Forest Ecosystem

1.3.1. Forest in the economy

The combined agriculture, forestry and fisheries sectors are recorded to account for about 28% of GDP. The real value of forestry is likely to be underestimated because it does not include contributions to other uses such as fuelwood, carving wood, medicinal & cultural, handicraft, flowers, food, and other non-wood forest products. More importantly, it does not place a value on the substantial environmental benefits of forests: conservation of biodiversity, maintenance of soil fertility, prevention of soil erosion, coastal protection, carbon seizure and improving water quality (Figure 2). Neither does it acknowledge the important role of forestry in supporting sustainable agriculture and building resilience to climate change.

The forestry sector currently employs about 200 people in nurseries, plantation management and sawmilling operations. About 900 m^3 of plantation logs and 500 m^3 of coconut logs are milled each year. Most production is consumed domestically but some is exported. The export value of wood carvings from indigenous forest tree species and trees on farms is unknown but likely to be significant. Sawmilling is estimated to constitute 10% of the manufacturing sector which in turn contributes about 5% to GDP.

Figure 3: Forest Ecosystem with fresh water for the people of 'Eua in Tonga



Source: Tonga Timber Limited

1.3.2 Status and Trends

1.3.2.1. Forest Ecosystems

The majority of the Tonga's natural forests are harbored by uninhabited volcanic islands and the island of 'Eua, southeast of Tongatapu Island. The rest of the forests are found as isolated patches on the inhabited islands of the Tonga Group, as result of agricultural and settlement activities.

NBSAP 2006 provides a non comprehensive snapshot of the extent of Tonga's forest ecosystems as at 2006 (Table 1). The stocktaking consultants estimated those statistics by deducting or adding the estimated current annual rate of destruction or utilization or replenishment of those species and ecosystems from/to the latest available estimates. For instance, Dahl (1986) + Parker & Whistler (1998) were used for ecological zoning, species diversity and endemism; Desloges(1994) + Bellingham & Fitzgerald (1996) + Wiser at al (1999) for calculating the area of ecosystems; MoF for forest plantation area and Burrows & Douglas(1996) for the coconut palm resources and farming land. Those rough estimates were done with the anticipation of a comprehensive national inventory before 2010.

Recent data from FRA 2005 indicated that Tonga has the lowest percentage of forest cover in all Oceania, with an average of 23.3%. The most recent data is presented on page 17, Table 1 of the Draft National Forest Policy for Tonga 2009 (TNFP 2009). It gives the best estimate available of forest areas by MLSNR although in much broader land class categories than the NBSAP 2006. Those statistics were further modified for the purpose of this report in order to establish Table 1 & 5. The total land area of Tonga is between 69,100 and 75,210 ha depending on whether the lake area of of 6,523 ha is included (TNFP 2009).

Table 5: The summary: Area and percentage land cover of various land classification in Tonga (2009)

Island group	Land Class	NBSAP 2006		TNFP 2009		MOVEMENT
		Area (ha)	%	Area (ha)	%	Area (ha)
Total	Woodland	8,000.0	11.5	6,458.7	9.4	(1,541.3)
	Coniferous plantation	800.0	1.2	371.7	0.5	(298.5)
	Non-coniferous plantation			129.8	0.2	
	Coconut*	48,000.0	69.5	51,093.4	74.4	3,093.4
	Mangroves and wetland **	2,963.0	4.3	1,767.1	2.6	(1,195.9)
	Other	9,337.0	13.5	8,866.5	12.9	(470.5)
	Total	**69,100.0**	**100**	**68,687.2**	**100**	**(412.8)**

Notes: * Includes grassland, shrub land & cropland, ** Saline & Estuarine

Sources: 2006 figures (NBSAP) 2009 figures (Draft National Forest Policy for Tonga 2009)

There is no doubt that Tonga's remaining natural forest is diminishing, although at a much slower pace than before. The estimates may not be as accurate as they could be but the expected declining trend is indicated. The woodland (natural forest) had declined from the estimated 11.5% coverage in 2004 to 9.4% in 2009. This trend is translated to about 308ha of forest area cleared per annum in the last 5 years (Table 1 & 5).

Table 6: Harvesting and Planting, TTL's plantation forest 2006-2009, 'Eua

Year	Harvesting		Planting Area(ha)
	Volume (m3)	Area(ha)	
2006	421	1.70	16.00
2007	257	1.00	14.00
2008	644	2.00	15.20
2009	584	1.70	11.20
Total	**1,906**	**6.40**	**56.40**

Source: Tonga Timber Limited, January 2010

The significant 58% drop in the coverage of coniferous plantations as shown in Table 1 & 5 could have possibly been distorted by firstly the lumping together of the non and coniferous forest areas in the 2004 stocktake and secondly the overstating of the size of the private and TTL's forest plantations in 2004. Data collected from the TTL Annual Reports 2006 to 2009 showed an increase in the area of the Company's forest plantation by 50 ha (Table 6). The Company's forest plantation was 439 ha in 2006 and 489 ha in 2009. The 489ha forest consists of 345 ha of coniferous forest (*Pinus caribaea*) and 144 ha of non coniferous forest (mixer of *Toona ciliata*, *Agathis robusta*, *Switenia macrophylla* and *Tectona grandis*). These figures reasonably tallied with the TNFP estimate.

Table 7: Number of Seedlings sold for 2007 - 2009 MAFF Nurseries in Tongatapu

Type of Species	Number of Seedlings sold / planted			
	2007	**2008**	**2009**	**TOTAL**
Timber	1,010	1,714	22,525	**25,249**
Cultural	6,052	2,107	9,323	**17,482**
Ornamental	30,535	130,065	34,459	**195,059**
Medicinal	2,200	-	3,102	**5,302**
Handicraft	8,500	-	10,202	**18,702**
Fruit trees	9,566	796	10,000	**20,362**
Cash crops	1,754	1,287	57,243	**60,284**
Coastal	533	-	359	**892**
Sandalwood	-	-	632	**632**

Others	1,877	-	-	**1,877**
TOTAL	**62,027**	**135,969**	**147,845**	**345,841**

Source: MAFFF Annual Reports 2007 – 2009. Annual figures were consolidated by the writer.

The increasing number of seedlings sold from the MAFF Nursery in Tongatapu reflects the public's high level understanding of the important roles that trees play in the farming system and the need to conserve important cultural and medicinal plants (Table 7). The 345, 841 seedlings that were planted in the last three years alone, if all survived, is equivalent to 415 ha of fully stocked plantation forest, a significant contribution to species conservation and national biodiversity (See Table 7).

The coconut replanting scheme of MAFF has outpaced the TTL harvesting rate by almost 2 to 1 despite the absence of any replanting figure for 2006 (Table 8). This performance is translated into a net increase of 8,301 palms or 66 ha at the assumed rate of 125 palms per ha, since 2006. This is way below the 3093 ha increase in land used for coconut that is presented on Table 1. These discrepancies may not alter the trends but should be sorted out by way of a national inventory. Total production of coconut sawn timber was 1,292 m^3. Data showing the total number of palms cleared for agricultural development is not available but this is believed to be insignificant due to a marked decline in the acreages of squash in recent years.

Table 8: Production target and achievement 2006 – 2009, Coconut Resources

Year	Harvesting	Replanting	
	No. of trees	**Seedlings produced**	**Seedlings planted**
2006	7,200	na	na
2007	4,078	1,800	682
2008	1,733	26,601	1,104
2009	1,340	22,991	20,866
Total	**14,351**	**51,392**	**22,652**

Source: Tonga Timber Limited, January 2010 and Forestry Division, February 2010

The number of protected areas – which includes forest parks - remained at the 2006 level of 19 (Annex 1). The total of protected area is about 1, 010,057 ha of which 99.3% are marine based and the rest are on land. The areas of some of the very smaller reserves are not available. The total area of national forest parks is 6,710 ha representing 9.8% of Tonga's total land area of 68,687 ha and 11.2% of the total area of forest ecosystems (59,767 ha). The national park on 'Eua is often policed by the Forestry Division (FD). Therefore, apart from minor disturbances to the forest by eco-tourism and other visitors, the park area had not changed. Report from the Officer in Charge (OIC) of FD in Ha'apai confirmed the continued clearance of the National Parks on Tofua for agricultural purposes. Farmers from the surrounding islands clear the land and plant it with crops such as *alocasia, colocasia, xanthosoma* and piper *methisticum* then return home. They may visit again few times for weeding before harvesting. The extent of this abuse can only be determined if a national inventory is carried out.

1.3.2.2. Forest Species

The threatened status of plants is one of the most useful signs for assessing the condition of an ecosystem and its biodiversity. The estimated number of described plant species in Tonga that appears on the 2008 IUCN Red List of Threatened Species is used for assessing and monitoring Tonga's plants' conservation efforts (Table 9).

The sixty (60) plant species that were identified and declared endangered under the NBSAP 2006 is the epicentre of the species conservation efforts up to 2009 (Table 10). It was noted that the IUCN database is designed for global monitoring therefore the 2009 analysis, at national level, is clearly stated as not to confuse the global priority setting scheme. It is important that MECC annually facilitate the updating of Tonga's database at IUCN for more effective conservation planning and priority setting.

Table 9: Estimated number of described and assessed species for Tonga

Taxonomic Group	Sub group	Estimated number of species described*	Number of Species Assessed
Plants	Mosses	6	0
	Ferns	35	0
	Cycads	4	1
	Conifers	1	1
	Dicots	128	3
	Monocots	137	0
	Algae	51	0
	Fungi	219	0
Total Plants		**581**	**5**

Source: "The Pacific Islands: an analysis of the status of species as listed on the 2008 IUCN Red List of Threatened Species"

There is enough evidence that although some of the conservation actions that were scheduled for implementation in the past 5 years are yet to be carried out, Tonga has appeared to contribute positively to the regional and global conservation of biodiversity (Table 10 & 11).

Table 10: Summary of NBSAP 2006 Red List of Threatened Plant Species by Plant Type

Type of Plant	Critically Endangered (CE)	Endangered (E)	Vulnerable (V)	Abundant (A)	Total
1. Medicinal	7	10	5	-	**22**
2. Ornamental & Cultural	1	7	3	-	**11**
3. Timber	3	7	1	-	**11**
4. Medicinal +Ornamental & Cultural	1	4	2	-	**7**

5. Timber + Ornamental & Cultural	1	3	1	-	**5**
6. Medicinal & Timber	1	3	-	-	**4**
TOTAL	**14**	**34**	**12**	**-**	**60**

Source: NBSAP 2006 (Annex 2: p 89, 90 &91.) The classification into plant type was done by the writer.

In the national scene, the current review revealed that 31(52%) of the 60 plant species that were declared threatened in the NBSAP 2006 showed improvement in their threatened level, 28(47%) showed no movement and 1(about 1%) worsened (Table 11 and Annex 1A.4) Twenty five new threatened species were identified in the 2009 review (Annex 1A.3)

Globally, the 2003 IUCN Red List of Threatened Species reported a total described plant species for Tonga of 463. Only two (0.5%) of these species were assessed by IUCN and were both declared threatened. In the 2008 IUCN Red List, the number of described plant species increased to 581. Three more species were assessed, two of which were declared threatened making a total of four threatened plant species for Tonga today. One of the threatened species is at a critical level (CR) and three at the vulnerability status (V). One of the five assessed species is still in the least concern category (LC) (Table 2).

Species may move between categories for a variety of reasons, including genuine improvement or deterioration in status, new information being available about the species that was not known at the time of the previous assessment, taxonomic changes, or mistakes being made in the assessments (e.g. use of incorrect information, etc).

Analysis of the statistics revealed that a high percentage - over 58% - of the threatened species are used for Tongan medicine; followed by timber and ornamentals/cultural at about 40% and 35%, respectively (Table 10 & 11 & Annex 1A.4). It reemphasizes the fact that medicinal plants, regardless of where they are, are more vulnerable to unauthorized and uncontrolled utilization. Since only part(s) of the plant is used for medicine, they can be easily and illegally removed at unofficial hours. Those that are located within national parks, forest reserves and coastal forests are and will be easy target for illegal utilization.

Table 11: Current Status of NBSAP 2006 Red List of Threatened Plant Species by Plant Type

Type of Plant	**Critically Endangered (CE)**	**Endangered (E)**	**Vulnerable (V)**	**Abundant (A)**	**Total**
1. Medicinal	6	3	12	1	**22**
2. Ornamental & Cultural	-	4	6	1	**11**
3. Timber	2	3	3	3	**11**
4. Medicinal +Ornamental & cultural	1	1	2	3	**7**

5. Timber + Ornamental & Cultural	-	1	3	1	**5**
6. Medicinal & Timber	-	2	2	-	**4**
TOTAL	**9**	**14**	**28**	**9**	**60**

It is expected that if plans to conserve species continue the number of threatened plants that will be nationally declared in future years will decrease. It is also expected that the majority of any new threatened plant species will be medicinal plants. Globally, the number of IUCN's described plant species for Tonga is expected to increase possibly to as close to 770, which is the total number of species that was estimated by Dahl (1986) as presented on page 82 of NBSAP 2006. The number of assessed threatened species should increase in subsequent years to as close to the total number that are nationally identified.

To summarise the results of Tables 10 and 11, and the state of threatened plant species by plant type:

- Three new plant species were assessed by the IUCN in 2008, two of which were declared as threatened species now making a total of four.
- 117 new plants entered Tonga's described species category of IUCN now making a total of 581.
- Attempt has been made to consolidate the list of endangered plant species into one national list entitled "Threatened plant species of Tonga as at 31 December 2009" (Annex 1A.4). It brings together the four plant species from the 2008 IUCN Red List of Threatened Species, the 60 plant species from 2006 NBSAP Red List and the 25 new plant species from 2009 Review making up a total of 89 plant species or 15% of Tonga's estimated described plant species of 581.
- The 60 threatened species that were brought forward from NBSAP 2006 represent about 10% of the total number (581) of Tonga's described species. One of which is endemic [1(2%)], six are believed to be endemic, Whistler 1998 [6 (10%)] and the rest are non endemic [53 (88%)].
- Fourteen [14(23%)] of the 60 threatened species brought forward were declared critically endangered (CE). Of which, nine [9(64%)] species remained at the same danger level, four [4(29%)] improved one step lower to endangered (E) level while one [1(4%)] made a two steps improvement to vulnerable (V) level (Table 10 & 11).
- Thirty four [34(57%)] of the 60 threatened species brought forward were labeled endangered (E). Of which, nine [9(26%)] species recorded no improvement. Seventeen [17(50%)] species made one level improvement to vulnerable (V) level while remaining eight [8(24%) species made a two level improvement to abundance (A) level (Table 10 & 11 & Annex 1A.4).
- Twelve [12(20%)] of the 60 threatened species brought forward were labeled vulnerable (V). Of which, ten [10(83%)] species recorded no improvement. One [1(8%)] species got worse by one level while only one [1(8%)] species improved to abundance (A) level (Table 10 & 11, Annex 1A.4).
- Twenty five new threatened species were identified during the 2009 review. Of which three [3(12%)] species are critically endangered (CE), five [5(20%)] are endangered (E) and seventeen [17(68%) species are at vulnerable (V) level. Fifteen [15(60%)] of the new threatened species are used for medicine. Eight [8(32%)] are used for ornamental/cultural purpose and eleven [11(44%) are used for timber, posts and firewood. Six [6(24%)] species are likely to be endemic, Whistler (1998) (Annex 1A.4).

1.3.3 Threats

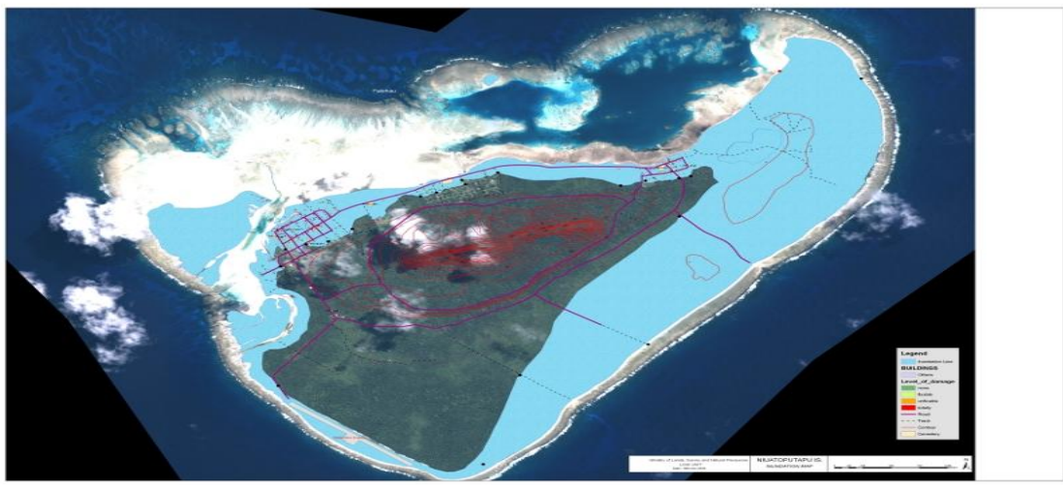
1.3.3.1. Climate Change and Natural Disasters

The major threats that apply to plant species conservation are equally shared by the forest and other ecosystems. Of particular interest, however, are issues of natural disaster and climate change, which have recently been brought to life by the 2009 tsunami that hit Niuatoputapu and the February 2010 tropical cyclone. It should remain a reminder to all planners that climate change and the threat of natural disasters can no longer be taken lightly (Fig. 4 & 5).

Figure 4: Coastal forest ecosystem at Niuatoputapu Island is completely destroyed by the 2009 tsunami

Source: Tonga's Department of Meteorology

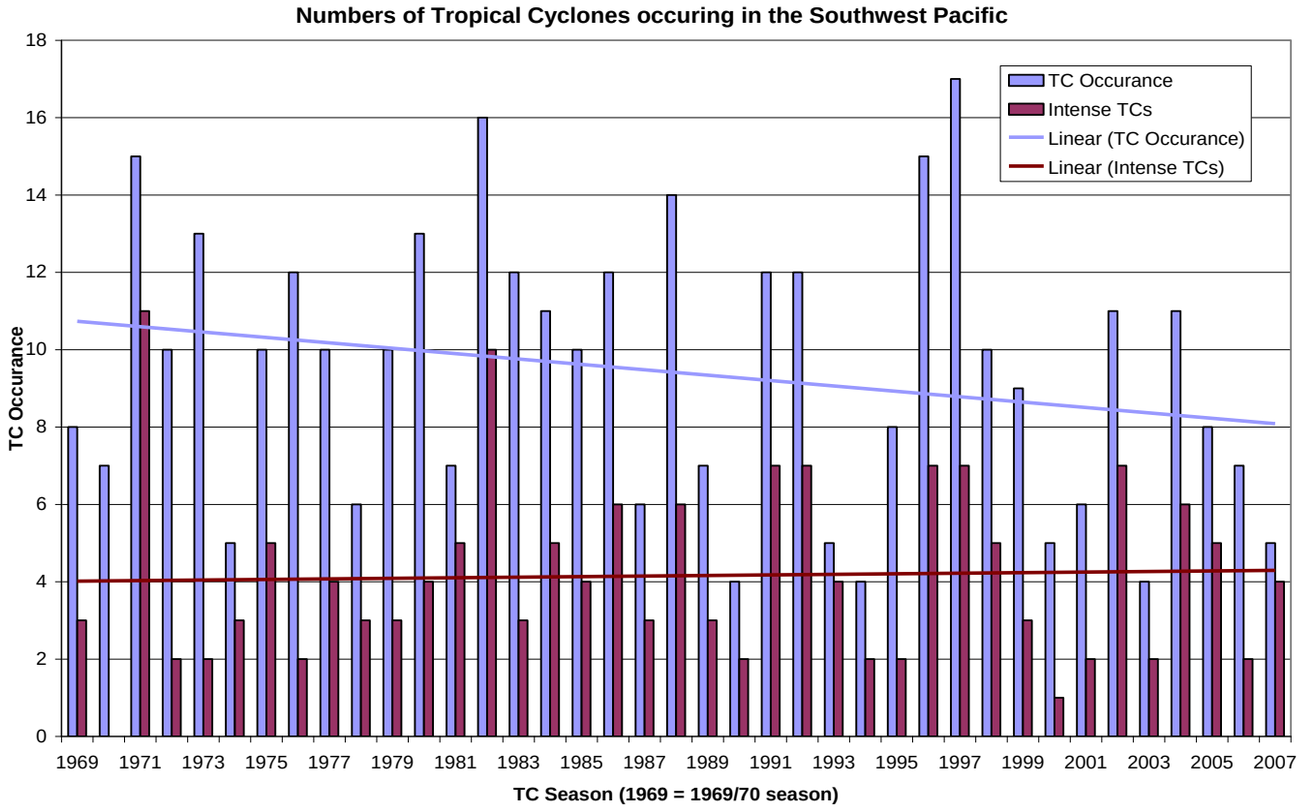
Figure 5: A satellite view of Niuatoputapu showing the area (light blue shade) that was submerged in sea that water



Source: GNS Science Report 2009/71

Figure 5 shows a satellite view of how far the sea travelled inland (shown by the light blue shaded area) on Niuatoputapu as a result of the tsunami in September 2009. Out of a total land area of about 1,500 ha, 690 ha (46%) of the land was inundated. Eighty nine ha of forest [89 (6%)] within the inundated area was completely destroyed. The remaining 501 ha of the area inundated consists of villages and other forests. The destroyed forests will take a long time to recover.

Figure 6: Numbers of Tropical Cyclones occurring in the South West Pacific



Source: Tonga Department of Meteorology.

Figure 6 clearly demonstrates the trends in the frequency of tropical cyclones in relation to their intensity. The linear graph shows that there is a decrease in frequency of cyclones (blue line), but they appear to have increased in intensity (red line). This prediction model should therefore be incorporated into the development of protection and conservation models for Tonga.

Also very common at the western district of Tongatapu is sea intrusion, caused by various cyclones or during King Tides. The western district, especially around the Kolovai area, is experiencing a progressive retreat in coastal land due to the current high sea level stand which is obvious at this site. That has also caused damage to coastal plants and properties in the area.

Figure 7: Sea intrusion at western side of Tongatapu destroying the already fragile coastal plants

Source: Tonga's Department of Meteorology

Two tropical cyclones namely Vainu and Lin directly hit Tonga in 2006 and 2009, respectively. The former equally affected all the islands of Tonga. Tongatapu and 'Eua were the hardest hit by the latter. The extent of the damage inflicted by the cyclone on the threatened species is not known but from observation it was certainly serious on the coastal plants and the medicinal and cultural plants that are planted in the exposed surrounding of the town allotments.

Volcanic eruption, although much more unpredictable and not frequent in nature, has destroyed a lot of marine ecosystems around the island of Hunga Tonga (Figure 8).

Figure 8: Volcanic eruption in February 2009 destroyed marine ecosystems around Hunga Tonga

1.3.3.2. Human Impact

Uncontrolled exploitation of threatened plant species for medicinal, cultural, construction and cooking purposes have been the major causes of species destruction in most islands of Tonga except for 'Eua, Kao, and Tofua. On these latter

islands, where there are remaining government forest reserves and private forested land, the destruction of those forest ecosystems for agricultural purposes has been the major cause of species destruction. It was fortunate, from a species conservation point of view, that the squash export industry has experienced a downward trend in the last four years, which in turn has saved a lot of forest on Tongatapu and 'Eua.

Prolonged period of drought, coupled with the normal land preparation practice of slash and burn, has caused a lot of uncontrolled bush fires throughout Tonga. This misuse or the uncontrolled use of fire, rather than agriculture itself, is one cause of species and habitat destruction. Establishment of fire management guidelines should be pursued and enforced.

Continued land reclamation for town allotments from the shrinking mangroves forest in and around the Fanga'uta lagoon in Tongatapu and the northern coast of Tongatapu poses a serious threat to this ecosystem. Most of the reclamation is illegal and this should be stopped. This type of encroachment will lead to pollution to the lagoon as a result of human waste and rubbish disposals.

It is therefore imperative to plan the location of ex-situ conservation sites for threatened species (i.e. botanical gardens, parks and reserves, etc) in view of avoiding or reducing the impact of a direct hit by the above mentioned phenomenons and also human impact.

Figure 9: A Casuarina tree at Nuku'alofa waterfront is uprooted by Tropical Cyclone Lin

Source: Tonga's Department of Meteorology

1.3. Coastal and Marine Ecosystem

1.3.1. Fisheries in the Economy

Tonga has a small, open, South Pacific island economy. It has a narrow export base in agricultural goods which includes fisheries. Together they make up close to one third of Tonga's total exports, and the highest contribution to the country's GDP, in term of export.

There are four types of fisheries conducted in Tongan waters: the Offshore Fisheries, which includes long-line fishing; Deep Sea Fisheries which includes snapper and grouper; Inshore Fisheries which includes artisanal and most sustainable fishing; and lastly Aquaculture Fisheries which was initiated as a response to decline in catch reported from these three sectors of fishing. This is an ex-situ program which attempts to rear endangered fishes onshore before release to wild to propagate.

1.3.2. Status and Trends

Tonga's coastal zone has a variety of coastal habitats that includes beaches, reef flats, sea grass beds, reef slope, submerged reef, sand spits, lagoon and mangroves.

1.3.2.1. Marine Ecosystems

Coral Reef Ecosystems

Coral reefs are the most diverse of all marine ecosystems. Coral reefs, including those in Tongan coastal waters, contain at least one million species of marine organisms. The coral reefs distributed throughout Tongan groups comprise three major reef types: (1) fringing reef, (2) barrier reef, and (3) submerged reef.

Blastomussa Merletti

Psammocora Haimana

Alaveopora catalai

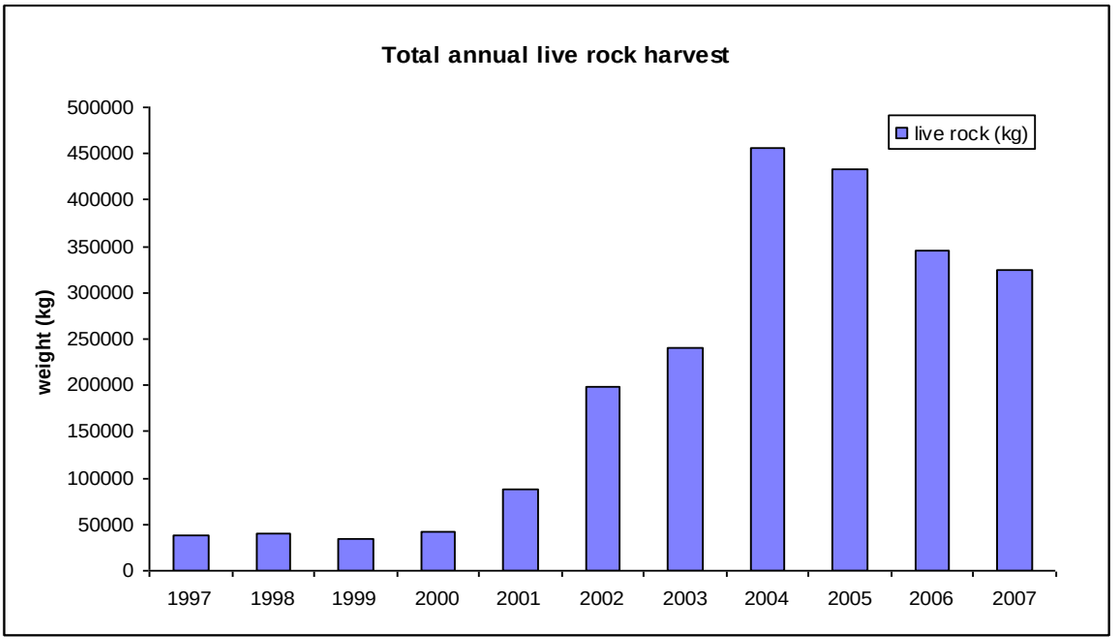
Typically, coral reefs have great ecological and resource significance for their habitat heterogeneity, extremely high biodiversity, and distinct trophic structure and primary production.

Based on PROCFish Reef Fish Socioeconomic Survey, conducted between the years of 2002 and 2008, coral percentage cover has been revealed to have declined dramatically throughout Tongan Groups. However, the level of coral species has not yet been confirmed in terms of total coral species existing in Tonga but it is believed to around 300 plus species.

For live rock, it is obvious from Figure 10 that since 2002 there has been an increase in removal and export of live rock (Figure 10). This increase in export of live rock has coincided with an increase in number of complaints received by DoF from the public.

Marine Aquarium Fisheries has become the second highest export revenue earner for the Kingdom. However, in 2008, the Fisheries Department banned the removal and export of live rock. There are allocated harvesting areas but in recent years the monitoring of this fishery has been very poor due to lack of funds. A management plan and specific regulations are in place and the future of this fishery lies in encouraging people to export live rock currently being farmed through artificial propagation, in the DoF.

Figure 10: Total annual live rock harvest



Live rock provides protection for small fishes and later would grow to provide nutrients which are very important for this type of habitat. This biotic relationship is essential in building a population big enough to be utilized sustainably. Taking small fishes and live rock for aquarium can be degrading to the habitats and species if not controlled properly.

Seagrass Ecosystem

Seagrasses create a habitat for many aquatic organisms. The root, stem and leaves provide protection for prey from predators, and also shelter for many organisms from current and wave action to some degree. Thus sea grasses are ecologically significant, both because of their high primary productivity and their value as habitat.

Two seaweed species (Angle-hair and Grape) are thought to be very vulnerable in abundance due to their acute sensitivity to biotic factors that may reduce their growth as a direct and indirect consequence from fishing activities and environmental changes. The Grape seaweed *Claurepa sp* is no longer abundant in Fanga'uta lagoon, perhaps as a response to some environmental changes in the lagoon. Kaly et al (2000) suggested a possible reponse to increasing sedimentation from runoff as the likely cause. This edible seaweed used to be abundant in the local market however is no longer a regular item, indicating a marked decline in the abundance of this species in the wild. Urgent study is warranted to determine the cause for this fast decline in population of this species.

The Angle-hair seaweed *Cladosiphon sp*, which is known locally as 'Limutanga'u', is one of the commercial export commodities developed in the late 1990s. It has provided an excellent cash crop for many local fishers especially coastal communities. The harvesting season takes place from August to November annually. The production in term of export has been varied. When export of the seaweed commenced in 1996, 36 tonnes was exported. This increased to 403 tonnes in 1997, then decreased to 79 t in 1998 and increased to 200 t in 1999, (Fisheries Annual Report, 2001). The fluctuation of the production is due to the combination of factors such as global warming (i.e. water temperature variation) and bad weather/rough seas (i.e. reduced growth rate by dispersement of the spores to unfavorable habitat).

Mangrove Ecosystem

Mangroves consist of tropical tree species assembled at the intertidal range of sheltered shores (Ellison, 1998). Mangroves mostly inhabit muddy coasts in the tropical and subtropical coastal areas, which provide shelter for other marine invertebrates, including fishes. Tonga always has had cultural and historical affinities with mangrove ecosystems. Long before the introduction of modern technology and the industrial revolution, mangroves were part of Tongan life culturally and historically.

Lekileki – *Xylocarpus moluccensis* (Lamarck) - is one of the mangroves species which has almost reached its extinct level, (Ellison 1998) especially in areas of Tongatapu. This mangrove species is culturally unique for Tongans as its bark is utilized for medicine as a treatment for internal bleeding, injuries, etc. However, this species is subject to destruction for fire wood, similar to *Lumnitzera lottorea* (Hangale). The bark of another two mangrove species, Tongo Lei (*Rhizophira mangle*) and Tonga Ta'ane (*Brugueira gymnorrhiza*) are mostly harvested by local people for making tapa cloth (Ngatu) but recently, a replacement product for these mangrove species' bark has proven very effective. However, Lekileki and Hanagle species are at a very critical to endangered level, while the other two indicated species are still at endangered level (Ellison, 1998).

1.3.2.2. Marine Species

The determination of the status of marine biodiversity in Tonga is complicated, in terms of marine species abundance and the detrimental effects from human activities on the abundance on these species. Few studies have been done specifically on determining the variety of species. Instead, most of the work done by the Fisheries Division of Ministry of Agriculture & Foods, Forests and Fisheries (MAFFF), Ministry of Environment and Climate Change (MECC) and Marine and Ports Department has focussed on the commercial species, which have direct impact on the livelihoods of the Tongan people, at the coastal zone. As a result, this review focuses mainly on edible marine species in both offshore and inshore areas. Comparisons are made with the regional and global against the national level of availability. In particular in the tropical and sub-tropical coastal areas, some marine species that exist or are endemic to Tongan coastal waters have not been surveyed adequately for an accurate database of information on the exploitation level for selected edible commercial marine species (i.e. Tuna fisheries, deepwater snapper and groupers, and edible inshore fisheries resources).

When compared with the first national stockstake for Tonga's NBSAP, there is not a lot of change in terms of the existing number of species, apart from two new deepwater species just found in February 2010 (as shown in bycatch from 'Alatini Fisheries Company). In regards to the status of marine species, nine rare species have been found for corals species, one endemic species of reef fin-fishes (rabbit fish), and new introduced species for giant clams (*Tridacna crocea*). However, giant clam species dominate the critical endangered species for the shell-fish, as do sea cucumber species for Echinoderm. Most of the endangered and rare species listed in 2005, especially inshore species, were directly related to the Ha'apai Groups, whereas some species have been recently confirmed under PROCFish (2009) reef-fish survey between all main 3 groups (Tongatapu, Vava'u, Ha'apai). As a result, more species, especially coastal edible marine species, have reached their exploited level and a few vulnerable species are becoming endangered (PROCFish, 2009).

Table 12: Status of marine species: Critical endangered (CE), endangered (E), rare (R), vulnerable AND endangered (VE). New Species and endemic species occupied last two columns.

SPECIES	CE	E	R	VE	New sp.	Endemic
Pelagic		2				
Deepwater				3	2[a]	
Mammals	2	5				
Fin-fishes reef		6		2		1
Coral	1		9			
Shell-fish	6	2	1	1	1[b]	1
Seaweed and Seagrass				2		
Echinoderm	7					

Notes: a: found in February 2010, b: introduced species in 2007 for aquaculture.

Offshore Marine Resources (Pelagic/Oceanic species). (Annex 1B.1)

Yellow Fin Tuna

Big Eye

The Yellowfin and Bigeye Tuna Fisheries Resources are considered to be critically endangered under the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. The Western and Central Pacific Forum Fisheries Commission (WCPFC) has ordered a two-year closure of pockets on the high seas and in the Pacific Ocean effective January 01, 2010 to purse seine fishing, which normally uses fish aggregating devices to catch tuna stocks. Tonga became a member or Party to this Convention in 2003. Due to the migratory characteristic of these two species, it is a precautionary approach to include them in the CITES endangered species list for all the Western Central Pacific regions including Tonga. In fact, there is no direct biological study nationally to consider the endangered level of these two species, except that catch record has shown a decline in the amount of catch between 2002 and 2007, from 1672 metric tonnage (mt) to 861 mt respectively (Tonga Fisheries Facts and Figures, 2009).

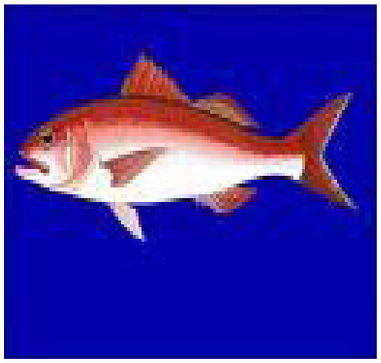
Whales and Turtles

Green Turtle

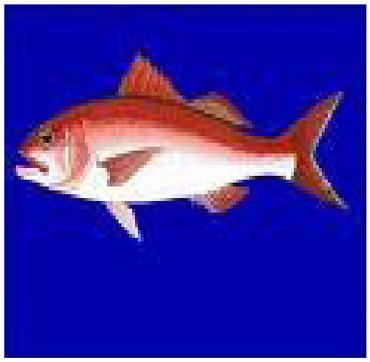
Hawksbill Turtle

The whale fisheries resource is totally protected under the *Fisheries Management Act 2002*. This also includes turtles. In regards to the turtle species, Hawksbill turtles and Green turtles are totally protected, due to the fact that the wild population of these two species has been revealed to have dramatically decreased both at a National and Regional level. Other species of turtles are harvested seasonally (March to July) with female turtles being banned from harvest all year round, under the *Fisheries Management and Conservation Regulations 2008*. Although whale fisheries resources are totally protected, indicated whale species (Appendix 1B.1) seem to be very critically endangered at Tongan coastal waters during spawning season, especially humpback whales. Humpback and sperm whales were one of the species targeted by Tongan whale hunters in the 1970s for meat. Lobby for protection of whale fisheries was a political issue and a ban on fishing was imposed in the late 1970s. Tongan Coastal water is one of the spawning sanctuaries for whales of the South Pacific Oceans, especially in the summer season during their migration routine annually from the Antarctica regions.

Deepwater Species



Mohuafi



Palu Tavake

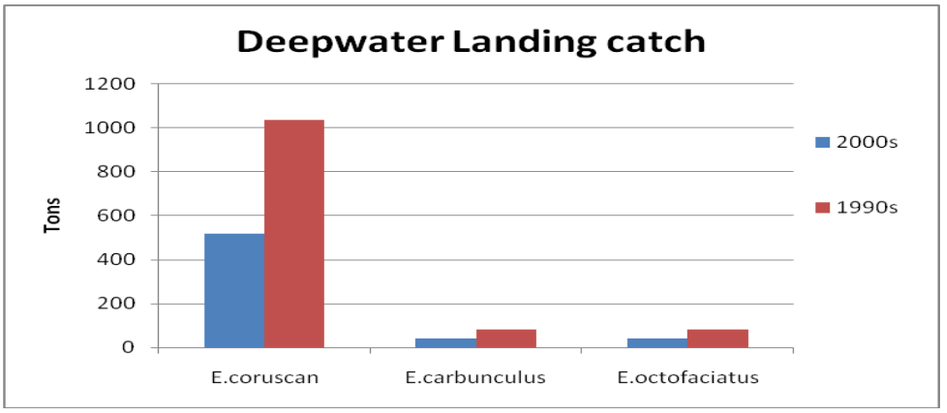
Palu Kula

Based on the landing catch (metric tonnage) for deepwater snapper and grouper as shown in Figure 11**,** the total catch for each species has been in a dramatic decline since the 1990s, when comparisons are made with the total catches during the 2000s for *Etelis coruscan (*Palu Tavake*)*, *E.carbunculus* (Palu Malau) and *Epinephelus octofaciatus* (Mohuafi) (Fisheries Division Annual Report, 2008). The *E.coruscan* is the most targeted species due to its high value at the international market (Fresh Product), but there could be several factors attributing to reduction of catch levels in the 2000s (i.e. fewer vessel were in operatation etc.) and should be taken into consideration.

Based on the current available data, as a safeguard approach, management controls to protect this vital deepwater fisheries resource at a national level should be considered. The current Deepwater Management Plan (Fisheries Division, 2008), restricting vessel size and number of Licenses issued, is limited. This highlights the possibility of seasonal closures being imposed during the year, especially during the spawning events for target species, in a way to assist or improve new recruitment rates.

Two new deepwater species were found in February 2010 by one of the deepwater snapper vessels around Ha'apai's seamount fishing areas, at a depth of 370 meters. Consultation with the crews revealed that this is the first time they caught this sort of fish. One fish is similar to the Triglidae family (gurnards) and the other belongs to the Peristediidae family (armored searobins); however, it was not possible to identify to both Genus and Species level due to the lack of fish identification resources availability.

Figure 11: Landing catch for deepwater fisheries in comparison between year 1990s and 2000s



Source: Fisheries Database

Inshore Marine Species

<u>Reef-fish Species</u>

It has been confirmed under PROC-Fish Project (2009) that one of the rabbit fish species - *Siganus niger*, known locally as 'Pokumei' - is endemic to Tongan coastal waters. As a result, it could be vulnerable to overfishing due to the fact it's one of the most commonly targeted fish species for night divers, gill nets and fence fishing. On the other hand, no biological study is currently in place to determine the total wild population, therefore listing *Siganus niger* as a nationally endangered species is a precautionary approach. The humphead wrasse - *Cheilinus undulates* - is already listed at CITES Appendix 11, but has insufficient data for an accurate prediction for the national status of the wild population. However, this is a recent target fish species for live export to the Hong Kong market, after an Exploratory License was issued to a Company in 2009. Approximately 300 live specimens have been exported from the wild based on the records submitted by this Company to the Fisheries Head office, but the illegal landing catch from the night divers is unknown. Therefore, as a precautionary approach, management should declare this reef fish as endangered nationally.

Mollucs Species

Echinoderm (Sea cucumbers species)

This type of fishery is under lots of stress at the moment due to political lobbying. The reopening of harvesting after a 10 years ban in 2008 is likely do a lot of damage to this species.

Flower Fish

Golden Sandfish

Prickly Redfish

Based on the 2009 harvesting season, fishers mostly targeted several species (Annex 1B.2) due to their high value in the Asian market, particularly *Holothuria nobilis, H.fuscogilva* and *H.scabra* var. versicolor. In fact, all species of sea cucumbers under family Holothuridae are listed in CITES, Appendix 11 worldwide; but at a national level, some species are still in high abundance, such as curryfish, lollyfish, snakefish. This is due to the fact that they reproduce asexually (Ngaluafe, 2008). The targeted species are vulnerable to overfishing due to their reproductive mode of sexually reproducing (broadcasting spawning) and by having a low recruitment rate this may lead to their disappearance. It is therefore necessary for the indicated species to be protected in terms of imposing a stricter quota system during harvesting season, and as an additional control measure, closure of harvesting during the spawning season.

Shellfish Species

Giant clam species (Tridacna sp)

The most common species for giant clams are *Tridacna derasa* (Tokanoa), *T.squamosa* (Matahele), *T.maxima* (Kuku), *T.tevoroa* (Toki/Nge'esi manifi), and *Hippoppus hippoppus* (Vasuva topuva'e'I hoosi). Two introduced species (*T.gigas and T.crocea*) are additional species to the giant clam species, whereas *T.tevoro* is endemic to Tongan Coastal waters.

T. Tevoroa

T. Maxima

The *T.derasa* species was mistakenly declared to be extinct under First Biodiversity National Report (NBSAP), instead it was the *H. hippoppus* species that was extinct in late 1970s. In fact, most of the species of giant clams are at critically endangered level; however due to assistance through stock enhancement under the Division of Fisheries' (DoFi) Mariculture Centre, the species are being replenished and transferred to reefs. However natural breeding for these two introduced species is still unknown because new recruitment has not been found in the wild, especially *T.gigas*.

To'o teka (Cockle - *Gafrarium tumidum*)

The cockle species is currently extinct in certain areas of Tonga, most noticeably around Fanga'uta Lagoon, based on information gathered from communities located around the Lagoon. This species is currently very rare overall, and consequently difficult to find at the local markets. In fact, the species has re-located to a different habitat, possibly due to the high sedimentation rate at Fanga'uta Lagoon (its previous habitat).

Mussels (Kuku – *Modiolus sp*)

This selected mussel's species is well known locally as 'kuku', and is one of the prominent shellfish species found at the inner reefs and intertidal areas. The exploitation of this species is mostly directed for home consumption only but it is decreasing in numbers in some areas probably due to overexploitation. This is a favorite village meal because they are easy to pick and close to shore. However, it is disturbing to hear from villagers that some people tend to use fire as a method of fishing to capture these mussels. Such method is not discriminatory and would kill all juveniles and lead to the decline in the population of this important food.

Kele'a (Trumpet triton – *Charonia triton*)

Kele'a is one of the rare species present in Tongan Coastal waters. It's mostly found within tidal areas (5 – 30 meters water depth) of the outer reefs. The harvesting of this shellfish is mostly targeted by the jewelry traders for shell crafting, after enjoying the meat for food. Due to its rarity, size limit as a control measure should be adequate, as established under the *Fisheries Management and Conservation Regulations 2008*, due to minimal pressure from harvesting.

1.3.3. Threats

All marine and coastal biodiversity are threatened by contamination of these waters with oil and tar released from boats and ships, and ship's ballast water that may contain alien invasive species.

1.3.3.1. Fishing Activities

Coral Reef

The coral reef areas in Tongan groups has low percentage cover as well as declined in reef fish abundance, according to PROCFish studies in 2009, compared to year 2002 baseline study. One of the recommendations to improve this situation was to impose a ban spear diving at night, as the main cause for the damages to the reef environment. Apart from night spear fishing, illegal destructive fishing activities regulated under the *Fisheries Management Act 2002*, such as dynamite fishing and fish poisoning, are still practiced in Tongan coastal waters.

Harvest of live rock is one of the target products for most of the License Holders for aquarium operations. Licences are issued by the Fisheries Division. Based on the information from the communities' fishers, including reef checks conducted by Fisheries Division, most of the reefs where the aquarium divers exploit live rocks were greatly damaged. Consistently, divers were using re-bar, chisel bars etc to remove the rocks from the reefs instead of collecting the broken rock, which settle at the reef bottom as sediment. As a result, the Fisheries Division imposed a ban on the harvest of live rocks for aquarium purposes in late year 2008.

Seagrass

The main direct threat to the sea grasses ecosystem was gill net fishing activities especially artisanal fishing. Dragging of the fishing net at the bottom of the sea floor directly damaged the growth of sea grasses. Additionally, collection of other marine organisms which sheltered in the seagrasses (i.e. sea cucumbers, cockle, etc.) also damaged the seagrass growth. In fact, dead seagrass dominates the marine debris washed to the shore during high tide along Tongan coastal beach areas, especially at the intertidal zones.

Commmercial and Artisanal Fisheries

Historically, Tonga's inshore, in particular the intertidal areas, has been subject to heavy fishing. This is because Tonga's marine tenure system is an open system, with the coastline open to everyone and not restricted to any particular group of people. As a result, all types of fishing have been used in this zone, ranging from commercial, artisanal to subsistence fishing.

Marine production and consumption has undergone major changes in past decades. These changes have been triggered by various environmental factors as well as social and economic issues. However, fishing activities clearly indicated the main threat to the marine biodiversity apart from indirect impact caused by Coastal Development (i.e. land reclamation, deforestation of the mangrove areas, etc.). Recent scientific studies in Tonga (PROCFish Socioeconomic Study in the Pacific Regions including Tonga, 2009) have shown that, in many places, coastal areas are already exploited at, or beyond, their maximum capacity.

The demand for marine resources is constantly increasing, and this can be explained by several factors: 1) Tonga's population continues to grow, 2) the 2006 Tonga Census revealed a shift in diets toward more animal products and its trend is predicted to continue in the future, and 3) the demand for imported marine resources by industrialized countries, and particularly by Asian countries, continues to increase as their own resources dwindle.

1.3.3.2. Natural Disasters

Natural disasters such as volcanic activities, cyclones and tsunami are the major impacts causing threats to the marine ecosystem in different aspects especially inshore fisheries resources. The cyclone is the major natural phenomenon which has been smothering the corals reefs biodiversity on most occasions apart from coral bleaching caused by *Acanthaster planci* outbreaks and high temperatures. Tsunamis are one of the latest natural disasters experienced by Tongan communities, with a tsunami occuring late last year (October, 2009) especially affecting Niuatoputapu Island.

Based on the information gained from the government officials' visits to Niuatoputapu Island, various species of fin-fishes were brought to the land with the tidal waves, and there was destruction and smothering of the corals reef ecosystem surrounding the Island.

1.3.3.3. Diseases

Diseases are a natural phenomenon but are difficult to prove due to a lack of biological studies in-place. Invasive species may also cause a potential threat to the marine biodiversity; however the extent of this is also unknown. In 2008, a 'fish gill' was reported at Fanga'uta Lagoon but the cause of this is still unknown. A sample was taken from finfish species found at the beach front of the Lagoon but did not detect either algal bloom outbreaks or uncollected fishes from dynamite fishing. Dynamite fishing is still one of the common fishing methods targeting mullet fisheries resources around the Fanga'uta Lagoon. However, an algal bloom outbreak is a natural phenomenon caused from eutrophication, which results from high nutrient input to the coastal waters. The effect of nutrients input is not only to enhance productivity but also can cause a change in species diversity, as a result of changing environment. An outbreak of Crown-of-thorns starfish – *Acanthaster planci* - is known worldwide as a natural predator posing threats to corals, which has also occurred at Tongan coastal reefs.

1.3.3.4. Ciguatera Fish Poisoning (CFP)

Ciguatera Fish Poisoning (CFP) is one of the significant health and fisheries resource problems known in the Pacific regions, including Tongan groups. This problem threatens the dependency of Tongan people on seafood. About 30 people were admitted to hospital between 2009 and 2010 for CFP poisoning. Ciguatera is a global disease caused by the consumption of certain warm-water fish (Ciguateric fish) that have become contaminated with high level of sodium channel activator toxins (ciguatoxins) (Lewis, 2008). Ciguatoxins are produced by *Gambierdiscus spp* through benthic dinoflagellates which accumulate through marine food chains into fish consumed by humans.

In the Ha'apai Group, there is general belief that ciguatera outbreaks tends to occur during cyclone season which is from November to April. Unfortunately, no scientific baseline study or biological research or any ciguatera monitoring program has been carried out to substantiate this claim and to allow the identification of all the ciguatoxic fish species in Tongan Coastal waters (Ngaluafe, 2008). However, from local knowledge especially from experienced fishermen in the Ha'apai Groups, two volcanic islands (Kao and Tofua) and one barrier reef (Hakau Fisi) are known to be ciguatoxic areas due to the fact that most fish catch from these areas is believed to cause CFP. The red bass, *Lutjanus bohar*, has been commonly associated with CFP in the last decades. However, recently, several reports have been received from the Ministry of Health regarding other reef fishes involved, but these claims have not been substantiated.

1.3.3.5. Natural Predators

Some herbivore marine species feed on seagrasses, such as sea urchin and sea slugs, however turtles are the main threat. No biological study has been conducted to determine how these herbivore species affect the seagrass ecosystem, especially reduction of the marine juvenile organisms attached to the seagrass for shelter in terms of larval development.

1.3.3.6. Land Reclamation

Land reclamation around Tongatapu lagoon is the main threat to the mangrove ecosystem. Mangroves are totally protected under the *Birds and Fish Preservation Act 1974*, which is implemented by the Ministry of Lands, Survey and Natural Resources (MLSNR). The cultural and historical uniqueness of mangrove for the Tongan people still exist but has declined due to existence of other alternatives to making tapa cloth.

1.3.3.7. Others

Water pollution either from run-off (eutrophication), water ballasting, and oil spill are common threats to the marine biodiversity but none of these have occurred on a threatening scale in the last 5 years.

The tsunami that hit Niuatoputapu late 2009 caused different species of reef fishes and reef materials to be brought onshore by the approximately 15m waves. The threat of global warming is new and its likely impact is yet to be determined. However there is a strong indication that a rise in temperature may affect reef survival, fish reproduction and survival of most marine species.

Figure 12: Reef fishes that were brought onshore by the tsunami, 2009

1.4. Agricultural Ecosystem

1.4.1. Agriculture in the Economy

The economy is heavily based on the remittances from Tongans living abroad, mainly in Australia, New Zealand and the United States (around 40% of GDP). Fishing and agriculture is the second largest income source, followed by Tourism**.** Agricultural production is still the predominant economic activity, accounting for 23% of GDP, 70 percent of total merchandise export, and 40% of employment. Over 64% of Tongan households (10,102) are involved in agriculture, out of which 59% are subsistence, 38% are involved in subsistence agriculture with cash crops and only about 2% are fully commercial crop producers (Agriculture Census 2001). Tonga has a good growing climate and fertile soils, and is well placed to serve markets in both southern and northern hemispheres.

1.4.2. Status and Trends

1.4.2.1. Agro Ecosystems

Genetic diversity

Agro-biodiversity in the Tonga, as in the Pacific region, has a very long history of unique challenges. The crops that are grown today were brought by our early descendants. They brought with them yams, taro and banana through roots stocks and suckers. Recent introductions such as breadfruits and sugarcane were also planted from roots and cuttings. Fruit trees, namely citrus, mango and avocado were amongst the most recent introductions to the country and are propagated from seeds.

It is noted that species conservation was not a matter of concern in the early days because the introduced crops were domesticated as integral parts of the traditional farming systems that was virtually free from notorious pests and diseases. It was not until the exponential demands from increased populations and other socio-economic pressures that the agro-biodiversity genetic diversity became threatened.

Essentially, this review realized that the diversity of root crops and others that are propagated vegetatively (from plant parts and not from seeds), have little scope to increase genetic diversity. With reference to Annex1C.1, of the eight priority species declared critically endangered, seven (88%) are root crops.

On the other hand, crops that are propagated from seeds tend to increase in genetic diversity. This is a result of many factors including the genetic mutations that normally occurs during flowerings and the ability of seeds to stay dormant for longer periods thus allowing longer distance movements. This is evident in the review species list (Annex 1C.1 & 1c.2) in which over 60% are fruit trees. It is noted however, that since most of the fruit trees listed are a recent introduction to Tonga, they are susceptible to pest and diseases attacks.

1.4.2.2. Agro Species

Species Compositions

In the context of this text, a priority species is declared as being critically endangered (CE) or rare and endangered (RE) in reference to its nationwide status, unless its occurrences are site specific. For instance, *Citrus jambhiri* is declared as being rare and endangered but is found to grow in abundance in the forested areas of ‘Eua.

Essentially, the NBSAP listed 21 priority agro-biodiversity species as being critically endangered (CE). This is a very broad list due to the fact that some of these species were named as either genus or in Tongan names. The vagueness in this is that some of the species in the declared genus have several species, of which some are critically endangered and some are found in abundance. For instance, Citrus (as genus) was declared CE in the NBSAP however, there are six citrus species listed in this review, being:

(1) *Citrus auraifolia* (laimi niua toputapu), which is critically endangered. It was almost completely eradicated by a leaf minor pest in the 1980s.

(2) *Citrus jambhiri* (lemani petepete), or rough skin lemon. This is found in abundance around the forested areas of ‘Eua but appears susceptible to pests attack when found in isolation, thus remaines rare and endangered nationwide.

(3) *Citrus paradisi* (moli tonga), which is found to be abundant in Foa, Ha'apai; but is rare and endangered in other parts of Tonga. There are approximately three varieties of moli tonga found in Tonga, amongst which one is edible.

(4) *Citrus macrophylla* (kola), a more recent introduction, is rare and endangered.

(5) *Citrus macrophylla* (moli kai) also known as (moli inu), is rare and endangered.

(6) *Citrus latifolia*, is rare and endangered.

NBSAP priority list further classified into specific species

Due to the broadness and generalization of the priority list declared in the NBSAP, this review attempted to further classify the priority list into specific species categories under each respective genus. This task is necessary in order to confirm a more detailed and specific priority species list although the need for a formal and comprehensive inventory of the agro-biodiversity species is apparent.

Accordingly, the NBSAP priority list was further cut down into specific species and therefore resulted in a reviewed list of **59** priority agro-biodiversity species (Annex 1C. 2). For the purpose of the Fourth National Report, this implies that the NBSAP priority list of **21** species has been revised and found to have increased by **38** species.

Overall, there are 30 root crop (51%) varieties consisting of six *Yams*, nine *Colocasia*, four *Xanthosoma*, three *Alocasia*, six *Ipomea*, and one each of *Cyrtosperma* and *Amorphophallus species.* Fruit trees made up 13 species (22%) on the priority species list, and some seven species (12%) crops of social uses, five (8%) coconut and four (7%) banana varieties.

A summary of the revised NBSAP list is outlined in Table 13 below:

Table 13: Summary of the reviewed NBSAP priority species list outlining major species groups, quantities, and level of availability

Species groups (crop types)	No. of species		Level of availability					
			Critically Endangered		Rare & Endangered		Abundant	
Root Crops	**30**	51%	**20**	67%	**1**	3%	**9**	30%
Social uses	**7**	12%	**2**	29%	**3**	42%	**2**	29%
Fruits	**13**	22%	**1**	8%	**12**	92%	**0**	0
Banana	**4**	7%	**0**	0	**4**	100%	**0**	0
Coconut	**5**	8%	**0**	0	**5**	100%	**0**	0
Total	**59**	100%	**23**		**25**		**11**	

From this initial review of the NBSAP priority list, the root crops varieties are noted as being most vulnerable to loss of species diversity. There are a lot of contributing factors but the recent shift from traditional farming systems to commercial farming is considered in this review as the major cause of the drastic drop in the root crop diversity. Commercial agriculture concentrates on planting crops that are demanded by the markets. Further, it promotes

monoculture and heavy mechanization of farming. Most of the root crops in demand by the overseas markets are new inventions of plant genetic improvement and agronomic developments. For example, about three of the highest demanded colocasia taro were developed from a mixture of local varieties and introduced ones. The other species are therefore dropped and not grown by the farmers.

All root crops are propagated vegetatively in Tonga, unlike what occurs in Africa and Asia. This restricts the tendency to store and multiply them quickly.

Fruit trees are becoming vulnerable due to their susceptibility to pests and diseases attacks. Crops with valuable social uses are losing out to modern technology. For example, *Tacca leonopetaloides* is being replaced by imported goods such as flour and paper glue.

Table 14 further breaks down the crop types into major genus, Tongan names and the number of species existing in each aroid type.

Highlights from Table 14 are:

- ✓ *Of the* **59 species** *reviewed and included on the priority list during this assignment, some* ***30*** *(51%) are root crops;* ***13*** *(22%) are fruit trees species;* ***7*** *(12%) species with specific social uses;* ***5*** *(8%) coconuts; and* ***4*** *(7%) banana species.*
- ✓ *There are 20 species (67%) under the root crops group that are declared critically endangered; 1 specie (3%) rare and endangered; and 9 species (30%) declared abundant.*
- ✓ *Under the fruit trees group 1 species (8%) is declared as being critically endangered; and 12 species (92%) as rare and endangered*
- ✓ *The priority species with social uses Mahoa'a Koka'anga is found to have 2 species (29%) declared critically endangered; 3 (42%) rare and endangered; and 2 (29%) abundant species*
- ✓ *Under the coconut group; 5 out of 5 (100%) are declared rare and endangered*
- ✓ *There are 4 banana species and all (100%) declared rare and endangered*

Table 14: Summary of the NBSAP priority list listed under the main crop types

Crop types	Genus	Tongan names	No. of species
ROOT CROPS 	*Dioscorea*	'Ufi	6
	Colocasia	Talo Tonga	9
	Xanthosoma	Talo Futuna	4
	Alocasia .	Kape	3
	Ipomea	Kumala	6
	Cyrtosperma	Pulaka	1
	Amorphophallus	Teve	1
FRUIT TREES	*Citrus*	Moli	6

	*Syzygium*	Fekika	6
	Spondius	Vi	1
COCONUTS	*Cocos nucefera*	Niu	5
BANANA	*Musa*	Siaine/Hopa/Pata	4
TRADITIONAL	*Brousonnetia.*	Hiapo	2
	Tacca leonopetaloides	Mahoa'a Koka'anga	1
	Saccharum officinarum	To	3
Total			**59**

Current status of species composition after this review (2010)

This review has noticed that that the list prepared for the preparation of the NBSAP was too narrow and does not include all species. The reviewed list in Annex 1C.2 is testimony to this statement. This review will aim at preparing a complete list, although a proper inventory of the agro-biodiversity is recommended.

Annex 1C.2 also outlines an additional list of agro-biodiversity priority species declared in this review. A brief summary is given in Table 15:

Table 15: Summary of revised number of species groups

Species groups	No. of species	Level of availability					
		Critically Endangered		Rare & Endangered		Abundant	
Fruit trees	**94** (61%)	**0**	0%	**67**	71%	**27**	29%
Root Crops	**31** (20%)	**7**	24%	**16**	52%	**8**	26%
Vegetables	**14** (9%)	**0**	0%	**10**	71%	**4**	29%
Banana	**11** (7%)	**0**	0%	**7**	64%	**4**	36%
Social uses	**3** (2%)	**1**	33%	**1**	33%	**1**	33%
Total	**153**	**8**	5%	**101**	66%	**44**	29%

Here are the highlights from the information collated in Table 15:

- ✓ *Of the 153 species reviewed during this assignment, 94 (**61%**) are fruit trees species; some 31 (**20%**) are root crops; 14 (**9%**) as vegetables; 11 (**7%**) as banana and 3 (**2%**) as species with specific social uses.*
- ✓ *Under the fruit trees group, 67 species (71%) are declared as being rare and endangered; and 27 species (29%) declared abundant.* Most of the fruit tree species listed are declared priority because most are a recent introduction to Tonga. This is evident with the fact that over 80 different species are planted in the fruit orchard located at the MAFFF Vaini Research Station. It is recommended that a proactive replanting scheme be implemented with assistance from some form of external funding to support the scheme.

- ✓ *There are 7 species (24%) under the root crops group which are declared critically endangered; 16 species (52%) rare and endangered; and 8 species (26%) declared abundant.* Again, root crops are susceptible to species diversity loss because of the shift to market-oriented farming and the vegetative propagation nature of the crop.
- ✓ *The traditional vegetable species such as Pele is found to have 10 species (71%) declared rare and endangered; and 4 (29%) abundant species*
- ✓ *There are 7 banana species (64%) declared rare and endangered; and the remaining 4 (36%) are still abundant*
- ✓ *The socially useful species such as Mahoa'a Koka'anga and Teve share 33% each of critically endangered, rare and endangered, and abundant species respectively*

1.4.3. Threats

The agro-biodiversity of Tonga continues to face stiff and increased challenges from natural and man-made threats.

1.4.3.1. Natural threats

Climate change related threats

Agro-biodiversity is amongst the thematic areas vaguely defined in the NBSAP as becoming vulnerable to the impacts of climate change. However, the occurrences of natural disasters such as cyclone, flooding, erratic weather patterns and droughts are directly and indirectly considered as natural threats to the agro-biodiversity ecosystems in many ways (Figure 13&14):

- ✓ Climate Change contributes towards loss of agro-biodiversity crops, resulting from adverse climatic effects such as drought (water stress) and flooding, salt spraying on crops, wind damages to crops etc
- ✓ Decline in crop and livestock yield due to fluctuation of water distribution patterns, decline in soil nutrient and lack of fodder etc.
- ✓ Decline in soil conditions and structures resulting from heavy use of farm machinery in mono-cropping, unsustainable fallow systems, repeated cropping etc

The impact of climate change on crops and livestock is most severe when several climatic factors occur simultaneously. For instance, prolonged drought coupled with heavy wind causes severe crop loss particularly on mono-cultured commercial crops.

Figure 13: Desertification

Figure 14: Cyclone damage

1.4.3.2. Pest and disease infestation (Fig. 15)

Pest and disease infestations of crops are exacerbated by a combination of poor farming practices and increased adverse effects of climate change. For instance, mono-culture coupled with poor rainfall (drought) contributes towards substandard plant growth thus increasing vulnerability to pest and disease attacks. The increased number of pests and diseases is closely correlated to the increased number of introduced crop varieties.

In this light, the Tonga traditional farming systems of "sequential" or "relay" cropping is proven as a more robust system that greatly minimizes pest and diseases infestations. A mixture of several crops in one plot provides a buffer to attack by diseases and pest. For instance, the anthracnose (fungal) disease that affects *Dioscorea alata* does not affect *Alocasia* taro.

Figure 15: Weakened taro plant becomes susceptible to pest attack

1.4.3.3. Bush fires (Fig. 16)

Natural bush fires are caused by lightening and sometimes by sun scorching. Prolonged drought periods often result in natural bush fires because most of the biomass becomes very dry. Slash and burn is an old farming practice in Tonga. However, it was previously done on a small scale and used just to kill big trees in a shifting cultivation system whereby farming rotates within one tax allotment ("'api 'uta"). The problem today is large scale slash and burn practices to clear grasslands for commercial farming. The problem of destroying the entire ecosystem is exacerbated by mechanization and repeated farming leaving a shorter fallow period.

Figure 16: Slash and burn on larger scale

1.4.3.4. Man Made Threats

Farming developments in general

In the NBSAP, agricultural development in general is highlighted as the major cause of loss of forest biodiversity. Similarly, the revolution in agricultural development such as changing from manual labour to *mechanization* farming, the shift from traditional mixed cropping systems to *monoculture*, changing from organic (non-chemical) to *chemical and inorganic fertilizer*, and shifting cultivation to *repeated farming* of the same piece of land, etc, is the major cause of loss of agro-biodiversity.

Commercial farming (Fig.17)

The major threat comes from commercial farming which focuses on maximum utilization of the land in a short period of time. Essentially, commercial farming produces crops that have market value, which changes from time to time to meet market demands. Consequently, crops with lesser market value are left out and therefore there is a risk they will become extinct due to lack of planting materials. Commercial farming enables farm machinery to over-work the soils through over-tillage, compound the soil structures as well as change the status of the soil conditions. Land tillage during wet conditions makes the soils compact. Tillage along land on slopes increases the risk of soil erosion. Increased use of agro-chemicals such as weedicide decreases the chance for the unwanted crops to survive.

Figure 17: Commercial farming

The Tongan traditional farming systems is one of the most robust and sustainable systems known world-wide. Planting of crops on a "relay" or "sequential" manner allows for a diversity of crop varieties growing on a similar plot for a prolonged period of time (up to 5 years) depending on the crop varieties. Given the longevity of the cropping cycle, short-term and long-term crops are left to grow in harmony. The opportunity for widespread infestation of pest and diseases is kept low because of the high crop diversity, by which each crop acts as a buffer to pest and diseases that prey on others.

Slash and burn

Slash and burn is mentioned as a stand-alone farming practice because it is used in both commercial and subsistence farming practices throughout Tonga. It refers to the cutting down of trees and bushes including grasses, and burning. Repeated slash and burn is detrimental to all living ecosystems on the land and minimizes the opportunities for plant/crop rehabilitation and survival.

Short fallow periods (Fig. 18)

Due to increased population pressure on limited farm lands and increased inaccessibility to lands occupied by non-farming and migrated landowners, the arable farm lands available for farming in Tonga is at a minimum. Consequently, many people acquire land for farming through short-term leasing arrangements of as short as one year for commercial crops such as squash and vegetables. In order to maximize crop return from the same piece of land, the traditionally longer fallow periods of up to 10 to 15 years are being cut to as low as one month. This implies that the soils are continually cultivated thus giving no opportunity for rehabilitation of larger trees species and restoration of longer-term stable crops. Short fallow periods also contribute towards downgrading the structure and condition of the soil.

Figure 18: Continuous cultivation leads to soil degradation

1.4.3.5. Urbanization

People moving from rural areas and outer islands to main towns, such as Nuku'alofa and Neiafu, causes a lot of social problems. One of these problems is the dividing up of farm lands adjacent to old settlements into town allotments. This causes major removal of forested and farm lands for construction of houses and public infrastructures such as roads and schools.

1.4.3.6. Institutional policy frameworks

MAFFF still do not have a National Agricultural Policy. Nonetheless, its operations have been traditionally tailor-built to accommodate and fulfil the designated outcome objectives set out in the government's strategic planning framework. Since approximately four decades ago, there have been eight Strategic Development Plans (SDP1-8).

1.5. Species Conservation

1.5.1. Background

The threatened status of species is a very important indicator of the condition of an ecosystem and its biodiversity which, in turn, determines the conservation model that is appropriate for adoption. The status of the threatened species had been thoroughly assessed and discussed in the previous sections of this chapter. Highlighted in this section are existing conservation models, most of which have no direct link to the requirements of the NBSAP but the output contributes, in one way or the other, to species conservation.

The review noted that although biodiversity is always a victim of natural disaster, these occurrences are seasonal and should not be taken as an excuse for neglecting biodiversity conservation. This section therefore highlights issues and threats that are not only universal and shared by all thematic areas but are influential in the conservation decisions and efforts on a daily basis.

1.5.2. Status and Trends

1.5.2.1. Forestry

Programmes that relate to species conservation are classified into two groups namely; general and specific. The general programme indirectly approaches the species conservation issues in the broader sense. Specific programmes on the other hand target a particular species.

GENERAL CONSERVATION

Agroforestry

Initially the agroforestry programme was established as a way of increasing the resources of exotic timber species by extending planting from the limited forest reserves to the boundaries of the vast area of tax allotments. Setting up tree nurseries on all islands on Tonga was part of that important development. Today all those nurseries produce and sell annually to the public a wide range of seedlings. The range includes timber, medicinal, cultural, and ornamental and fruit trees.

As detailed in the species monitoring matrix, the Forestry Division (FD) nursery at Tongatapu alone raised and sold 345,841 seedlings during the years 2007 to 2009. A significant portion of this consists of cultural, ornamental and medicinal trees that are included in the NBSAP Red List of threatened species (Table 7). A policy decision on raising a certain amount of seedlings of certain threatened species, with appropriate financial allocations, is all that is needed by the FD to start on a bigger but more focused species conservation programme.

Reforestation

The plantation forests on 'Eua are the result of continued reforestation on land that was dubbed as waste land, as it has a very thin soil with scattered rock protrusions. The predominant vegetation cover was grass, *Dicranopteris linearis* (kahiva'e). Natural regeneration was extremely low to impossible due to daily exposure to strong southeasterly breezes.

The introduction of strong pioneer pine (Pinus caribaea) to these sites created an ideal micro climate that encouraged and accelerated natural regeneration under the established pine forests. The fast disappearing tree fern, Cyathea lunurata (ponga) was amongst the beneficiaries (Figure 1). Part of these enriched forests will be preserved as natural forest, to act as a buffer for the National Park, which is acting as a corridor connecting the fragmented forest reserves and conservation areas. This programme should also be encouraged on the grassland of Tofua and Tafahi, and the huge part of 'Eua that is privately owned.

National Park and forest reserves

Lack of funds has hampered the implementation of the management plan for the National Park on 'Eua. The review noted ongoing joint efforts between MECC and FD to fence the southern boundary of the Park. This is a major step forward for ensuring the safety and hence the survival of the threatened species that live in the Park. The threatened species that are native to 'Eua should be propagated and used for enrichment planting in the Park.

The forest reserves that are managed by Tonga Timber Limited (TTL) have been jointly zoned and mapped by FD and TTL for the purpose of providing maximum benefit, in terms of both direct financial return (plantation forests development) and the services the forest provides to the community such as a host for ecotourism, and guaranteed pure and abundant water supply (Figure 3). Some of the areas that are not forested but are part of the water catchments will be enriched with native trees and will never be cut down again. Threatened medicinal plants could go into this zone for controlled utilization in future.

SPECIFIC CONSERVATION

Santalum yasi

Uncontrolled harvesting of sandalwood (Santalum yasi) for export in the past had led to the harvesting of young trees which not only lowered the quality of wood for export but means that the general population is now much younger. If the age structure is not corrected soon the natural regeneration won't catch up with the rate of utilization therefore exposing the species to the risk of extinction. The FD is in the process of introducing new legislation that will temporarily suspend the export of the wood for a set period of time, in view of establishing a normalized age structure from which a sustainable industry is launched. The suspension will not only allow the existing population to reach maturity but it will also encourage farmers to replant. In the meantime Santalum farmers must be registered and their farms will be monitored by FD. In future, farmers without a registration number won't be allowed to sell their wood to exporters, thus discouraging theft. Export quotas will be based on sustainability issues. Increased numbers of sandalwood seedlings are now raised in FD nurseries throughout Tonga.

Species of Cultural significance

Garcinia cessilis (Heilala), the most important cultural and ornamental plant of Tonga, was considered critically endangered (CE) in the 1960s. However increased propagation of the species by the Government and private nurseries and individuals has now brought its population to a sustainable level on all islands except Niua Fo'ou. Other important species such as *Fagraea berteroana* (Pua Tonga) and *Gardinia toitensis* (Siale Tonga) shares similar success stories. A key factor for ensuring sustainability is the fact that almost all the replanting in the last 3 decades was on private land (ex situ) where security is provided and utilization is strictly controlled by the land owners.

Species of medicinal value

With the exception of large trees that are used for medicine as well as timber, most medicinal plants are small to medium sized making them acceptable for replanting on private land (ex situ) where security is guaranteed and controlled utilization is practiced thus maintaining the population at sustainable level.

1.5.2.2. Marine

Aquaculture Activities

Aquaculture is one of the Fisheries management tools to assist to replenish overexploited marine species throughout stock enhancement programmes, which are currently conducted at Fisheries Division's Aquaculture Research and Development Section. The initiation of this programme is directly focused on shellfish such as giant clams, trochus, greensnail and winged pearl oyster. Recently, live corals and rocks, as a new aquaculture commodity, have been cultured to enhance the coral reefs and has included selling to the aquarium traders as a way to reduce pressure on harvesting the wild populations.

Marine Management Areas

The Marine Protected Areas (MPAs), including Marine Reserves, has been a vital control fisheries management tool established at selected areas. These have however failed to achieve their objectives due to a lack of compliance. In all MPAs established around coastal areas, especially Tongatapu, there is no difference between other fishing areas adjacent to these areas in term of species richness, coral cover percentages, etc. Local fishers, especially night divers, still continued to heavily exploit these marine protected areas in the same way as other fishing grounds. The latest results from scientific research at the Great Barrier Reef has shown that MPAs should be targeting only spawning habitat areas for each individual species, as this is much more effective than zoning bigger areas with multiple species. In fact, fisheries resources are still managed under 'open access' management strategies; however,recently, the Fisheries Division has established six Special Management Areas (SMAs). These are similar to MPAs however these SMAs directly empower island communities to carry out the management of individual SMAs, on a 'close access' basis, meaning only that particular community can access the area.

Mangrove Re-planting Activities

Replanting of mangroves is mostly carried out by the youth programme in various communities, under MECC's environmental promotion, which is mostly funded by GEF. In addition, the Australian and New Zealand governments have also contributed to cleaning the mangrove areas especially adjacent to the rural areas (i.e. Haveluloto Youth Project, Halaleva Youth Project, etc.).

1.5.2.3. Terrestrial Fauna

The stocktake in 2004 listed the number of freshwater bird species at 20, of which only the Hengehenga (Tongan whistler *Pachycephala jacquinoti*) is listed as endemic and the Malau (Niuafo'ou megapode *Megapodius pritchardii*) as being extirpated to Vanuatu. The Hengehenga is rated as near threatened (IUCN 2009) and the Malau was considered in the stocktake to be endangered (IUCN 2009).

Ex-situ conservation of the Malau has been ongoing since 60 eggs were buried at volcanically heated sites on Late, and an additional 35 eggs and chicks introduced to Fonualei. Sightings of Malau were confirmed on Fonualei in 2003 under a survey that was conducted by Watling (Birdlife International 2004). A similar survey conducted in 2004 on Late confirmed no sightings or signs of Malau activity (Birdlife International 2004).

Tonga Community Development Trust (TCDT) had carried out a community consultation in 2007 on Tonga's Important Birds Areas (IBA) to identify, inform and engage governmental and civil society stakeholders in Tonga regarding the IBA

process and to undertake government and community visits to three priority IBAs – Niuafo'ou, Vava'u and Ha'apai. The main outputs from this project were community workshops conducted in Vava'u, Ha'apai, 'Eua, Niuas and Tongatapu, to raise awareness on birds conservation needs. A report was also submitted to the sponsor, Environment Consultants Fiji (ECF), based on community consultations and priorities which were appended to Tonga's Final Report on its IBA to Birdlife International. ECF donated USD $ 5,500 to this project.

TCDT is currently working on developing a Model Species Recovery Plan in view of securing the population of globally threatened species in Tonga, focusing initially on Malau (Polynesian megapode) and later on other threatened species in Tonga. The project components include literature review on work undertaken on the protection of Niuafo'ou megapode; development of communication strategy; conducting a species and community survey, and the formulation of the Recovery Plan. Critical Ecosystem Partnership Fund (CEPF) is donating USD $50, 000 to the project.

TCDT is currently engaged in trying to improve the management and protection of Tongan Megapode as one of the endemic and endangered species of land birds in Niuafo'ou by engaging the people of Niuafo'ou in developing, implementing and monitoring effective management options for the protection of the Tongan Megapode from depletion. This includes community workshops to discuss co-management options with MECC, the development of a sustainable alternative livelihoods project and the development of policy, legislative and effective co-management mechanisms. The Programme of Works on Protected Areas project (PoWPA), through MECC, is donating USD $15,000 for this project.

Despite TCDT work on the megapode, the lack of updated information on the terrestrial fauna of Tonga urgently needs the attention of the policy makers. Updated information is the key to realistic planning, proper coordination of stakeholders' efforts and efficient utilization of Tonga's limited financial resources towards the achievement of a more effective and sustainable conservation objectives.

1.5.2.4. Agriculture

Programs conducted at the MAFFF experimental farm , at Vaini, focus mostly on economic crops. Most of the agriculture species conservation is done in-situ. The concept works on the basis that as more people are growing certain species the less vulnerable that species will be. Certain species, especially those with good economic value, are less vulnerable. However, crops (species) which are not economical and are not in favour by farmers, due to long harvest periods, are in danger of extinction. These species need urgent attention and there is no known program on line for this threat.

1.5.3. Threats to Conservation

Throughout this review, four outstanding **"L"** issues have constantly contested the top ranking on the review's Red List of Biodiversity Threats. They are, in order of importance, the **L**ack of operating funds, the **L**ack of political will, the **L**ack of appropriate legislation and policies and the **L**ack of skills. In-depth analysis of the four issues has been carried out to verify those claims.

1.5.3.1. Lack of operating funds

Most Ministries have no specific vote for biodiversity but for the purpose of this review they have provided an estimate of the amount they estimate is spent on biodiversity related projects. It was noted that Tonga has experienced very slow economic growth since 2006 which may have contributed to the low level of budget allocation to relevant Ministries. Considering inflation, the allocation for biodiversity has, in real terms, decreased over the past years. At the time of this review, Ministries were trying to cope with an 18% cut in their recurrent budget. This event had basically removed everything except money for salaries and wages only.

1.5.3.2. Lack of Political Will

Three outstanding cases are highlighted here to verify this issue, namely sea cucumber species (Echinoderm), the construction of the Vuna Wharf and the continued conversion of the mangrove ecosystems at Tongatapu into residential areas.

Echinoderm (Sea cucumbers species)

Unlike other Ministries, DoF appears to be well off in terms of legislation and policy matters on protection and conservation of species. They had a management plan with protocols and enabling legislation in relation to sea cucumbers; however, this somehow was overridden on political grounds.

Three popular species namely *Holothuria nobilis, H.fuscogilva* and *H.scabra* var. versicolor are under great pressure for two reasons. Firstly, they are highly valued in the Asian markets and therefore sought after by the local fishermen. Secondly, their reproductive nature is often associated with very low recruitment rate therefore they are vulnerable to disappearance from our waters. This fishery was banned in 2008 for a 10 year period but political lobbying resulted in the premature lifting of the ban in 2009. It is considered necessary for the above named species to be protected by controlling the quota system, size restrictions during the harvesting seasons, and a ban on harvesting during the spawning season.

Vuna Wharf

Despite passing the *Environmental Impact Assesssment Act* ("EIA Act") in 2003, Government went ahead with re-construction of Vuna Wharf in Nuku'alofa without an EIA conducted prior to the commencement of this project. The project is worth 3 million Tongan Pa'anga, and involves a lot of dredging and reclaimation. Sediment from dredging were pumped through a four inch hose and dispersed into the water outside of the reef. The sediment plume caused by this would have damaged the reef and its inhabitants. This impact is still yet to be determined.

Conversion of mangroves forests into residential areas

Continued conversion of mangrove areas into residential land means these areas are vulnerable to flooding during cyclone times, but worst of all during tsunami events.

The proposed relocation of low lying villages in Niuatoputapu to higher ground is a very expensive exercise and should be an example to all living in low lying areas, including lagoon dwellers. Therefore, further allocation of the mangrove forests for the purpose of town allotments should not be allowed to continue.

1.5.3.3. Lack of Appropriate Legislation and Policy

Currently, there is no overall Land Use Policy for Tonga (LUPP), a prerequisite to sustainable management and hence development. This will be a factor that will continue push some of our unique species towards IUCN threatened species RED status. Some specific cases are discussed in this section.

There is scope for further protection of Tonga's remaining forests. The FD is mostly excluded from all matters dealing with Reserves and National Parks, despite this being fundamentally important to their roles. In addition, FD does not have any regulatory powers to identify appropriate land for tree regeneration and replanting. This jurisdiction rests with Ministry of Lands Survey and Natural Resources (MLSNR).

1.5.4. Implications for a biodiversity loss

The implications of biodiversity loss for a developing country like Tonga can be considerable and wide ranging. About 60% of the population is rural and may depend heavily on bio resources for their food, income and well being. The small

land area and limited natural resources is a challenge to Tonga's sustainable development. Tonga relies heavily on a narrow and finite base of natural resources derived from agriculture, forestry and tourism. As this review reveals these resources are dwindling and there is an urgent need for careful stewardship and management of these resources.

It has been evident since the ratification of the Convention on Biological Diversity (CBD) that Tonga has not seriously considered its responsibilities. Biodiversity has never been a feature in the national plan nor in the Government sectors' work plan. As a result, there is evidence of unsustainable trends, like the fast encroachment of agriculture on forest land, overexploitation of bio-resources, habitat destruction, land degradation, increased squating, pollution, poor disposal of wastes and rapid expansion of vehicular traffic that relies heavily on fossil fuel combustion. There is also an increase in unemployment, followed by a rising level of poverty, which has not been properly acknowledged. It appears that recent development has been unsustainable, and based on short term gain for a long term loss of goods and services offered by nature's ecosystems.

The negative trends mentioned above can be easily reversed by Government taking the lead. The Millenium Development Goals include concern about environmental sustainability. Government should take their cue from this global goal, and incorporate into appropriate policies in the National Plan, and water this down to sector plans. Target 9 of MDG 7 goal states:"Integrate the principles of sustainable development into country policies and programs and reverse loss of environmental resources". Enforcing this policy with proper framework in place and with financial backing will ensure sustainable development, and offer protection to Tonga's biodiversity. Economically, sustainable development is about forgoing short term gain for a long term availability of goods and services. This would be the way forward for Tonga.

Some of the most negative impacts on human well being from adverse changes in biodiversity are presented below as examples from the forest, coastal marine and agricultural systems.

1.5.4.1 Impact of Changes in Forest and related Ecosystem

The rising cost of electricity and gas has led to an increase in the use of wood as firewood. This is more important in the rural than in the urban areas, although firewood is sold in urban areas. Additionally, people rely on forest for medicinal plants, food items and other wood requirements. In 'Eua, people depend heavily on freshwater from forests for their daily domestic requirements. Hence a loss or degradation of forests resulting in reduced irregular flows, dirty water, and drying up of natural springs, will affect this community. The sale of firewood is a source of income, and the loss of forest will have serious impact on people dependent on this.

Other important consequences of deforestation and forest degradation on human wellbeing are soil erosion and consequent loss of soil fertility. This in turn will lead to reduced agricultural productivity. Most farmers counter this effect with increased use of fertilizers, which has a detrimental effect on down stream people or areas including lagoon and coastal areas. Fertilizers have been attributed as a cause of algal bloom in the lagoon, which may be related to a reduction in marine organisms in this area.

Traditional medicine is still popular despite the existence of a largely free health system. The harvesting of these plants has raised eyebrows as a cause for concern, due to a fast decline in the number of species in the wild. Most of the medicinal plants are now recorded as endangered and require replanting and propogation programs. This may have negative impacts on the health of the rural population.

1.5.4.2. Impact of Changes in Coastal Marine Environment

The fishery sector earns valuable foreign exchange through the export of marine and aquaculture products, and provides direct employment to about 2044 households, while indirectly sustaining at least 16,000 households (2006,

census). However, the traditional coastal fishery has been severly affected by over fishing and the use of unsustainable methods like dynamite and poisoning of fishes.

Building of coastal structures can affect the coastal equilibrium system and can affect fisheries. The development of Vuna Wharf without an Environmental impact Assessment (EIA), and implementation of controls related to containing the sediment plume, had some negative effects on the reef west of the construction site. This is an example of habitat degradation, with effects which have yet to be determined, and which is highly detrimental to the environment. Likewise, degradation to the lagoon, removal of mangroves, sea grass beds and salt marshes that function as a vital breeding ground and nursery for numerous of species of fish, crustaceans and molluscs will reduce the commercial value of inshore fishing, thus affecting the fisher communities that depend on them for their livelihood.

Unlawful removal of beach sand is ongoing and has resulted in coastal erosion and indirect removal of sand from beach resorts, depriving them of vital income due to a decrease in the number of tourists visiting the resorts. Beach sand indirectly has high economic value aside from its natural protection to land and properties.

Another area that requires attention is the possible introduction of invasive species through ships' water ballast. Unregulated discharge of this water into Tongan waters could be potentially dangerous. Therefore strict regulation is required to prevent this potential risk and protect Tonga's marine species.

1.5.4.3. Impact of Changes in Agricultural Systems

The agriculture sector and fishing collectively contribute 23% of the GDP, decreasing from about 30% in 1999. This trend is continuing due to a decline in the amount of export in both sectors. Most of the agricultural products now are sold locally with little export to New Zealand. Agricultural productivity relies heavily on availability of fertile and arable land. The heavy usage of chemical pesticides, herbicides and fungicides in agriculture has degraded the soil and led to pollution of ground water and surface waters. The removal of forest has resulted in land erosion, further depriving soil of its natural fertility. This will adversely affect human health and agricultural productivity in the long-term.

Monoculture and only planting crops of economic value will result in a decrease in the diversity of agricultural species. This increase the vulnerability of our root crops to diseases, if mixed cropping is not encouraged as a priority.

1.5.4.4. Impact of Changes in Biodiversity on Tourism

Tourism brings foreign currencies and contributes significantly to Tonga's Gross Domestic Product. The total number of visitors arriving in the Kingdom in 2007 was at 70,415. By the end of 2008 this number had increased to 91,218, an increase of about 30%. His Majesty's Coronation was responsible for this surge in the number of tourists in the period 2007-2008. About 23,000 tourists came from New Zealand and 11,000 from Australia. The United States of America was the third main contributor of tourists, at about 6,000.

Eco tourism is a new trend in this industry and many tourists seem to be attracted to this type of environment. It is important therefore to preserve the environment and our way of life to cater for this new development. The protection and preservation of Humpback Whales (July – October) has led to a thriving industry in Vava'u. The Green tour to the national Park in 'Eua is another example of the popularity of this type of tourism. Environmental protection is a key issue for Tonga Tourist Bureau and they have taken eco-tourism seriously. The development of resorts in several smaller islands have applied this concept and present the Tongan environment as a way of life, as opposed to offering luxury European-style accommodation and experiences.

Tourism is a potential major contributor to the economy and therefore provides us with the incentive to maintain the natural beauty and social structure of the country. It should be encouraged and protected from activities that would tend to lower its value and its positive impacts. This required that unpolluted places of unspoilt aesthetic value and adequate biodiversity are present to attract tourists interested in sustainable tourism. As such, environmental problems leading to biodiversity erosion will jeopardize the expansion of this industry in the future.

1.5.4.5. Overall Outlook for the Future

Despite the many problems facing the conservation of biodiversity there is a growing awareness of its importance, through community programs and introduction of biodiversity curriculum in schools. Economic development and human well being are dependent on a healthy environment and abundant bio-resources. Currently we are losing our forest, and the decline in fish catch and a in diversity of our agricultural species implies unsustainable practices. This trend is dangerous and needs to be reversed urgently. This would require changes in lifestyle and attitudes of people towards the environment and its limited resources. Government can assist in reversing this trend by including biodiversity in its work plan and encouraging cross sectoral collaboration with appropriate policies and financial support in place. This will facilitate the full implementation of the NBSAP objectives which in turn will act to improve its economic development and well being of its people. In doing so, Tonga will contribute more to its global commitment to conserve the environment and save the planet Earth.

CHAPTER II: Current Status of National Biodiversity Strategies and Action Plans

2.1 NBSAP Formulation Process

The formulation of Tonga's National Biodiversity Strategy and Action Plan (NBSAP) went through different stages, after the ratification of the Convention for Biological Diversity (CBD) in May 1998. It took four years from this date for the Cabinet to set up a National Biodiversity Advisory Committee (NBAC) by 2003 to overlook the CBD objectives and the formulation of the NBSAP. In 2005 a National Environmental Coordinating Committee (NECC) was established to overlook all internationally funded environmental projects in the Department of Environment. The Committee also replaced the NBA Committee established in 2003. Tonga's NBSAP was finally published and launched in June 2006 with support from the Global Environemnt Facility (GEF). The Coordinating Body was the NECC.

2.2 NBSAP Focus

The NBSAP report identified eight thematic areas that are essential to conservation of biodiversity in Tonga. The first four were species specific and the last four were related to the administration and management of biodiversity objectives. The areas of focuses were:

1. Forest Ecosystem	5. Local Community and Civil Society
2. Marine Ecosystem	6. Access and Benefit Sharing from the Genetic Resources
3. Species Conservation	7. Mainstreaming Biodiversity Conservation
4. Agro-Biodiversity	8. Financial Resources and Mechanisms

The strategies and actions plan were designed to ensure that conservation and sustainable utilization of biodiversity is carried out effectively. These strategies and actions were assigned to government agencies, NGOs and stakeholders in the field of biodiversity to implement. There were 37 objectives to pursue with specific strategies and planned activities assigned to each theme area. Furthermore, indicators were assigned to each objective to indicate achievement.

2.3. Implementation

The Department of Environment was established in 2001 with the responsibility of coordinating and implementing environmental matters. In January 2005 the Cabinet approved the formation of the National Environment Coordinating Committee (NECC), with an oversight responsibilities for all existing and future donor funded environmental projects. The NECC is chaired by the Minister for Environment and has representatives from eight government organizations including DOE, MAFF, MoFish, MoForests, MFA and the Solicitor General. DOE (now MECC) reports to this Committee regarding donor funded programs. Refer Annex 2A1 for the Implementing Structure.

The implementers of the NBSAP report to the Director of the DOE (now MECC) and from there to NECC. The NBSAP Action Plan was established to be implemented through a multi sectoral responsibility. Implementers of each objective are listed in Table 16. The prominent agencies are DOE, MAFF, MoF and MoF although various actions are proposed for other agencies, like the Solicitor General, other government agencies, NGOs and Civil Society groups. Implementers and

players are all engaged either individually or jointly in carrying the actions that are scheduled either simultaneously or sequentially. This indicates that the one of the main challenges for the implementation of the NBSAP would be one of coordination.

Since 2006 two very important changes took place within government. First was the re-merging of the three Ministries - Ministry of Forestry, Ministry of Fisheries and Ministry of Agriculture and Food - into one Ministry, the Ministry of Agriculture, Food, Forestry and Fisheries (MAFFF) in 2007. Secondly, was the establishment of Department of Environment (DOE) as a Ministry of Environment and Climate Changes (MECC) in late 2009.

This chapter is aimed at reviewing the current status of the implementation of the NBSAP strategies and actions plan. This will be followed by comment on the status of mainstreaming biodiversity in different sectors, the obstacles and challenges of the implementation of the Convention, and resources available.

Documented below is an attempt to delineate current status in the implementation of the strategies and action plan set out in Tonga's NBSAP. Please refer STATUS part of Table 16 below for discussion of current status of each objective.

Table 16: Review of Status of Implementation

NBSAP VISION	Tonga's biodiversity and genetic resources are protected, conserved and sustainably managed.		
Theme 1 Objective	Forest Ecosystem		
Objective 1.1	To minimise the loss and degradation of forest ecosystems and habitats as a result of agricultural expansion.		
Intended Outcomes	**Indicators**	**Means of Measurement**	**Assumptions**
The expansion of agriculture is minimized and contained	Total area of pristine and established secondary forests remaining at 2005 levels	Aerial photos, satellite images. MoForests reports	Logging of native forests is limited to current areas or reducing. No severe natural disaster (cyclones, fire) occurring.
Implementers	MAFF/ DO.GR/MOPO/DOE, MOFO, MLSNR, MAF, TWB.		
STATUS	Analysis of the extent of changes in the forest area had been a challenging task. The estimate of forest areas for the Biodiversity First National Report (2006) were based on a literature review of four reports between 1994 and 1998 notably Desloges (1994) with a total land area of 69,100 ha and Burrows & Douglas (1996) at 74,700 ha. Desloges (1994) estimate is used as benchmark for the analysis of changes in forest areas from 2005 to 2009 (see Table 11). The 2009 estimate of forest area was obtained from the National Forest Policy for Tonga (2009). The benchmark figures were not yet adjusted for 2005 but at least it enabled us to establish the trends on biodiversity movement. The decrease in the native forest (woodland) area from 11.5% in 2005 to 9.4% in 2009 tallies with the result of the interview of stakeholders that agricultural expansion towards the forest ecosystem is still continuing in all the islands of Tonga. Similarly, the decrease in the mangrove and wetland area from 4.3% in 2005 to 2.6% in 2009 also agrees with the result of the interview of stakeholders that this ecosystem continues to be a victim to agriculture and urbanisation, particularly at the Hala'ovave, Sopu and the Lagoon edges at Tongatapu.		

Objective 1.2	To ensure the optimal and sustainable allocation and use of Tonga's land and natural resources.		
Intended Outcomes	**Indicators**	**Means of Measurement**	**Assumptions**
Forest ecosystems and ecosystems services are protected.	An integrated land use plan is adopted & implemented. Legislation and polices adopted & enforced.	MLNR reports & maps MoForests reports.	Political and public support exists. Funding and capacity is not constraining.
Implementers	MOFO, DOE, MLSNR, MAF, CPD/MOW/ PSC/NS0's, CL		
STATUS	Forest continued to suffer from uncontrolled agricultural expansion. The proposed National Integrated Land Use System (NILUS) is yet to be formulated and the adverse effect of its absence has resulted in the relocation of 45 registered tax allotments (75 ha of farmed land) from the water catchment area to another part of the forest reserve on 'Eua. The vacated land is already replanted with trees but the trees on the new reallocated tax allotments are now being cleared for farming. This painful and costly event can only be avoided by having a formal NILUS in place to guide future development. Until an Integrated Land Use System is in place, conservation and propagation will be a difficult job. At the sectoral level, DoF and TTL had gone ahead and developed a land use plan for TTL'S forest estate whereby the land for conservation and plantation development is clearly identified and a management plan for each land use have been prepared. A draft National Forest Policy for Tonga 2009 (NFP) has been prepared by FAO and GTZ to consolidate the views of all stakeholders on how Tonga's forest resources should be managed, to act as an agreed basis for planning and subsequent action, and to provide the basis for enacting legislation. DoFO is in the process of securing funding for the review of the Forest Act. Threatening this whole development however isthat the power in relation to land allocations rests with the Ministry of Lands, Survey and Natural Resources (MLSNR).		
Intended Outcome	Indicators	Means of Measurement	ASSUMPTIONS
Agricultural expansion is managed within predetermined Areas	1. Reducing of loss forest cover. 2.	Aerial photos & GIS maps Forest boundary surveys.	Political and public support exists.
STATUS	At the national level, the pressure of limited land in Tonga is reflected by the continuing encroachment of agriculture on forest reserves and natural forest. Better farming machinery and demand for cash cropping are the main cause for this encroachment. At the sectoral level, the plantation forest cover is increasing in 'Eua island due to TTL's replanting program, which in the past four years far surpassed the rate of harvesting. The total area that was harvested was only 6.4 ha compared to total planted area of 56.4 ha (Table 6.) However, everywhere else in Tonga, forest is threatened.		
Objective 1.3	To ensure the sustainable management of Tonga's natural resources.		
Intended Outcomes	**Indicators**	**Means of Management**	**Assumptions**

Reduction in the annual area forest lost.	National Forest Policy is adopted and implemented. Forest legislation is updated. DoF staff and budget increases.	GIS maps MoForests Annual reports MoForests approved budgets.	Political support exists.
Implementers	MOFO/DOE/MLSNR/MAF/CL/DO/TO		
STATUS	The review estimated a reduction of forest cover by 26% from the 2006 figure. This is due to reduction in woodland (13%), plantation forest (10%) and mangrove forest (3%). This gives an average annual loss of about 9% (Table 5). This loss is likely to continue unless an Intergrated Land Use is in place and existing laws in relation to Parks and Reserves and mangroves are enforced. There is a need for a proper stocktake to be taken island by island to verify actual sizes and species, to assist accurate prediction and decision making to occur. Interview of stakeholders reveals the view that the size of the National Park on 'Eua remains the same but individual trees are either removed, cut or damaged for the purpose of obtaining medicine, firewood, carving wood or decoration. It is also reported by stakeholders that the uncontrolled removal of trees from the coastal forest for firewood, medicine and carving is at an alarming rate and contributes to the overall decline in the forest cover.		
Objective 1.4 Conservation Areas	To improve the management of existing parks and reserves and, consistent with the integrated land use plan, to expand the conservation area network to recover representative samples of all major terrestrial ecosystems.		
Intended Outcomes	**Indicators**	**Means of Measurement**	**Assumption**
Improved management of parks and reserves.	No. of management plans developed and implemented; Increasing in trend in funding Increasing in visitations.	Existence of management plans. Visitors book from parks etc.	Increasing funding correlates to increasing no. of PA staff and investment in PA developed.
Implementers	MOFO/DOE/MLSNR/MAF/TO/DO		
STATUS	The management of the Forest Park in 'Eua has deteriorated due to lack of funding. The recently formed Ministry of Environment and Climate Change (MECC) has the ultimate GoT responsibility to manage the Parks and Reserves. The inclusion of a budget for park management and creation of new parks is expected from MECC budget request for 2010-2011. It seems that the one and only existing Management Plan (1998) for the 'Eua National Park did not raise as much money as it was supposed to do for it to be self funded. This resulted in a deteriorated state for the park. The concept of national park is still new and foreign to most Tongans; therefore a considerable increase in the promotion and reinforcement of the concept is required, for the community to see the benefits that may flow from such a system before it is regarded as socially and politically acceptable. The 'Eua Ecotourism Association, in collaboration with the MoT, has made a significant step towards raising public awareness and the promotion of the national park and reserves through their website. Hopefully this will attract tourists and funds to revive this concept.		

More ecosystems under conservation management.	No. of new conservation areas; No. of previous unrepresented or unrepresented ecosystems under conservation management.	GIS maps No. of CA management plans. Aerial photos & satellite pictures.	No drastic natural disaster or environmental event happening.
STATUS	There is no growth in this area due to the absence of a National Land Use System and the funds for establishing, control and policing such conservation areas. The existing National Forest Park in 'Eua has suffered from lack of proper management. There is evidence of abuse as local people are harvesting priority species like ahi and other medicinal plants. At the national level, the one and only significant establishment of new conservation area was the relocation of 45 registered tax allotments within the catchment areas (75 ha of farmed land) to be rehabilitated with forest. However there is no plan in place to expand forest ecosystems. This review also revealed abuse of forest reserves in isolated volcanic islands through agricultural practices. The draft National Forest Policy for Tonga (2009) envisaged the formulation of a National Land Use Plan and a National Agricultural Policy as a way forward for Tonga. This could be a starting point for Tonga provided they can find finance to monitor and manage additional forest ecosystem effectively.		
Objective 1.5 Information, research and monitoring.	To promote the effective and systematic collective and management of relevant information through scientifically designed research and surveys.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
Knowledge of the status of forest biodiversity is up to date and verifiable.	Regular and up-to-date information available. Ecosystem survey completed Data available on databases.	No. of technical survey reports Amount of data stored on databases.	Technical capacity exists.
Implementers	MOFO/DOE,MLSNR/MAF		
STATUS	Tonga's forest resources are listed in its NBSAP 2006. Only Tonga Timber Limited (TTL) managed to engage an independent valuer in 2007 to carry out a comprehensive inventory and valuation of its forest estate, at 'Eua island. Knowledge of the status of forest biodiversity in the TTL's Forest Estate is now up to date and verifiable. To facilitate the impending privatization of TTL and the anticipated increase in the sustainable production of wood from the estate, DoF had confirmed the engagement of an FAO funded group of consultants to carry out an EIA on this intention. However, there is a need for proper stocktake to be undertaken to accurately define the true status of this important ecosystem throughout the island groups.		
Objective 1.6 - Public awareness and education	To increase public understanding and support for the conservation and sustainable use of forest biodiversity.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**

Supportive public of forest conservation actions.	No. of people participating in forest activities e.g. tree planting No. of people surveyed with supportive responses.	Polls and attitude surveys	Positive attitude translates to positive actions.
Implementers	MOFO/MAF,DOE.MOH,MOE		
STATUS	The existing public awareness programs on forest activities are ad hoc. TV and radio programs are not regular. The formation of an Agroforestry Society for farmers of the Eastern District had proven to be the best available and practical means of getting the conservation message across and above all applying those messages. To ensure efficiency and continuity exists in the administration and operations of the Society, DoF and MECC must play a strong advisory and supportive role. The Tongan culture thrives on group/village activities. Strategies are of necessity when directed towards group efforts such as youth, clubs, NGOs, schools, churches, etc. Of particular interest and importance to the conservation efforts is the initiative taken by a private business ('Ene'io Enterprise Ltd) to establish a botanical garden for the purpose of providing eco-tour services to the community and visitors to Vava'u. Other islands may find this example relevant and set up such program with some assistance from MECC and DoF. The introduction of biodiversity and environment in Primary, Secondary and Tertiary Schools' curriculum is one giant step towards achievement of the knowledge and attitudinal quality that will ensure the long term sustainable usage of biodiversity. However this may take time to take effect. Street interviews showed that secondary school students know more about biodiversity and conservation than farmers and fishermen. If this is the case then our future could be brighter, although current negative practices should be halted.		
Theme Area 2 -	Marine ecosystems		
Objective 2.1 - Minimize the impact Land based activities.	To minimize the adverse impact of land based activities on coastal and marine species and ecosystems.		
Intended Outcomes	**Indicators**	**Means of Measurement**	**Assumptions**
Healthy coastal ecosystems and habitats for priority species.	Reducing no. of algae bloom outbreaks. Reducing trends of eutrophication. Evidence of good coral growth.	Coastal, coral reefs & marine surveys.	No significant El Nino event.
Implementers	MOF,DOE/MLSNR/CPD/MCC/MOF/MOW/MAF/MMP		

STATUS	There has not been any biological study on the phytoplankton content of the Tonga coastal waters, especially to the formation of algal bloom, which was alleged to be the cause of dead fishes found in the lagoon in 2005. In 2008, a similar incident was witnessed and this was alleged to be caused by destructive fishing methods (dynamite). This type of fishing method is outlawed and is enforced under *Fisheries Regulation 2008*. The appearance of algal bloom is inferred to co-incide with an increase in squash farming, a lucrative market, in the 2000's. This type of farming demanded high usage of fertilizers which through runoff can cause the formation of algal bloom in the lagoon. This market has collapsed and algal bloom is no longer a threat in the lagoon. The Ministry of Environment 2003 Act on conducting EIA studies on major projects, including those at coastal zone(wharf, reclamation etc), has not been fully enforced. This is due to a lag in the formation of the Regulations required to enforce the Act, which are expected to be finalised by mid 2010. When this process is in place, protection of the environment - both coastal and land - will improve dramatically. A study conducted by South Pacific Secretariat under PROC-Fish program, has identified that abundance, size and species diversity is lower in the back reef area. This state was also noted to be repeated by the coral cover which is attributed to overfishing, especially spear diving at night times. Lack of monitoring works on protected areas gave us no direct clue on the health of this ecosystem. As a result the healthy status of our coastal ecosystems and habitats for the priority species remain unchanged.		
Objective 2.2 - Marine conservation areas	To expand the existing network of protected areas to effectively conserve major coastal and marine habitats of biological and socio-economic value.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
A 50% increase in the total area of marine ecosystem under conservation management in 10 years.	No. of new marine areas under conservation management.	GIS maps showing new marine areas Management plans approved and under implementation.	Supportive local communities.
Implementers	MOFI/DO/TO/DOE/MLSNR		
STATUS	The number of protected areas mentioned in the NBSAP 2006 still remains the same, at 8 parks and 10 reserves, at the time of this review. Monitoring works in these areas have been lacking for some time due to lack of funds. However, new areas have been established for similar reasons, and are called Special Management Areas (SMA). This type of conservation and sustainable utilization of resources is protected under the *Fisheries Act 2002*. The idea is based on community projects co-managed by the Department of Fisheries and the community concerned. There are six (6) SMAs already set up around Tonga. These SMAs are located at Tongatapu (2), Ha'apai (3) and Vava'u (1). Nomuka is in preparation for the 7th SMA with base line studies still underway. Plans and Regulations for the management of these SMAs are included in the *Fisheries Management and Conservation Regulation 2008*. According to the Division of Fisheries, this co-management arrangement is working well due to stakeholders' improved knowledge on the importance of the area to their sustainable sustenance and health. The increase in areas under conservation management is already at 33%. At time of this review works to be conducted under POWPA on protected areas are being organized. A project for farming of live coral and rocks is underway under ACIAR / SPC projects. This is aimed at supplying Aquarium Operators in future instead of mining the reef.		

	A continous project conducted in conjunction with SPREP is being undertaken by the Ministry of Fisheries to determine spawning ground (islands) for turtles. A final result of this study could produce a SMA for turtles, in future.		
Objective 2.3 - Sustainable management of marine biodiversity.	To promote the use of environmentally sound practices in the management of marine resources.		
Intended Outcomes	**Indicators**	**Means of Measurement**	**Assumptions**
Marine resources are managed sustainably.	No. of management plans developed & implemented. No. of fishing practices & technologies banned by legislation. Legislation banning under sized catches enacted and encforced. Declining no. of adverse reports of negative impacts of whale activities. Declining no. of incidences of algae boom and COT. PacPOL implemented successfully.	Physical existence of management plans. Copies of legislation Reports of MoFish Reports of whale watching operators PacPOL reports	Legislation will be enforced. Cooperation of whale watching operations.
Implementers	MOFI/TUB		
STATUS	There is new Fisheries Management and Policies in preparation but targeting mainly commercial fish species (tuna, snapper and grouper), aquarium, ornamental products and aquaculture activities. Banning of destructive methods (poisoning and explosion/dynamite) is enforced under *Fisheries Regulation 2008* but still under emphasized. More fish species are added to the size limit control measures under the 2008 Regulation indicating that species are threatened. The Tuna Management Plan was reviewed in 2009 with technical assistance from Forum Fisheries Agency (FFA) to include Ecosystem Approach Strategies (EAS), which will assist greatly in preserving species and habitats in the future.		
Objective 2.4 - Information research and monitoring	To promote scientific research and regular monitoring of critical marine ecosystems, and the proper management of scientific data to support the conservation and sustainable management of marine ecosystems.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
Knowledge of the state health of critical marine ecosystems is current and regularly updated.	No. of marine survey reports of critical ecosystems and species: Amount of data on database.	Reports of marine surveys. Database and amount of data stored.	Technical expertise is not a constraint.

Implementers	MOFI/DOE		
STATUS	This objective is largely ignored at the moment due to a lack of financial support. Ministry of Fisheries is working on a database project with assistance from SPC, SPREP and FFA since 2009. This would provide a good source for sharing information in the future. Research is focusing mainly on harvesting and the sustainable utilization of commercial marine species (sea cucumber, snapper, grouper, tunas, seaweed resources etc). Research and monitoring budgets requested through government are often regarded as low priority. This objective desperately requires financial support to become effective.		
Objective 2.5 - Public awareness and education.	To enhance public knowledge and understanding of Tonga's marine ecosystems and of issues related to their conservation as a mean of fostering public support for marine conservation objectives.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
A general public that is well informed of marine conservation issues and supportive of marine conservation objectives.	No. of local initiatives supporting marine conservation; No. of local communities schools, organizations etc interested and are involved in community conservation work.	Polls and questionnaire surveys. Count of supportive communities or local initiatives.	Locals are willing to express support and participating in pollign and questionnaire surveys.
Implementers	MOFI/NGO's/DOE		
STATUS	TV and radio programs co-sponsored by the Ministry of Environment, Fisheries Division, Ministry of Agriculture & Foods are on-going and proving successful in promoting awareness and reasons for conservation and sustainable consumption of resources. In 2007 and 2008, Department of Fisheries conducted its own awareness programs through primary and secondary schools in Tongatapu, using live and cultured species. Demonstrations were made on the relationship of marine species to their habitats and ecosystem. Fieldtrips were also organized for schools to visit the Mariculture Centre at Fisheries. This program is regarded as successful due to the frequency of visits from schools to the centre, which are still received up to today. Individual and students with marine project are still visiting site seeking information from staff of the Mariculture centre.		
Theme Area 3	**Species Conservation**		
Objective 3.1 - Protection of priority species	To ensure the protection of viable populations of all priority conservation species of Tonga.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
Priority species are well protected & their population increasing.	Populations of priority species increasing. Associated habitats are healthy.	Species survey reports Aerial photos and satellite pictures.	No drastic or environmental event happening.
Implementers	MAF/DOE/MOFI/MOFO/TUB		

STATUS	About 52% of the 60 plant species that were declared critically endangered (CE) in 2005 have improved under this review. Three new species entered the critical level (CE), 5 into the endangered zone (E), and 7 into the vulnerable (V) level. Protection of the priority species in situ, i.e. natural habitats such as coastal beaches, coastal forest, reserve and national parks, are often at risk due to a lack of funds to police those areas. Protection ex-situ in town and tax allotments and in experimental farms is more effective as land owners are responsible to the establishment and protection of their own plants. In agro species, two species which have recovered fully to abundance are *Xanthosoma spp* (taro) and *Broussenetia spp* (hiapo). This is mainly due to their high yield and shorter harvesting time. Two priority marine species in the giant clams *(Tridacna spp)* and sea cucumber (*Holothuria spp*) still remain threatened but they are being propagated ex-situ in a research facility at Division of Fisheries. Ex-situ conservation of the malau bird has led to the establishment of a population on the island of Fonualei, Vava'u. The PoWPA project will enhance the survivability of threatened species in Tonga by focusing attention on the protected areas in our Kingdom. There is an urgent need to update information on the current status of threatened species.		
Objective 3.2 - Sustainable use and management of species	To ensure the sustainable use and management of species of economic and cultural significance.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
Targeted species are managed sustainably.	Populations of targeted species are increasing ex situ and or in-situ.	Regular population count. MAFF and Dof reports.	No drastic natural disaster or environmental event happening.
Implementers	MOFO//MAF		
STATUS	In-situ and ex-situ programs are both used in propagating both marine and terrestrial species. The Malau was introduced to Fonualei and reintroduced to Late island. Recent surveys confirmed sighting of Malau in Fonualei but none in Late. This species therefore remains endangered. There has been no monitoring of populations of other bird species within the last decade. There is need to update the status of these species of importance to enable sustainable and strategic planning to occur. Out of the 60 plants declared threatened, 52% improved while 47% remain at same level, with only 1% deteriorating and becoming critically endangered. In relation to the marine species, Special Management Areas (SMAs) project are managed by members of the community. This is a close tenureship with only people of the community allowed to fish in the area. No fishing season and no take out zones apply to these SMAs.		
Objective 3.3 - Invasive Species	Prevent the accidental introduction of known invasive species into ecosystems and agricultural biodiversity.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**

Local biodiversity is free of the threat of invasive alien species.	No new accidental introductions. No. of species of threatening biological species made at borders. Populations and spread of known invasive species declining.	MAFF (Quarantine) reports. SPREP reports on PIER.	Data on seizes on border control operations are made and reported.
Implementers	MAF/DOE/MOFO/MOFI		
STATUS	*Mimosa diplotricha* is new invasive weed to Tonga. The new Biosafety Act will also give MECC a similar role to MAFFF in biosecurity. MAFFF and MECC need strong collaboration in this area at a national level. The potential for invasion through ships' water ballast is real in Tonga, due to lack of a proper facility and a control process in place. Marine and Ports need to collaborate with Division of Fisheries in designing policies to alleviate this problem. Also attention should be drawn to marine organisms on ship's hulls which could be another source of invasive species. A proper facility would be very expensive but other temporary measures like sampling of water ballast for laboratory testing could be ideal for the time being.		
Objective 3.4 - Research and monitoring	To encourage basic scientific research monitoring surveys to identify, document and monitor progress in the conservation of priority species and to support on-going planning and conservation efforts.		
Intended Outcome	**Indicators**	**Means of measurement**	**Assumptions**
Better understanding of what is known and not known about Tonga's priority species ecological requirements for conservation management.	Completed review of existing information about priority species. Monitoring programs initiated and maintained.	Reports of MAFF, MoF, DoF and DOE.	Technical capacity is not a constraint
Implementers	DOE/MAF/MOFI/MOFO/MOE		
STATUS	There has not been any complete review on the priority species. Scientific research is affected by a lack of funding. The national budget on this activity is very restricted and given low priority. There is an urgent need to seek project funding for research/monitoring activities from international funds. Another area worth noting is a high requirement for more scientists in the three main sectors of forestry, marine and terrestrial fauna and Flora. This need was indicated in NBSAP 2006 but is now critical due to a voluntary redundancy program in 2007 which saw a large reduction in the number of Tonga's scientists. A structure for manpower training in the areas mentioned above is required for an effective implementation in the future.		
Objective 3.5- Public Awareness and Education	To enhance public knowledge and understanding of priority species and their importance for conservation as part of Tonga's natural heritage, as a way of fostering public support for species conservation objectives.		
Intended Outcome	**Indicators**	**Means of Measurement**	**Assumptions**

A general public that is well informed of Tonga's natural heritage and priority species, and supportive of species conservation work	No. of local initiatives supporting species conservation. No. of local communities, schools, organizations etc interested and are involved in species conservation work.	Polls and questionnaire surveys. Count of supportive communities or local initiatives.	Locals are willing to express support and participate in polling and questionnaire survey
Implementers	DOE/NGO/MAF/MOFI/MOFO		
STATUS	There is urgent need to engage NGOs, Churches, community, and government to work together using media outlets, workshops and also the internet. The current public awareness programs which include introduction of environment topics into schools' curriculum is an advantage but does not address much in the area of conservation regarding our priority species. Priority species need to be emphasized at this level.		
Objective 3.6- Capacity Building	To strengthen the technical, management and research knowledge and skills of local scientists and researchers, and the capacity of responsible agencies and organizations to effectively implement research programs supporting the protection, conservation and sustainable management of Tonga's priority species.		
Intended Outcomes	**Indicators**	**Means of Measurement**	**Assumptions**
Adequate expertise and capacity exists locally t independently address Tonga's priority research needs.	No. of graduates returning No. of staff attending specialized training; National herbarium is established. Specialized equipment procured; Increasing trend in research funding. No. of research papers published.	Reports of MAFF, MoForests, MoFish, DOE.	Appropriate overseas education and research institutions and supportive and appropriate training courses are on offer.
Implementers	MAF/MOFO/MOFI/DOE/MOE		
STATUS	Currently, there appears to be adequate expertise to implement the objectives of the NBSAP, but this is a thin layer left behind by a voluntary redundancy in 2007 which saw a big reduction in number of Tonga's scientists. This shortage has not been corrected. Tonga will be in deep trouble if another voluntary redundancy package is offered and the current scientists take it. Therefore there is a need for structured manpower training to be in place to mitigate this risk. Capacity building is critical to the longterm management of terrestrial fauna and flora. Long term formal and short term training is required to keep everyone up to date and interested in this area. One zoologist is required to work with MECC fulltime. Collecting updated data can lead to long term strategic planning for research and development.		
Theme Area 4	AGRO-BIODIVERSITY		

Objective 4.1 - Conservation and sustainable use of threatened agro-biodiversity.	To preserve the genetic variability of Tonga's agro-biodiversity and promote the conservation and sustainable use of threatened agro-biodiversity species of economic and socio-cultural importance.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
Populations of all targeted species are increasing in the wild and ex-situ.	No. of seedlings of priority species planted. No. of mixed planting and agro-forestry farms established. No. of ex-situ initiatives established. Decline in the unsustainable farming practices.	MoForests reports MAFF reports.	No drastic natural disaster or environmental event happening.
Implementers	MAF/NGO's/MOFO		
STATUS	There is a degree of difficulty faced by this sector in propagating priority species, due to a lack of financial support. Propagation in this sector is based on what farmers are willing to grow and when farmers are commercially orientated then only species with monetary value have the chance to propogate. At the moment, there is a Fruit Tree program in place on citrus and other priority species. Seedlings are sold for planting at residential compound (AGAR/MAFFF Report 2008/2009). Two species - *Xanthisone spp a*nd *Broussonet spp* - were noted to have become abundant due to their high yield and shorter production period. They have become the farmer's choice of economic species.		
Objective 4.2 - Research and development	To promote and support research initiatives that contributes to the conservation of threatened species and the sustainable use of commercial and traditional agro-biodiversity.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
Improved understanding of the conservation requirements of targeted species and their habitats and of associated threats.	No. of research initiatives implemented. No. of scientific research papers/ reports published.	MAFF reports Scientific journals.	All research projects are relevant and targeting approved NBSAP priorities.
Implementers	MAF/MOFO/DOE		
STATUS	Once again research initiatives are based on priority and availability of funds. This is the barrier facing research and monitoring programs at the moment. The Ministry of Agriculture, Food, Forestry and Forest (MAFFF) is engaged on some ex-situ programs, especially on fruit tree seedlings, which are distributed to members of the public to plant mostly at town allotments. There is no specific program on targeted species.		

Objective 4.3 - Public awareness and education.	To foster public support for the conservation of threatened agro-biodiversity by enhancing awareness and understanding of their importance.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
Tongan public is well informed about the importance of protecting threatened agrobiodiversity and supportive of agrobiodiversity related initiatives.	No. of local farmers participating in replanting programmes; No. of local communities school, organizations etc interested and are involved in species conservation work.	Polls and questionnaire surveys.	Locals are willing to impress support and participate in polling and questionnaire surveys.
Implementers	DOE/MAF/MOFO		
STATUS	Conservation is part of High Schools syllabus, which also includes the genetic part of biodiversity, at Form 5 and 6. Farmers are aware of conservation but they are driven by economic reasons. They pick *Xanthisone* and *Broussonet* species because they are high yield. The other species are in need of being conserved ex-situ, in case of any outbreak of diseases or other natural disasters.		
Objecctive 4.4 - Capacity Building	To strengthen the capacity of local farmers, agriculturalists and scientists to effectively implement programmes for the protection, conservation and sustainable management of Tonga's agro-biodiversity.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
Technical and management capacity are strengthened at all levels.	No. of successful privately managed agroforestry or mixed planting farms. Level of innovation demonstrated by farmers. No. of scientists, farmers, biosecurity offers trained.	MAFF extension reports Site assessment of innovation. MAFF training reports.	MAFF extension reports cover privately managed farms.
Implementers	MAF		
STATUS	There are four demonstration farms involved in a volunteer program with MAFF providing technical assistance. These farms are all involved in different crops, including planting vanilla and kava. Other programs include Youth and women groups who are involved in vegetables, pandanus and taro planting at Pelehake village. However, more work is still required in this area. Most of the farmers in Tonga are not trained, but farming as a second choice; or it is regarded as a school dropout activity. It is therefore important that further training is funded for farmers.		
Theme Area 5	Local Community and Civil Society		

Objective 5.1 - Local communities and resource owners.	To empower local communities and resource owners to effectively participate in the conservation and the sustainable management of biodiversity resources in areas under their control.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
Local communities and resource owners are active and effective contributors to biodiversity conservation and resource management.	No. of national level planning processes involving local communities and resource owners. Amt. and quality of conservation and resource related information accessed by locals. No. of community based conservation area projects initiated. No. of multi-sectoral project takes teams with local NGO, civil society representation.	Polling of planning processes & multi-sectoral task teams; No. & type of requests received for technical information from local people. MoFish, DOE and MLSNR reports.	National level planning processes are participatory and accessible to local people. Local people are interested and available to participate.
Implementers	DOE/NGO's/ALL GOVT/MOFI		
STATUS	This objective has been achieved through civil society programs. Currently there are about four youth programs on conservation of the lagoon and other coastal areas around Tongatapu and the Ha'apai group. These are community based programs targeting rehabilitation and conservation, conducted by youth groups. The other project is on forest conservation, targeting National Youth Groups on Vava'u, Ha'apai and Tongatapu. Target areas with existing forest have to be legally transferred to this group to conserve and replant.This area however requires an independent technical body to monitor their projects to ensure that issues are addressed properly.		
Objective 5.2 - Civil Society	To empower civil society and groups to be effective advocates of biodiversity & sustainable resource management.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
Civil society organizations and groups are active advocated or biodiversity conversant	No. of civil society advocating initiatives. No. of new environment multi sectoral committees with civil society reps.	Polling	No political restrction on formation of and activities of civil society groups.
Implementers	DOE/MLC/NGO's/ALL GOVT		
STATUS	This objective has been achieved. Civil society initiated its programs in 2008, and there about seven programs already operating on biodiversity at the moment. Theserelate to mangrove rehabilitation, coastal protection and replanting in the coastal zone, a coastal erosion program in Ha'apai and forest conservation around Vava'u, Ha'apai and Tongatapu. Objectives 5.1 and 5.2 are considered successful however there is a concern in		

	monitoring and reporting on these projects. There is a need for an independent body to monitor all NBSAP implementation and report to the responsible sector or to MECC. The body can give advice and ensure that objectives are achieved and sustainable.		
Objective 5.3 - Schools	To ensure the full integration of biodiversity conservation concepts into school curricula at levels.		
Intended Outcomes	**Indicators**	**Means of Measurements**	**Assumptions**
School children are understand and are supportive of conservation objectives early in life.	No. of schools and environmental conservation projects. No. of students supportive of conservation intiatives.	Polling and questionnaire surveys.	Increase in understanding will result in positive changes in behaviour.
Implementers	MOE/Relevant GOVT M/DOE		
STATUS	This objective has been achieved. The concept of biodiversity conservation has been integrated into primary and secondary schools curriculum. The relationship of the environment and its biodiversity is addressed. Functions of ecosystems are also addressed.		
Theme Area 6	Access & Benefit Sharing from the Use of Genetic Resources and TEK		
Objective 6.1 - Access to Genetic resources	To prevent illegal access to and lawful exploitation of Tonga's genetic access.		
Intended Outcomes	Indicators	Means of measurement	Assumptions
Tonga's genetic resources are fully protected from unlawful exploitation.	No. of illegal access cases prosecuted. No. of application received, and legally approved.	Polling MoJustice reports.	Legal framework is in place and enforced.
Implementers	CL/DOE/MLC/MAFF/MOFI/MOFO		
STATUS	There is no legislation in place that is specific to this area. An immediate need is for our endemic species to be registered with the appropriate authority. This will allow benefit sharing if the genetic resources are found to benefit others. A study was conducted by the Victoria University of Wellington (VUW), New Zealand in 2009 on sponge as a possible cure for cancer, and was done with the knowledge of DoF. Tonga could stands to gain if the cure is developed and successfully applied in future.		
Objective 6.2 - Fair and equitable Sharing of Benefits	To ensure the fair and equitable sharing of benefits generated from the use of genetic resources.		
Intended Outcomes	Indicators	Means of measurement	Assumptions
Local owners of resources and Traditional Ecological Knowledge (TEK) are receiving equitable	No. legally binding agreement signed benefiting local owners of resources and TEK.	Polling	Information on benefits sharing is accessible.

share of benefits.			
Implementers	DOE/MLC/MAF		
STATUS	Tonga needs to register its endemic species with the appropriate authority and pass legislation that is needed to address this objective. There is no specific legislation on this area.		
Objective 6.3 - Traditional practices & ecological knowledge	To prevent the loss of traditional ecological knowledge (TEK).		
Intended Outcomes	Indicators	Means of measurement	Assumptions
Traditional ecological knowledge (TEK) is documented, protected from unlawful use and where appropriate, promoted.	Reports, database etc capturing TEK. Legislation enacted and enforced. Appropriate TEK applied in conservation management	DOE reports and databases. Crown Law Office reports. MLC reports.	Holders and custodians of traditional knowledge willing and able to share TEK.
Implementers	DOE/CL/MLC/TTC/NGO's/TUB		
STATUS	There are books on medicinal plants and old fashioned medicine but a thorough study of this knowledge is warranted.		
Objective 6.4 - Public Awareness and Education	To raise public awareness and understanding of the importance of Tonga's genetic biodiversity resources and Traditional Ecological Knowledge (TEK).		
Intended Outcomes	Indicators	Means of measurement	Assumptions
Tongans have pride in their natural heritage, are well informed about their TEK and supportive of efforts to protect them	Increasing use of traditional healing methods, and other TEK.	Polling and questionnaire surveys.	Pride and improved awareness of natural heritage will result in support for conversation efforts.
Implementers	DOE/MOE/TUB		
STATUS	A company has been registered under the name of INDIGENOUS PHARMACEUTICALS INCORPORATED in January 2010 to look at developing local medicine from Tonga's genetic resources. The company's intention is to set up a laboratory to test some of the traditional medicines as treatment for specific diseases and produce en masse. There is renewed interest in traditional medicine due to recurring sicknesses and other cultural related diseases (diabetes, HBP etc)		
Theme Area 7	**Mainstreaming Biodiversity Conversation**		

Objective 7.1 - Legislation, policies and plans	To integrate concepts of conservation and sustainable use of biodiversity into all relevant sector policies, programmes and plans.		
Intended Outcomes	Indicators	Means of measurement	Assumptions
Concepts of conservations and sustainable use of biodiversity are integrated into sectoral policies, programmes and plans.	No. of sector plans policies & legislation that specifically integrate conservation and sustainable use of biodiversity. No. of projects & programs implemented by Government Agencies integrating conservation and sustainable use of biodiversity. The NBSAP is recognised as authoritative reference for economic planning purposes. No. of projects redesigned to comply with EIA recommendations.	DOE reports.	Greater integration of conservation and sustainable use concepts will result if NBSAP in recognized in national planning as the source document for national environmental issues and priorities. EIA is consistently enforced.
Implementers	DOE/CRD		
STATUS	This requirement is urgent. This will be a cause for synergy and it would be of great assistance for implementing the biodiversity objectives across the sectors. The traditional method of sectoral development of legislation and policies is becoming a constraint to addressing cross cutting issues of national priorities because the overlaps are left unattended, leading to failure in implementing. What is needed is a cross cutting legislation to cover all, or each sector has to incorporate biodiversity into their policies and new legislation.		
Objective 7.2 - Mullti - sectoral collaboration	To improve and strengthen multi-sectoral collaboration amongst all relevant sectors and stakeholders in support of biodiversity conservation and sustainable development.		
Intended Outcomes	Indicators	Means of measurement	Assumptions
Agencies and organizations of varied interests and areas of specialization work collaborate regularly on conservation work.	No. of conservation projects involving organizations from different sectors. No. of environmental initiatives initiated by non conservation organizations and companies.	DOE reports	Collaboration indicates shared concern and commitment to conservation objectives.
Implementers	DOE		
STATUS	Cross sector collaboration is weak within government but it seems to work well in non government organizations. The function of Civil Society as implementers of biodiversity programs has been well performed with about seven programs operating at the moment around Tonga. Civil Society has lagoon edge programs on mangrove replanting, coastal protection replanting program and a forest conservation program with national youths. Tonga Trust has programs on endangered megapode species in Niuafo'ou, and developed model recovery programs for endangered species and Tonga's Important Bird Areas (IBA).		

Objective 7.3 - Environmental Impact Assessment	To ensure that environmental and social impacts of all proposed major projects and activities are thoroughly assessed using approved EIA guidelines and standards prior to implementation.		
Intended Outcomes	Indicators	Means of measurement	Assumptions
EIA is an acceptable planning requirement for all development activities.	No. of development projects redesigned to take into account EIA recommendations. No. of major projects with EIA reviewed and approved by DOE.	DOE. Reports	There is political commitment to enforce EIA legislation without discrimination.
Implementers	DOE/ALL GOVT		
STATUS	The EIA Act 2003 is in place, however is awaiting the completion of its Regulations which are currently prepared in draft form. There are more than 10 major projects that have undergone the EIA process. Some recent projects are: Vuna Wharf Project and Tonga Naval Base Rehabilitation Works. MECC is expecting the EIA to be in full force by the middle of this year.		
Objective 7.4 - Economic valuation	To encourage the quantification of benefits derived from the use of biodiversity and other ecosystem services to support the full integration of biodiversity conservation into sustainable development planning and decision - making.		
Intended Outcomes	Indicators	Means of measurement	Assumptions
Biodiversity valuations results are accepted and incorporated into cost benefit analyses of development proposals.	No. of conservation with biodiversity benefits fully quantified and built into cost-benefit analyses.	DOE reports	Biodiversity valuation results are accepted by Central Planning officials when reviewing economic analyses of development proposals and projects.
Implementers	DOE/ALL GOVT		
STATUS	Tonga Timber has done valuation works on its 'Eua forest plantation. No work has been done on other forest ecosystems around Tonga. Work is underway to quantify mangrove (its value as firewood, habitats and offering coastal protection), and other marine habitats. However no work is in place or planned on marine and agricultural ecosystems.		
Objectives 8		Financial Resources and Mechanisms	
Objective 8.1 - Assessment of biodiversity conservation capacities.	To ensure the thorough and comprehensive assessment of technical, managerial and administrative capacity for implementing biodiversity conservation within Tonga's line ministries and all conservation organizations.		
Intended Outcomes	**Indicators**	**Means of measurement**	**Assumptions**

Gaps in Tonga's technical, scientific, technological managerial and administrative capacity are identified and a plan for filling them is implemented.	NCSA report is compiled. No. of capacity building measures identified in NCSA and NBSAP implemented.	NCSA report. NBSAPand DOE reports on capacity building initiatives. Meeting or workshop reports.	Capacity building initiatives are driven by the needs and gaps identified in the NCSA and NBSAP.
Implementers	DOE		
STATUS	The NCSA report has been compiled and published. However there is lack of funding to pursue capacity building. This review identified a need to back up existing scientists in fishery, forestry, agriculture and NGOs. There is an urgent need for a zoologist for terrestrial fauna to be based at MECC. This position would be essential for a proper stocktake to take place in future. At the moment the layer of scientists is thin due to a voluntary redundancy package offered in 2008, which many scientists took. If any scientists decided to leave overseas now, this would impact negatively on Tonga's scientific capacity and the NBSAP main goals.		
Objective 8.2 - Collation and dissemination of donor related information.	To inform all interested organizations of potential funding sources for biodiversity conservation and of donors funding requirements.		
Intended Outcomes	**Indicators**	**Means of measurement**	**Assumptions**
All interested organizations, groups and individuals are informed on possible sources of conservation funding and or funders requirements.	No. of meetings? Workshops held. No. of organizations attending. Quality of funding proposals received.	DOE reports and database. DOE workshop reports. Qualitative assessment of proposals.	Accessibility to DOE database is feasible for most organizations.
Implementers	DOE		
STATUS	Workshops have been held with a number of organizations attending. However, most government organizations believe that MECC should provide all funds for implementation of NBSAP, through GEF, UNEP etc. because government is not funding any of the NBSAP objectives. Discussion with Acting CEO of MECC indicated that all government sectors are aware of their focal points in term of international financial sponsors. It is possible that Fisheries, Forestry and Agriculture do know their focal points, however their work plans may not include NBSAP objectives. In the NGOs, it does not appear that they experience much difficulty with accessing funds for their biodiversity programs. The Civil Society has seven community based programs operating at the moment on GEF Small Fund grants.		
Objective 8.3 - Capacity building in conservation fundraising and	To strengthen the capacity of key stakeholders in planning and implementing fund raising strategies and in managing conservation funds/.		

management.			
Intended Outcomes	Indicators	Means of measurement	Assumptions
Amount of projects funding received by conservation organizations register a significant increase over previous years.	No. of successful fund raising initiatives including proposals.	Reports of Conservation NGOs and donors.	NGO and donor reports are accessible.
Implementers	DOE		
STATUS	Civil Society and Tonga Community Development Trust have secured about 13 projects on fundraising from international sponsors. Please refer to Annex 3A.2 for the detail of past and on-going projects worth almost 1 million pa'anga.		
Objective 8.4 - Economic tools and instruments for Conservations Funding	To generate local funding sources for biodiversity conservation.		
Intended Outcomes	Indicators	Means of measurement	Assumptions
The establishment of local funding mechanisms well endowed with locally generated funding.	Funding mechanism idea supported and viable. No. of economic instruments introduced to generate income from biodiversity related services, and others.	DOE reports & database Report of feasibility study on funding mechanism	There is political support for conservation funding mechanism.
Implementers	DOE		
STATUS	Nothing constructive has been in place for this objective. Discussion with MECC reveals that government is only providing about 1% of its budget to MECC for biodiversity activities. Most of the funding is for salary alone. The same applies for all government sectors. At the moment every sector is facing a 20% budget deficit. Government is in no position to assist financially, although it seems receptive to assist any legislation in this area. There seems to be an opportunity to approach local banks and embassies for community conservation programs.		
Objective 8.5 - Partnership	To build effective partnerships with key local and international organizations to support the implementation of NBSAP.		
Intended Outcomes	Indicators	Means of measurement	Assumptions

Increasing numbers of partnerships between local conservation organizations and outside organizations.	Increasing no. of foreign organization active in biodiversity conservation work in Tonga. Increasing no. of multi-donor funded projects implemented in Tonga	DOE reports Donor reports	There are no political barriers to the participation of any foreign organizations in biodiversity conservation in Tonga.
Implementers	DOE/ALL GOVT		
STATUS	Civil Society and NGOs have established good relationships with GEF Small Grant and other international sponsors. A total of about 14 projects have been assigned as community based projects. They are successful because they are using the NBSAP objectives to design their projects and seek funds from overseas. German Agency for Technical Cooperation (GTZ) is also active with Forestry projects.		

2.4. Results and Interpretation

There were 37 objectives required to be achieved by the NBSAP in order to allow for full conservation and sustainable utilization of biodiversity. The status of the implementation of each objective is analyzed according to following criteria:

Status

GREEN: (SATISFACTORY) It is estimated that more than 50% of the indicators have been achieved and impact on objective is obvious and have reached sustainable position.

YELLOW: (WORK IN PROGRESS) It is estimated that up to 50% of the indicators have been achieved and impact on objective is below 50%. Not sustainable yet.

RED: (UNSATISFACTORY) Less than 25% of the indicators have been achieved and its overall impact on the objective is not so obvious. No obvious programs in place.

Current Rank

The current ranking of each sector is based on its value in the GREEN column.

Future Outlook

The future outlook for each sector is based on combined SCORE after adding values in GREEN and YELLOW columns.

Table 17: Analysis of implementation of the NBSAP objectives

	NUMBER OF OBJECTIVES				PERCENTAGE				RANKING	
THEMATIC AREAS	**RED INDICATOR**	**YELLOW INDICATOR**	**GREEN INDICATOR**	**TOTAL**	**RED**	**YELLOW**	**GREEN**	**TOTAL %**	**2009**	**2011**
Forest Ecosystem	4	1	1	**6**	**66**	**17**	**17**	100	5	5
Marine		3	2	**5**		**60**	**40**	100	3	1

Ecosystem										
Agro Ecosystem		4		**4**		**100**	**0**	100	5	1
Species Conservation	2	4		**6**	**33**	**67**	**0**	100	5	4
Local Community & Civil			3	**3**			**100**	100	1	1
Access & benefit Sharing	3	1		**4**	**75**	**25**	**0**	100	5	6
Mainstreaming	1	1	2	**4**	**25**	**25**	**50**	100	2	3
Financial Resources	1	2	2	**5**	**20**	**40**	**40**	100	3	2
TOTAL	**11**	**16**	**10**	**37**						
PERCENTAGE	**30**	**43**	**27**	**100**				**100**		

2.4.1. Overall Performance

Table 17 highlights in shade and in numerical form levels of achievements of the NBSAP objectives. Of the 37 total objectives, 11 (30%) are considered unsatisfactory **(Red status)**, 16 (43%) objectives fall in the work in progress category **(Yellow status)** and 10 (27%) objectives are satisfactory **(Green status)**. Leading the unsatisfactory category **(Red status)**, is the forest ecosystem, followed by access and benefit, and species conservation in second and third positions; with mainstreaming and financial resources in fourth position. Leading in the work in progress category **(Yellow status)**, is the agro ecosystem and species conservation, each having four objectives perceived to be performed. This is followed closely by marine ecosystem with two objectives and the remainder in third position with one objective each. In the satisfactory category **(Green status)** the local community and civil society leads followed by marine, mainstreaming and financial resources.

2.4.2 Sector Performances

2.4.2.1 Forest Ecosystem

Forest Ecosystem has total of six objectives assigned to it. About 66% of those objectives are considered unsatisfactory (Red status) making Forestry the second worst performing sector, to access and benefit sharing. The main weakness in this sector is the geographical isolation of the islands and the fragmentation of the remaining forests, which makes law and policy enforcement expensive and near impossible. Lack of integrated land-use planning makes the forest land vulnerable to the encroachment of agricultural development.

Although the sector ranked very low in the 2009 review – in fifth position overall - the sustainable management of the plantation forests, coconut palms and the agro forestry resources will in turn generate positive results once the illegal utilization of the remaining native forests ecosystems is arrested.

Public awareness for the importance of tree planting and conservation has given the sector a 17% achievement of Green status. Its future outlook remains the the same due to a large amount work required to be done on its yellow column.

2.4.2.2. Marine Ecosystem

Marine Ecosystem had five objectives assigned to it. It has no objectives in the Red indicating some implementation of activities in place. About 60% of its objectives are in the Yellow and 40% in the Green category. It is ranked the third best performing sector, and ranks first and equal position with Agro and Local Community sectors in its future outlook. This ranking is achieved by instigation of a series of management plans, in place since NBSAP 2006, having ex-situ programs for propagation of species, and conducting community programs on conservation and sustainable utilization of resources through Special Management Areas (SMAs) around Tonga. This sector has potential to do very well in meeting all its objectives in future.

2.4.2.3. Agro-Biodiversity

About 100% of the objectives in this sector have been reviewed as in the 50/50 category, suggesting potential activity in place. It ranks poorly in its current status but its future outlook is bright, sharing the first position with Marine and Local Community sectors. The focus of this sector is mainly in food security, and therefore there is limited performance in conserving priority species, which do not have high yield and a short harvesting period. The conservation in the agro sector is viewed as in-situ. Species are conserved by farmers by planting them. As an example, X*anthosoma sp*, as a priority species, is becoming abundant due to its high yield and shorter harvesting period. This has attracted farmers' attention and as a result it improves its status. This view is satisfactory until disease hits. It is therefore necessary that this sector encourages mixed farming as a protection against disease and other threats.

This sector will do well in the future by having ex-situ programs with other priority species, to cover for possible attack on its popular species. Species conservation is not new to farmers, as coconut planting has been enforced through a legislative requirement, and conservation can be encouraged in similar way.

2.4.2.4. Species Conservation

This sector has 33% of its objectives in the Red and 67% in the Yellow category. It has no objectives in the Green category. It is considered to be in the fifth position equal to Agro and Access and Benefit Sharing. On its future outlook, it scores 67%, which gives this sector a possible fourth position in future.

At the moment there is little assistance received by this sector from the Agriculture and Forest sectors. Currently, only the Department of Fisheries (DoF) contributes with its ex-situ programs on giant clams and sea cucumbers. Both agriculture and forestry have blamed their lack of conservation work on financial support. However, an improvement in the performance of these two sectors will affect the ranking of this sector in future.

2.4.2.5. Local Community & Civil Society

This is considered a non species sector. It records the highest performance and ranked first in having all its objectives in the Green. This can be explained by the activities of the Civil Society and NGOs, for example, Tonga Community Development Trust, securing funds from international sponsors to fulfill biodiversity objectives. NGOs have implemented about 14 community based projects, through GEF Small Grant Funds and other international funding agencies. Contributing to this success story is the effort put in by the Division of Fisheries in introducing its SMA community program. This program is now receiving funds, from Civil Society, to assist setting up and ensuring sustainability of this program. The SMA program is implemented by providing the community with the required knowledge on SMAs and the responsibility to police its regulations. This transfer of responsibility is a vital link at grass-roots level and a cause for synergy amongst the members of the community, which will ensure the success of the program. There is a need for this type of successful program to be rolled out to other thematic areas.

2.4.2.6. Access and Benefit Sharing

Access and Benefit Sharing has 75% of its objectives in the Red and emerged as the worst performing sector of the lot. It has 25% of its objectives in Yellow and ranks sixth in its future outlook. This sector lacks support in term of legislation and policies in place. Further, it lacks caretaker responsibility. Someone needs to coordinate this sector and if MECC can take up this responsibility then there is hope of improving the performance in future. Groundwork is required in registering our endemic species with the appropriate authority and establishing the legal framework badly needed by this sector. Importers need clear access and exporters (owners) also need to know his/her share. Access and Profit sharing will only proceed once these requirements are in place and a caretaker is coordinating its activities. It is anticipated that this sector will boom once these enabling factors are in place.

2.4.7. Sectoral and Cross Sectoral or Mainstreaming

Mainstreaming has 50% of its objectives in the Green, 25% in Yellow and 25% in Red. Having 50% in Green put this sector on second position on its current performance. However, its future outlook is at third position and considered satisfactory.

This sector is scoring well due to activities of the private sector. Leading in this sector is the Civil Society and NGOs, with their number of community programs in biodiversity financed through GEF Small Grant and other international sponsors. There is a feeling that synergy can be found in the NGOs and in the private sector rather than in government sector. This sector could be utilized more in implementing more NBSAP objectives.

2.4.8. Financial Resources and Mechanisms

Financial Resources and Mechanism has displayed a well balanced performance with about 40% already achieved (Green) and another 40% in the Yellow. It is currently ranked third on its current performance and second on its future outlook.

This achievement is once again due to strong contributions from the Civil Society and NGOs, with their overseas fundraising efforts, increasing their memberships and setting up biodiversity conservation programs for community participation around Tonga. The other 20% in Red is due to difficulty is raising funds locally to support this type of issue. With the economy in a very weak position, there is very little hope that this position on local fundraising will improve in near future.

2.5. Mainstreaming of Biodiversity in National Programs

There is a great need to mainstream biodiversity conservation into national plans and programs of the government of Tonga. The sectors will then take cue from this and include biodiversity in their own work programs. The procedure in Tonga is for each sector to put in their priority list to the planning team who would in turn prioritise and include them in the national plan. If this is the case, then MECC has the onus to present biodiversity as priority area to government. It is possible that DOE did not have the political power to push biodiversity when it was a department, however its new ministerial status may assist in elevating this important agenda to the National Plan.

Tonga's national plan is constrained by availability of finance and this usually leads to top down prioritization of the yearly or five yearly plans. The responsibility therefore rest on MECC and government of Tonga to find a compromise on this issue of biodiversity.

If biodiversity consideration is not in the national plan, then finance will not be made available and NBSAP objectives will remain unattended to. MECC needs to push biodiversity as a cross cutting issue and to be set as a priority area of the country in the sectors of environment, forestry, fishery and marine, agriculture, tourism, private sector development and so on. This is the only way biodiversity considerations can be achieved.

In summary, the result of the implementation is encouraging and well balanced. With about 27% of its objectives in Green and considering that 43% of its objectives in Yellow, Tonga is looking at a possible achievement of about 70% in near future if the following necessary requirements are put in place:

- Government to incorporate biodiversity considerations into its national and all sectors plans;
- Main implementers are empowered with financial support;
- Appropriate legislation is introduced to encourage cross sectoral collaborations.

CHAPTER III: Sectoral and Cross- Sectoral Integration of Biodiversity Considerations

3.1 Background

Despite the difficulty in achieving its biodiversity objectives Tonga remains dedicated to finding ways of achieving these targets in future.

Tonga is committed to the objectives of the UN Convention on Biological Diversity (CBD), which include the conservation and sustainable use of biodiversity, and fair and equitable sharing of the benefits arising out of utilization of genetic resources. As a party to the CBD, Tonga is committed to the promotion, conservation and sustainable use of biodiversity in all sectors of society.

Biodiversity is a national issue that requires all sectors of society to work together towards achieving its objectives and targets. Understanding the status and threats facing our biodiversity is a crucial first step and this was discussed in Chapter I. The issues and status of the implementation of the objectives were presented in Chapter II. In this chapter we will look into the implementation structure at sectoral and cross sectoral collaborations. The work of the sectors of government is reviewed in view of improving the implementation of the NBSAP objectives by encouraging cross sectoral partnership amongst all sectors.

3.1.1. Legal and Policy Framework

Tonga has no legislation or policies that are specific to biodiversity conservation. As a result, the overall management and protection of its biodiversity is not vested under one institution but under the jurisdiction of various ministries and departments. Related legislation can be found within the four sectors of biodiversity namely: Forestry Ecosystem, Marine Ecosystem, Agro-biodiversity and Species Conservation (Terrestrial Fauna).

A summary of legislation and policies that may apply to biodiversity conservation in years 2006 to 2009 are listed in Table 18 (Annex 3A.1). It is interesting to note that the only new legislation and policies after 2006 came from Division of Fisheries and Ministry of Environment and Climate Change (MECC).

3.1.2. Institutional Arrangements

Prior to 2006, the four main sectors (forests, food, fisheries and agriculture) were under three Ministries: Ministry of Fisheries, Ministry of Agriculture and Food and Ministry of Forestry. This would have been the ideal structure to implement the NBSAP objectives. However, after the launch of the NBSAP in 2006, a centralization process was put into place by government. Most likely for financial reasons, the three Ministries were combined into one Ministry: the Ministry of Agriculture Food, Forest and Fishery (MAFFF).

This new body (MAFFF) became the main implementer together with DOE, NGOs and other stakeholders; although other sectors were requested to contribute in areas that may cross their zones of influence. Another structural change took place at end of 2009 when DOE became a Ministry of Environment and Climate Changes.

The Department of Environment (DOE) of the Ministry of Lands, Survey, Natural Resources and Environments (MLSNRE) – now MECC – was allocated the coordinating role with regards to biodiversity or any environmental issues of all sectors.

In our discussion of Sectoral and Cross Sectoral performances we used the status of implementation of the objectives to demonstrate their applications and their differences. We have split the eight thematic sectors into two parts of 4 thematic sectors each. The first part contains sectors 1 to 4. All of these sectors' objectives deal mainly with species conservation and sustainable utilization. The second part contains sectors 5 to 8, which are considered non species but are mainly enabling factors to allow for conservation and sustainable utilization to occur. The split is necessary to demonstrate and evaluate the differences between sectoral and cross sectoral performances.

3.2. Sectoral Responsibilities

The Tonga Government operates in a sectoral manner in carrying out its duties. Legislation and policies have been designed so each sector focuses on its core function. Most of government issues and operation are conducted sectorally.

The principle of sectoral responsibility is taken under the conservation of biodiversity to mean that each sector has a responsibility to reduce its harmful impacts on the natural environment. Most of the responsibilities of biodiversity have been embraced well by most sectors of government but progress in implementing some of the objectives have been slow in some sectors due to lack of direction, confusion over roles, volunteer retirement, organizational restructuring and lack of financial resources.

The work of each sector of government relies on the National Economic Plan set out by government each year. During the year 2006 to 2009 there has not been any government policies in its National Action Plan to advocate the objectives of biodiversity.

Most of the work carried out on the biodiversity objectives, especially on species, was carried out by different sectors of government such as the Department of Forest, Department of Agriculture and Division of Fisheries. However, at time of this review the main implementers have shifted to MAFFF, which is a combination of the above departments. The result of the Implementation is given below, separated to species and non species objectives. See Table 18 and 19 below.

Table 18: Implementers of Species related objectives and the status of implementation

1	2	3	4		
SECTORS	**MAIN IMPLEMENTERS**	**MAIN IMPLEMENTERS**	**STATUS OF IMPLEMENTATIONS**		
	NBSAP-2006	**NBSAP-2009**			
(1) Forest Ecosystem	MoFo/ MAFF/ DO.GR/MOPO/ DOE/ MLSNR, MAF, TWB	MAFFF	**RED**	**YELLOW**	**GREEN**
(2) Marine Ecosystem	MOFi,DOE/MLSNR/CPD/MCC/MOF/MOW/MAF/MMP	MAFFF			
(3) Agriculture	MAF/DOE/MOFI	**MAFFF**			

	/MOFO/TUB				
(4) Species Conservation	**ALL SECTORS**	**MAFFF**			
TOTAL NUMBER			**6**	**12**	**3**
TOTAL PERCENTAGE			**27**	**59**	**14**

Mainstreaming is difficult in government because the approach towards policies and legislation is sectoral. At the same time mandates rest everywhere else in other government sector. This is one of the main issues that government sectors are facing in implementing the biodiversity objectives, which are cross sectoral in their nature. Mainstreaming requires a holistic approach and policies and legislation are required to be in place for this to happen.

Out of the 21 objectives targeted to be implemented in these sectors only 3 or 14% were considered to be fully implemented. About 12 or 59% are on-going and 6 projects or about 27% show no sign of being implemented at all.

The performance of the implementers of the NBSAP objectives on species conservation and sustainable utilization is considered to be below par. The large amount of objectives in the YELLOW is believed to be caused by the following factors:

1. Lack of direction from the Nation Action Plan (SDP 8- Strategic Development Plan)
2. Legislation and Policies are designed for each sector with mandate vested under different sectors
3. Disruption from MAFFF continuous restructuring
4. Lack of Government financial support
5. Lack of Coordination

3.2.1. Lack of Direction from SDP-8

The SDP-8 covered year 2005 to 2009. There is no direct policy given on Biodiversity Conservation and Sustainable utilization in this plan. Hence it follows that since government's sectors take their cue from the national plan, none of the implementing sectors had any policies in place specific to the objectives that they were facing. As a result the NBSAP report became strategies on the shelf (SOTS).

3.2.2. Legislation and Policies are Sectoral

There is no cross sectoral legislation in place. As a result most of the performance, resources and energy of the sectors are directed toward their mandates and core tasks. Objectives that cross the border of their influence usually have little

priority and do not get implemented. Most of the biodiversity objectives affect everyone and are therefore cross sectoral. Their implementation needs to be addressed by two or three sectors, otherwise objectives get left behind.

3.2.3. Continuous Restructuring of MAFFF

The review considered the continuous restructuring of MAFFF to have had a large influence on the performances of its three sectors (Forest, Fisheries, Agro), in implementing the objectives of the NBSAP. The initial decentralization of MAFFF required new legislation and policies to be put in place to facilitate the operation of the three Ministries. This decentralization could have provided the right machinery for implementing the biodiversity objectives through improved resources and improved focus. However, the re-amalgamation that occurred in 2008, when these Ministries were re-absorbed back to MAFFF, left some of these divisions in limbo with confusion, blurred focus and lack of resources. As a result this reshuffling resulted in high staff turnover due to more qualified staff leaving for regional positions or overseas. The volunteer redundancy that occurred in 2008 further reduced MAFFF capabilities and manpower.

3.2.4. Lack of Government Financial Support

There have not been any funds allocated in the Govenrment of Tonga Annual Budget to assist the implementation of the Biodiversity objectives, since the inception of the NBSAP in June 2006. This is a follow through from absence of direction from the National Plan on biodiversity issues. The lack of financial support also affected areas of scientific research, conservation programs, and managing and monitoring parks and reserves. To make matters worse government agencies are not eligible to apply for implementing grants, like GEF Small Grants, which are freely available to the private sector.

3.2.5. Lack of Coordination and Mainstreaming

Because most of the biodiversity objectives are cross sectoral, their implementation requirements are beyond sectoral influences but require close collaboration amongst sectors. In a strong sectoral environment like Tonga, coordination becomes very important. This was recognised by Cabinet when it set up the National Environment Coordinating Committee (NECC) to oversee, among other things, development of biodiversity resources as well as making policy direction on other issues related to biodiversity. This would have been the body to coordinate implementation of the biodiversity objectives. However, this body has never met, and the call for coordination therefore must fall back on Department of Environment, which in late 2009 became a Ministry. As a Department, it is possible that it could not perform its full coordination role because it was under the Ministry of Lands, Survey and Natural Resources. However, as a new Ministry there is hope that by the time of the next review that this sectoral issue would be solved as it would have the overarching mandates to fill the gaps between sectors allowing for a smoother and well coordinated effort to prevail.

3.3. Cross Sectoral Responsibilities and Colloboration & Streamlining

Cross sectoral performance appears to work well in the private sector, more so than in the government sector. The private sector has no limits or defined boundaries to restrict its adaptability. It is one sector operating in a changing environment, adjusting itself to each change along the way. The only factor that could change this sector's adaptability is finance, in a similar way to government organizations.

We have separated the species from the non species objectives simply to demonstrate differences in sectoral and cross sectoral performances. The species sectors cover Forestry, Marine, Agro and Species Conservation. The main implementers were government sectors and the performance of these implementers has been discussed above. In the non species' objectives the main implementers, aside from MECC acting as coordinator, are private sector bodies led by

the Civil Society, Tonga Trust and other NGOs. In the sectoral arena, energy is focused and limited only to the area of influence of that sector. In the private sector, a cross sectoral approach is working well with dispersed energy being easily weld together amongst the community to become a bigger force. This synergy is found to act behind community programs making this area an effective body to be encouraged with more activities in future.

Table 19: Non Species Implementers (2006, 2009) and Status of Implementation

SECTORS	MAIN IMPLEMENTERS NBSAP 2006	MAIN IMPLEMENTERS NBSAP 2009	STATUS OF IMPLEMENTATIONS			
1 Local Community & Civil Society	**DOE**, NGOs, CIVIL SOCIETY. GOVT	SAME				
2 Access & Benefit Sharing from the Use of Genetic Resources and TEK	CL/**DOE**/MLC/MAF/ MOFi/ MOFO /TVB/ MOE/NGOs	SAME				
3 Mainstreaming Biodiversity Conservation	**DOE**/All Govts/NGOs	SAME				
4 Financial Resources and Mechanisms	**DOE**/NGOs/All Govts	SAME				
TOTAL NUMBERS				**5**	**4**	**7**
TOTAL PERCENTAGE				**31**	**25**	**44**

The bulk of the implementation work in these sectors was carried out by the Civil Society, NGOs and the community. It is considered that cross sectoral issues are not found in the private sector and mainstreaming is working well due to projects being implemented at a grass root level by members of community. At this level there is a transfer of knowledge and ownership which would ensure that such programs will endure and become pillars for other programs in future.

Of the total of 16 objectives required to be implemented at these sectors, 7 (44%) were successfully implemented, 4 (25%) are in progress and 5 (31%) have not been implemented. When we compare the objectives achieved between government and private sectors, we find that the performance of the private sector outran that of government by about 30%. The achievements, in percentages, are comparable at 44% to the private sector and only 14% for government sector.

This has clearly demonstrated the need to streamline biodiversity through the sectors. It is still very important for the biodiversity requirements to be towed by government in term of policies and legislation, but the performance of the private sector is encouraging, a strength that is worth investigating further.

For a strong cross sectoral effort to occur in government sectors it is suggested that:

1. Annual national and sectoral work plans to address Biodiversity and Climate Changes issued as a matter of priority;

2. To facilitate implementation, MECC to devise holistic legislation and policies to be passed by parliament on sectoral performances on biodiversity.

CHAPTER IV: Conclusions - Progress Towards 2010 Target and Implementation of Strategic Plan

This chapter will look at Tonga's progress towards meeting the CBD 2010 targets, its contribution to the Global Strategic Plan and finally a discussion of lessons learnt from the implementation of the NBSAP objectives and ways to improve Tonga's future stand on conservation and sustainable utilization of its resources.

4.1. Progress toward 2010 Targets

Tonga's progress towards achieving its 2010 targets is measured using the CBD framework for goals and targets. By mapping Tonga's relevant national target against each global target, we can measure the progress through the achievement of the appropriate indicators listed for each national target. Achieving these objectives at a national level would be considered as Tonga's contribution to the world, in conservation and sustainable utilization of its biodiversity.

Details of Tonga's national objectives and Targets are listed in Table 16. Global Targets and Strategic Plan can be found in Annex 4a and 4b.

Table 20 below listed the CBD Targets in first column. Tonga's relevant Targets are in the second column in red, and its associated indicators in fourth column. The ranking for each objective is carried forward from analyses of the status of the implementation already conducted (Table 16, 17, 18 and 19, and are shown in last column, under indicator assessment.

Table 20: Progress towards 2010 Goals and Targets

GLOBAL GOALS AND TARGETS	RELEVANT National Targets	Tonga Contribution to Global Target	RELEVANT Tongan Indicators	2009 Indicator ASSESSMENT
Protect the components of biodiversity				
Goal 1. Promote the conservation of the biological diversity of ecosystem habitats and biomes				**RED - unsatisfactory. YELLOW - in progress GREEN - achieved.**
Target1.1: At least 10% of each of the world's ecological regions effectively conserved	1.4. To improve the management of existing parks and reserve and, consistent with integrated landuse plan, to expand the conservation area network to cover a representative sample of all major terrestrial ecosystems.		1.4. Number of Management plans developed and implemented; Increasing trend in funding; Increase in visitations.	

REMARKS:	Tonga NBSAP recorded 8 declared parks and 10 reserves. In this review it is noted that there is no further addition to this list. Monitoring of these parks and reserves is very minimal due to lack of funding. As a result the species may be in great danger due to fishing or illegal logging. There is no record book to record visitors to park. In addition there is no Integrated Land Use Plan (ILUP) in place.			
Target 1.2: Areas of particular importance to biodiversity protected.	2.2. To expand the existing network of protected areas to effectively conserve major coastal and marine ecosystem and habitats of biological and socio-economic value.	There is very little financial assistance from Government in meeting this objective. However funding are available from international donors.	Number of new marine areas under conservation Management	
REMARKS	The new concept on conservation is carried out by Division of Fisheries. It is called Special Management Area (SMA). There are six SMAs already established throughout Tonga. This is a community program whereby all management responsibilities are carried by the community. This new initiative indicates an overall improvement in conservation and sustainable management of resources, but more work is still required in future in determining spawning grounds as a mean for conservation purposes.			
GOAL 2: Promote the conservation of species diversity				
Target 2.1: Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups	**3.1 To ensure the protection of viable populations of all priority conservation species of Tonga.**		1. Population of Priority species increasing 2. Associate habitats are healthy	
REMARKS	About 52% of priority species of plant were assessed as improving. Agro is still focusing on economic crops for conservation and that was why two of its priority species, *Xanthosoma spp (taro) and Broussonetia spp* (tutu), are becoming abundant today. The first species provide food security, in a short harvest period while *Broussonetia* improvement is due to overseas demand for tapa cloth (Tongan traditional cloth made from bark of *Broussnetia* species). In marine, there is improvement in giant clams due to aquaculture; and an increase in number of sea cucumbers due to a 10 years cessation on harvesting. However, a recent political call for an early harvest would affect the viability of these species.			
Target 2.2: Status of threatened species improved.	3.4. To encourage basic scientific research and monitoring surveys to identify, document and monitor progress in the conservation of priorities species and to support on-going planning and conservation efforts.	Limited government financial support in this area.	Complete review of existing information about priority species. Monitoring programs initiated and maintained.	
REMARKS	Research into areas of species and conducting a complete review is very important to form a baseline, however is yet to be carried out. Threatened species are not targeted for any research. The lack of financial support from government in this area is a concern when this should be a priority area. There is currently a program within MECC through POWPA, targeting marine protected			

	area could reveal status of spcies in this area.			
Goal 3. Promote the conservation of genetic diversity				
Target 3.1: Genetic diversity of crops, livestock, and of harvested species of trees, fish and wildlife and other valuable species conserved, and associated indigenous and local knowledge maintained.	6.4 To raise public awareness and understanding of the importance of Tonga's genetic biodiversity resources and traditional ecological knowledge. 4.1 To preserve the genetic variability of Tonga's agrobiodiversity and promote the conservation and sustainable use of threatened agro-diversity species of economic and socio-cultural importance.		Increasing use of traditional healing methods and other Traditional Ecological Knowledge (TEK).	
REMARKS	The recurrences and persistence of certain diseases have turned a lot of people to traditional medicine and simple traditional meals. It is now realized that these medicinal trees are hard to find, unlike in the past, due to overharvesting and the lack of a replanting scheme. Programs now exist to encourage home replanting of these medicinal plants, through MAFFF. A recent discovery of certain marine sponges which could be used to cure cancer was made by students from Victoria University of Wellington, Wellington, New Zealand, may open door for conservation and sustainable utilization of this genetic resource. Agriculture is influenced by commercial farming and this therefore affects the attention on priority species. However, *Xanthosoma spp* is becoming abundant again due to its high yield and shorter harvesting period. This however would affect the genetic variety amongst this species. MAFFF needs to direct attention towards other priority species.			
Promote sustainable use				
Goal 4. Promote sustainable use and consumption.				
Target 4.1: Biodiversity-based products derived from sources that are sustainably managed, and Production areas managed consistent with the conservation of biodiversity.	3.2 To ensure the sustainable and management of species of economic and cultural significance.		Population of targeted species is increasing through in-situ and ex-situ methods.	
REMARKS	This is the main objective for setting up marine SMAs for the community to manage and police. It is an in-situ program with a closed tenure system, with no outside fishing allowed into the area. No fishing is allowed during the spawning period of certain species.			

Target 4.2 Unsustainable consumption, of biological resources, or that impacts upon biodiversity, reduced	2.3. To promote the use of environmentally sound practices in the management of marine resources		Population of targeted species are increasing ex-situ and in-situ	
REMARKS	The Acts are in place but the problem is enforcment and policing people's activities. This is due mainly to lack of funds to finance park rangers and other appropriate people to manage our biodiversity. In-situ programs conducted within Division of Fisheries are increasing the population of giant clams and other coral species.			
Target 4.3: No species of wild flora or fauna endangered by international trade	6.1. To prevent illegal access to and unlawful exploitation of Tonga's genetic resources.		Number of illegal access cases prosecuted. Number of applications received and legally approved.	
REMARKS	There is no direct Act to protect medicinal plants but the power is vested with Minister of MAFFF to authorize exportation of any plant's parts. As a result there has not been any prosecution in this area. Smuggling of genetic resources could be occurring.			
Address threats to biodiversity				
Goal 5. Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced				
Target 5.1. Rate of loss and degradation of natural habitats decreased.	1.1.To minimise the loss and degradation of forest ecosystem and habitats as a result of agricultural expansion.		Total area of pristine and established secondary forests remaining at 2005 levels	
REMARKS	Lack of an Integrated Land Use Plan is the main cause of habitat loss like deforestation. The priority at the moment is food security which means that without control through an Integrated Plan, agriculture will keep expanding in the expense of forest land. The total area of forest has decreased from 2005 level due mainly to agricultural expansion and land re-allocation. Forest land with mature plants has been recently converted to farming land at 'Eua. This is a classic example of a cross sectoral problem: where the biodiversity is regarded an important issue within MECC, however the Ministry of Lands, Survey and Natural Resources (MLSNR) has different priorities and powers for land subdivision.			
Goal 6. Control threats from invasive alien species				
Target 6.1. Pathways for major potential alien invasive species controlled.	3.3.Prevent the accidental introduction of known invasive species and reduce the adverse impact of invasive species on indigenous species and ecosystem and agricultural biodiversity	Marine Department is searching for ways to deal with ship's water ballast, due to its potential to introduce invasive species.	No new accidental introduction. Number of seizes of threatening biological specimens made at border	

REMARKS	There was one new species documented in this study, thought to be accidently introduced through Vava'u, called the mimosa sp.(*Tahiti).* It is believed to be brought from Tahiti by Tahitian workers. This type of complacency cannot be afforded and is a warning to quarantine workers in Tonga. There appears to be an increase in spread of existing invasive species due to an increase in the number of abandoned land, after failure of the pumpkin market. Furthermore there are no strategies on pre existing invasive species.			
Target 6.2. Management plans in place for major alien species that threaten ecosystems, habitats or species.	TO BE DEVELOPED		TO BE DEVELOPED	
	There is no target in the NBSP that is close enough to match against this global Target. This needs to be developed and mapped in to the NBSAP. However, the *Quarantine Act (Vol4, 1988)* prevents importation of alien species without prior approval of the Minister of MAFFF. Invasive species however are slowly increasing in numbers, indicating that enforcement is lacking.			
Goal 7. Address challenges to biodiversity from climate change, and pollution				
Target 7.1. Maintain and enhance resilience of the components of biodiversity to adapt to climate change.	TO BE DEVELOPED		TO BE DEVELOPED	
REMARKS	Effect of Climate change was not addressed on NBSAP 2006. Will incorporate this in future.			
Target 7.2. Reduce pollution and its impacts on biodiversity.	2.1. To minimize the adverse impact of land based activities on coastal marine species and ecosystem	The MECC *Environmental Impact Assessment Act 2003* deals with conducting EIA on major projects; and *Marine Pollution Act 2002* is already in place to protect coastal marine biodiversity.	Reduce number of algae bloom outbreaks. Reducing trends of eutrophication Evidence of good coral growth.	
REMARKS	The main Act for EIA is already in place, and there are about ten projects with their EIAs conducted under this Act. However, the delay in getting the supporting regulation passed means that the Act is not in full force. However, according to sources from MECC this is a minor drawback at the moment, and the Act is being enforced with good response from members of public. Of the ten projects with EIA conducted, two are coastal projects which involved dredging. The EIAs focused on mitigating the effect of sediment plume on marine organisms near the area. The EIA Act, when it is in full swing with its regulations in place, will be an useful tool for protecting biodiversity.			
Maintain goods and services from biodiversity to support human well-being				
Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods				

Target 8.1. Capacity of ecosystems to deliver goods and services maintained.	1.2. To ensure the optimal and sustainable allocation and use of Tonga's natural resources		An Integrated Landuse Plan is adopted and implemented. Legislation and policies to be adopted and enforced.	
REMARKS	One of the outcomes for this goal is shown in the NBSAP 2006 - a call for the protection of Forest ecosystems and ecosystem services. However, the non existence of an Integrated Landuse Plan in place is threatening forest ecosystems, due to uncontrolled expansion of agriculture into forest land. As a result the ecosystem services offered by forest are constantly threatened.			
Target 8.2. Biological resources that support sustainable livelihoods, local food security and health care, especially of poor people maintained.	4.1 To preserve the genetic variability of Tonga's agro-diversity and promote the conservation and sustainable use of threatened agro-biodiversity species of economic and socio-cultural importance.	No. of seedling of priority species planted. No. of mixed planting and agro-forestry farms established. No. of Ex-situ initiatives established. Decline in unsustainable farming practices.	1. No. of successful privately managed agr-forestry or mixed farms. 2.Level of innovation demonstrate by farmers 3. No. of scientists, farmers bio-security officers trained.	
REMARKS	One priority species *Xanthosoma spp,* is being farmed extensively due to its short harvest period and high yield, important for commercial farming. There is a big improvement in this area especially for poor people. The prices on farming products (root crops) and local seafood are high at moment allowing those who rely on these two activities as main source of income to thrive. However, the situation could lead to overexploitation if not controlled or checked to be in line with propagation programs (in-situ and ex-situ). Discussion with individuals from MAFF indicated that they are very keen to involve volunteer farmers more in their programs but require finance above what government provides.			
Goal 9 Maintain socio-cultural diversity of indigenous and local communities				
Target 9.1. Protect traditional knowledge, innovations and practices.	6.3. To prevent the loss of traditional ecological knowledge.		No. of legally binding agreements signed benefiting local owners of resources and TEK	
REMARKS	Attempts have been made in the past to document traditional medicine. A book was written by Mrs Bloomfield in the 1970s, followed by Tongilava etc, however they are not completed. Aurther Whistler, 1991 (East West Center) documents medicinal plants and Tongan medicine. This is urgently needed to be done because the older generations possessed this type of information, and there is a risk it may otherwise be lost.			

Target 9.2. Protect the rights of indigenous and local communities over their traditional knowledge, innovations, and practices, including their rights to benefit sharing.	6.1. To prevent illegal access to and unlawful exploitation of Tonga's resources.		No. of illegal access cases prosecuted. No. of application received and legally approved.	
REMARKS	There is lack of legislation directly applicable to this area. As a result there is no protection and no cases of unlawful exploitation have been reported or prosecuted.			
Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources				
Goal 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources				
Target 10.1. All access to genetic resources is in line with the Convention on Biological Diversity and its relevant provisions.	TO BE DEVELOPED			
REMARKS				
Target 10.2. Benefits arising from the commercial and other utilization of genetic resources shared in a fair and equitable way with the countries providing such resources in line with the Convention on Biological Diversity and its relevant provisions	6.2. To ensure the fair and equitable sharing of benefits generated from the use of genetic resources		No. of legally binding agreements signed benefiting local owners of resources and TEK	
REMARKS	There is no legislation specific in this area. Resources are needed to be registered with appropriate authority before one can claim benefits from it. There is work required in this area in future.			
Ensure provision of adequate resources				
Goal 11: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention				
Target 11.1. New and additional financial resources are transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention in accordance with Article 20.	8.2. To inform all interested organization of potential funding sources for biodiversity conservation and of donors requirements.		**1.** No. of meeting/ workshop held. **2.** No. of organization attending. **3.** Quality of funding proposals received	
REMARKS	MECC is working closely with Civil Society and NGOs in writing up community projects. There is no difficulty in accessing funds from GEF Small Grant and NZAID. There are about 10 projects done and currently executed, worth US$350,000 and another four projects in the pipeline.			

Target 11.2. Technology is transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with its Article 20, paragraph 4.	8.5 To build effective partnerships with key local and international organizations to support the implementation of NBSAP		Increasing number of foreign organization active in biodiversity conservation in Tonga. Increasing no. of multi donors' funded projects implemented in Tonga.	
REMARKS	There are about 13 projects being carried out by Civil Society and other NGO's funded by different sponsors. The biggest source of funds is from GEF Small grant, followed by NZAID, PoWPA, and CEPF (Critical Ecosystem Partnership Fund). These programs are conducted through community participation.			

4.1.1. Results and Discussion

There are seven (7) major areas identified as critical to the conservation and sustainable utilization of biodiversity globally. Twenty (21) sub goals were developed within these seven major areas, to guide members in their contributions (Tables 22a & b, Annex 4.1). Out of the 21 global sub objectives, Tonga has already contributed by achieving three objectives, six are regarded as work in progress and nine are regarded as underdeveloped. Three are yet to be developed because national objectives that could match these three CBD targets could not be identified. Refer Table 21a and b.

Table 21a: Global Targets vs National Targets and Status (rank)

	TARGETS			
GLOBAL TARGETS	**GLOBAL TARGET NUMBER**	**NATIONAL TARGET NUMBER 2006**	**NATIONAL 2010**	**STATUS (RANK)**
Protect the Component of biodiversity				
	1.1	1.4		
	1.2	2.2		
	2.1	3.1		
	2.2	3.4		
	3.1	6.4		
Promote Sustainable Use				
	4.1	3.2		
	4.2	2.3		
	4.3	6.1		
Address Threat to biodiversity				

	5.1	1.1		
	6.1	3.3		
	6.2	TBD	TO BE DEVELOPED	TBD
	7.1	TBD	TO BE DEVELOPED	TBD
	7.2	2.1		
Maintain goods and services from biodiversity to support human wellbeing				
	8.1	1.2		
	8.2	4.1		
Protect traditional knowledge, innovation and practices				
	9.1	6.3		
	9.2	6.1		
Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources				
	10.1	TBD	TO BE DEVELOPED	TBD
	10.2	6.2		
Ensure provision of adequate resources				
	11.1	8.2		
	11.2	8.5		

Tonga's progress is further discussed in detail below under the three ranking categories assigned to the objectives. The ranking criteria are similar to those used in Chapter 2.

4.1.1.1. ACHIEVED (GREEN)

Of the total global objectives about 17% objectives are considered as achieved. The achievements were in the following global areas:

1. Protect component of Biodiversity;
2. Address Threat to Biodiversity; and
3. Ensure provision of adequate resources.

Detail of this contribution is further discussed below. Please refer Tables 22a and b, 16 and 21.

Protect Component of Biodiversity

The three national objectives that achieved the green status are:

Objective 2.2: To expand the existing network of protected areas to effectively conserve major coastal and marine ecosystems and habitats of biological and socio-economic value.

This is achieved through a combined effort between Division of Fisheries, Civil Society, NGOs and members of the Community. The SMA project is targeted to strengthen community based resource management effort. The responsibility for managing and policing of the resources is given to the community. Six SMAs have been established around Tonga with funding assistance from Civil Society, through GEF Small Grant, to assist in setting up baseline data. The area is declared as a fishing zone limited only to the defined community with restriction on outside people fishing in the area. Details of operating of a proper conservation area in term of fish sizes, prohibited fishing methods and no fishing seasons have all been passed on to the community, through Division of Fisheries.

The SMA project provides a model for future conservation due to cost and degree of community involvement.

Address Threat to Biodiversity

Objective 2.1: To minimize the adverse impact of land based activities on coastal and marine species and ecosystems.

The passing of the *Environmental Impact Assessment Act* in 2003 and its recent application to about 10 projects is regarded an useful step towards protecting the environment, maintaining environmental services and allowing for members of community to continue enjoying benefits previously received from resources in the area.

The CBD requires environmental impact assessments (EIA) to be conducted for any projects, programs and plans likely to cause considerable harmful impacts on biodiversity, so as to avoid or minimize such impacts. The MECC enforces this act as an integral part of land use planning. The application of EIA in coastal developments is necessary to protect marine species from any imbalances caused by mans' activities on the marine environment. Construction at the coastal zone usually generates large sediment plumes that may suffocate reef ecosystems and marine species. Conducting EIA determines likely problems and mitigation measures can be set up to counter and minimize negative effects.

Public participation and consultation is important for successful implementation of EIAs. The aim is to educate members of the public in addition to experts. EIA is considered an educational tool because it requires consultation with the affected community, and this could be an educational experience for all. The review considers the application of EIA to development projects as an achievement to Tonga and useful contribution to preserving biodiversity.

Ensure Provision of Adequate Resources

Objective 8.5: To build partnership with key local and international organizations to support the implementation of NBSAP.

This objective is regarded as achieved due to efforts made by the Civil Society and NGOs in developing good relationships with reliable international financial sources like GEF Small Grant, NZAID/PEF, PoWPA and CEPF, for implementing their biodiversity programs. The lack of funding in the government sector is a threat to biodiversity and the availability of these funds to members of community helped alleviate this problem. The community has no defined agenda or restriction by sectoral policies, they are guided only by the objective that they are set up to achieve.

The total effort of the Civil Society in securing funds for its biodiversity projects for year 2009 totalled about US$350,000. Tonga Community Development Trust acquired about US$ 65,000 for their 2010 projects on endangered birds' species.

Table 21b: Summary: Tonga's progress towards 2010 targets

SUMMARY				
	RED	YELLOW	GREEN	TO BE DEVELOPED
1. 1.Protect the Component of biodiversity	2	2	1	
2. Promote Sustainable Use	1	2		
3. Address Threat to biodiversity	2		1	2
4. Maintain goods and services from biodiversity to support human wellbeing	1	1		
5. Protect traditional knowledge, innovation and practices	2			
6. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources	1			1
7. Ensure provision of adequate resources		1	1	
TOTAL	9	6	3	3

4.1.1.2. IN PROGRESS (YELLOW)

YELLOW is assigned to objectives that have some degree of implementation but not enough to be sustainable due to lack of financial backing, legal enforcement, community involvement and some weak indicator development.

There are about 33% of total global objectives in this category that are regarded as work in progress. These targets listed below.

This is a 50/50 zone. One can argue that some of these yellow objectives should be considered a green but the review has given these objectives their current status based on public consultation, which gave these objectives some degree of uncertainty, due to lack of the following enabling factors:

- appropriate legislation
- national and sectoral policies
- financial commitment and
- Integrated land use plan.

It is the opinion of the review that these objectives would be achieved if some or all of the above enabling factors occur. The government needs to reaffirm its commitment to the CBD requirements and put appropriate policies and financial support in place to facilitate the achievements of these objectives. Achieving these objectives would raise Tonga's contribution to about 50 percent and from a small island nation this would be a significant contribution.

4.1.1.3. UNSATISFACTORY (RED)

RED is assigned to objectives that have no clear program, lack financial backing, no legal enforcement in place and no indicator is achieved.

Of the total objectives in the RED category, about 67% falls into three broad categories;

1. Protect the component of the Environment
2. Address Threats to biodiversity
3. Protect traditional Knowledge, innovation and practices

The key implementers for these objectives are mostly government, especially from the following sectors; Department of Forestry, Division of Fisheries and Department of Agriculture. This review identified the following factors to affect the implementation of these objectives:

- Lack of national and sectoral policy directions
- Lack of a holistic legislation or policies to allow cross sectoral collaborations
- Centralisation of the three Ministries into one MAFFF.
- Lack of financial support

It is the agreement of the review that the above factors need to be addressed urgently for the RED category to shift towards YELLOW and finally GREEN in next review.

4.1.1.4. TO BE DEVELOPED

There are three objectives in this category. These are CBD objectives that are required to be matched by national objectives to be developed. These will be developed with appropriate indicators and mapped in to the Tonga's implementation matrix before next review.

4.2. Tonga's Progress Towards Goals and Objectives of the Convention Strategic Plan

Decision VIII/15, Annex 1, provides a framework for monitoring overall progress towards the 2010 goal. Tonga's contribution to the CBD goals is analyzed below on Table 22.

Table 22: Tonga's contribution towards Convention Strategic Goals and Objectives

STRATEGIC GOALS AND OBJECTIVES
GOAL 1: **The Convention is fulfilling its leadership role in international biodiversity issues.**
REMARKS: There is lack of funding within the government sector to implement the biodiversity requirements. This is likely due to the requirements being ranked as low priority and its absence from the national work plan. It is felt that the Convention needs to access or enable more funding in order to allow initiatives to filter down to individual country members rather than at regional and international levels. Furthermore, there is a

need to enable government sectors to access funding through GEF Small Grant for implementation and scientific research. Such applications to be approved and accounted for by the new Biodiversity Advisory Committee (BAC).

The Cartagena Protocol on Biodiversity has passed the formulation of legislation and regulation stage and is now progressing towards approval stage.

Biodiversity concerns and practices exist in different forms in the three sectors of government (Forestry, Fisheries and Agricultural policies), although not a direct response to the NBSAP of 2006. This review aims at recommending NBSAP as useful tool for designing government's sectors work plans. The private sector is utilizing this tool but government sectors have not.

GOAL 2:
Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention

REMARKS:
The financial situation has improved with Civil Society and NGOs but not at government level. It is important that the private sector is armed to conduct implementation of NBSAP and that the government's research and development area is well financed. This sector needs to have access to GEF Small fund.
There is a requirement for more scientists and biologists in the terrestrial fauna and flora area. Technicians are also required. Finance is also required for acquiring equipment necessary for conducting proper EIA and for measuring environmental parameters (surface and sub bottom currents, water quality etc).
There is a need for an independent scientific body to monitor and advise implementing agencies, especially in the private sector. The 13 projects already done and in progress may need to be appraised.

GOAL 3:
National biodiversity strategies and action plans and the integration of biodiversity concerns into relevant sectors serve as an effective framework for the implementation of the objectives of the Convention

REMARKS:
The NBSAP was required to be appraised by head of departments, private sector, NGOs and other stakeholders before being launched. It is apparent that this last step may have been overlooked because not many sectors in government refer to NBSAP as useful tool for designing work plan. However in the private sector, Civil Society and NGOs the NBSAP has a place. It is a framework use for implementing the convention objectives.

This framework is not working well in government due to the strong sectoral environment surrounding its operation. Furthermore there is lack of holistic or umbrella legislation and policies to guide the implementation of the Biodiversity requirements. Government has to lead by integrating biodiversity into the National Plan because other sectors take their cue from the National Plan. Lastly, the lack of financial support from government further inhibit sthis framework from operating at sectoral level.

This framework is working well in the private sector because it is not restricted with policies like in government. The only rule in the Private sector is the Terms of Reference (TOR) provided to community groups that are implementing the biodiversity objectives. The implementation is focussed at this level and meaningful to the community because they are involved and can witness results.

GOAL 4:
There is a better understanding of the importance of biodiversity and on the Convention, and this has led

to broader engagement across society in implementation.
REMARKS: Certainly, the public awareness programs generated by each sector, and schools having environment and biodiversity as part of their curriculum, has been successful in creating more awareness amongst the population of Tonga. As part of mainstreaming these awareness activities must be repeated until a sustainable culture is seen to develop. The development of this culture should be re-enforced through legislation and policing. The Civil Society membership has increased and subsequently the number of projects requested for GEF funding is also increasing. This is an encouraging trend and this sector is recommended to consider taking up the implementation of the Species Conservation objectives. In the government sector, there is awareness amongst the main implementers but outside of this, there is very weak awareness of the significance of biodiversity. This is also true of the top echelon and this is reflected in the failure to include biodiversity in the annual National Plan, which further leads to no budget being allocated to the three main implementers (DOFo, DOFi and Agriculture). Government has a greater capacity than the private sector but it is a vehicle without fuel when it comes to biodiversity implementation. Providing fuel through GEF Small Grants to this sector would certainly improve their performances but it should be regarded secondary to improving the system first in term of the following: • Integrate biodiversity and climate change as part of the National Plan and all government sectors plans. • An annual biodiversity budget is allocated to the main implementers (DOFo, DOFi, and Department of Agriculture).

CONCLUSIONS AND RECOMMENDATIONS

The NBSAP needs to be reviewed regularly so that it becomes an effective and strategic tool for achieving concrete outcomes. All sectors adopting goals and objectives of biodiversity with continuous effort to achieve them will create a healthy environment of conservation, sustainable use of resources and equitable share of resource benefits.

The guidebook to assist CDB countries in their preparation of National Goals and Objectives came out in 2008 after the formulation of Tonga NBSAP in 2006. It is apparent from this review that there are some discrepancies in alignment of national objectives with that of the CBD. This could have some effect on Tonga's score on its progress towards achieving the CBD objectives. It is therefore necessary to conduct an exercise in this area, and develop targets and appropriate indicators to get an accurate score for Tonga in future.

Tonga NBSAP has 37 national objectives in which 16 were regarded as ongoing and ten achieved. In determining how much Tonga is contributing to progress towards the CBD 2010 objectives, 18 national objectives were mapped into the framework of the CBD 2010 objectives. Out of the 18 objectives, nine were considered unachieved; six were in the on-going category and three contributed directly to the achievement of CBD objectives. This is equivalent to 17% of the total objectives mapped into the CBD framework. However, if we consider the 6 objectives in the Yellow zone or in progress, we have a potential achievement that can reach 50% if the following issues are addressed immediately;

1. Include policy on Biodiversity on both National and sectors Plans;

2. Implement holistic or umbrella legislation and policies to encourage cross sectoral collaborations; and

3. Improve Government funding

Mainstreaming of biodiversity considerations through society has been reasonably effective with most schools now having environment and biodiversity as part of their school curriculum. Community participation is increasing with some of the biodiversity objectives being attended to by community groups. However, mainstreaming appears to have some problems amongst government sectors, due to policies and legislation being sectoral. As a result objectives that require a few sectors (cross sectoral) to implement usually get left behind because of gaps existing between sectors. Lack of coordination, a national policy on biodiversity and finance are factors affecting government sectors performances.

The cross cutting nature of biodiversity works better in the private sector than in the government sectors. This is so because there are no sectoral rules in the private sector allowing them full flexibility to implement the biodiversity objectives. Furthermore the participation of the community in implementing these objectives, together with funding available from GEF Small Fund and other funding agencies, provide an enabling environment for more effective implementation in this sector.

The centralization of the Fisheries, Forestry and Agriculture into one Ministry, MAFFF, has had a serious effect in the implementation of the NBSAP objectives, due to a lack of focus and finance.

Tonga's NBSAP 2006 is considered to have achieved its goals to some degree. However, this is more apparent in the private sector than in the government sector. The NBSAP three main objectives were:

- Principally to guide government, civil society organizations, NGOs and individuals already in the field of conservation

- To inform and secure financial assistance from Tonga's traditional development partners and other funding organizations in implementing the biodiversity objectives

- To inform and educate and to remind all Tongans to value and take pride in their natural heritage, and to encourage them to contribute to its conservation and unsustainable management.

In its first aim, the NBSAP has provided a guide to the private sector but not to government. The Civil Society and NGOs are using the objectives in the NBSAP to request funding from international sponsors for their implementation activities. The government has neglected its obligation in this area.

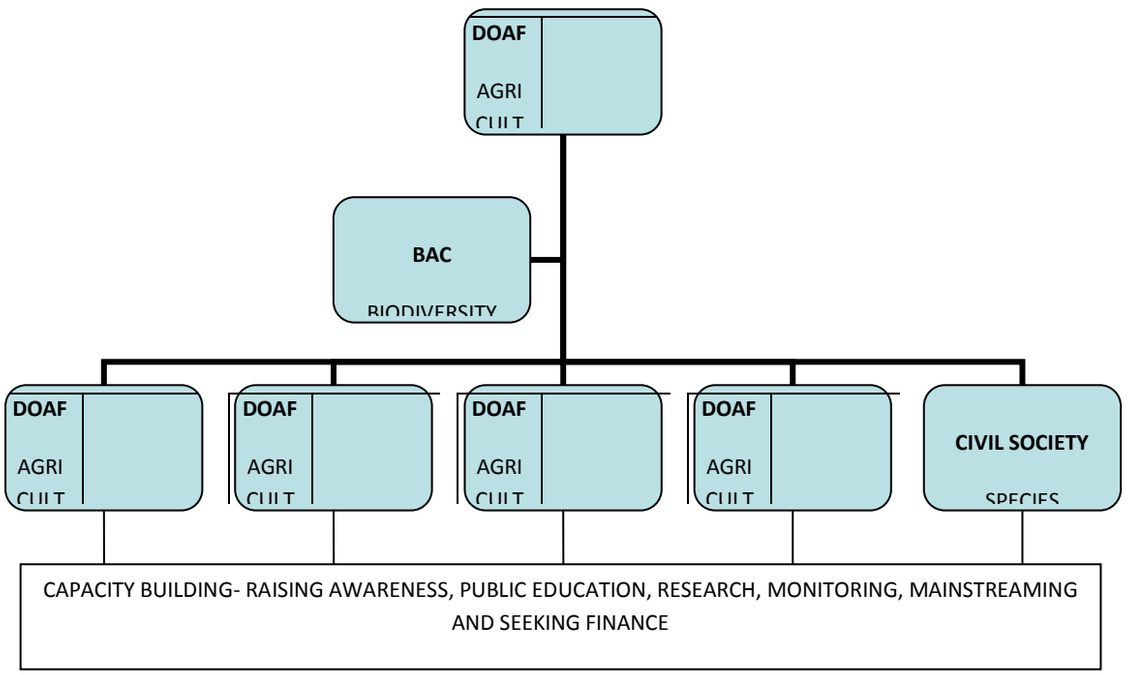
In its second aim, the private sector, through Civil Society organizations are assisted in their implementation by GEF Small Grant and other international funding agencies. From 2009 to January 2010 there are about 13 projects at different stages of implementation. In the government sector, because the NBSAP was not a used as guide to its yearly plan, no funding was therefore allocated and as a result implementation of biodiversity objectives in this sector was inefficient.

The NBSAP third aim - to inform and educate - is partly achieved by most primary and secondary schools now having biodiversity as part of their curriculum. Government sectors, especially MECC and MOFi and MAF have radio programs on biodiversity and this has helped in disseminating information to members of public. However, lack of enforcement and proper legislation in place has resulted in continuing abuse of biodiversity resources.

WAY FORWARD

1. In addition to recommendations made above, the following structural changes and other enabling factors are further necessary for a more efficient and effective implementation of the biodiversity objectives.

    a. New Implementing Structure



NOTE:

- The Biodiversity Advisory Committee (BAC) consists of the heads of the 5 implementing agencies above and is chaired by CEO. The CEO reports to Minister.
- The main task of BAC is to co-ordinate the formulation of biodiversity related policies and legislations monitor and coordinate implementation, prioritize biodiversity projects, etc
- Experiments and research still remain with government sectors only on field implementation that Civil Society is envisaged to participate.

b. That a structured capacity building be in place to develop the three sectors of marine, forestry and agriculture.

c. MECC to establish a zoologist position within the organization to deal with terrestrial fauna and flora.

d. The controller of GEF Small Grant to consider allowing government sectors directly involve with the implementation activities to apply for funds through the new coordinating Committee, BAC.

ANNEX A: Terms of Reference

TERMS OF REFERENCE – CONSULTANCY SERVICES

Preparation of Fourth National Report under Convention on Biological Diversity

[Project: Support to GEF Eligible CBD Parties for carrying out 2010 Biodiversity Targets National Assessments - Phase III]

Background

Tonga is a party to the United Nations Convention on Biological Diversity (CBD). The Ministry of Environment and Climate Change is the Executing Agency for the CBD for the Government of the Kingdom of Tonga.

As a party to the CBD, Tonga is required to take measures at the national level to ensure biodiversity conservation, sustainable use and protection of biological diversity as its contribution to the conservation and protection of global biodiversity. The National Biodiversity Strategy and Action Plan (NBSAP), which sets out how Tonga will give effect to its obligations under the CBD, were developed in 2006.

Parties to the CBD have committed themselves to achieving, by 2010, a significant reduction in the rate of biodiversity loss at the global, national and regional levels, as a contribution to poverty alleviation and to the benefit of all life on earth. In line with this commitment, parties are required to submit a Fourth National Report of the CBD, to provide an assessment of progress towards the 2010 Biodiversity Targets at a national level. The Fourth National Report will draw upon an analysis of the current status and trends in biodiversity and actions taken to implement the Convention at the national level, as well as consider what further efforts are needed.

Tonga has received Global Environment Facility (GEF) Biodiversity funding for the 2010 Biodiversity Targets National Assessment project.

An environmental NGO or Civil Society Group will be recruited to assist in facilitating the review of data and consultations for 2010 Biodiversity Targets National Assessment. The NGO or Group will be expected to conduct consultations with stakeholders for the collation of information in compiling the Fourth National Report; and is expected to produce and finalize a draft of the national report in consultation with stakeholders before submitting the final report to the MECC.

The Fourth National Report will follow the following format:

Executive Summary	
Chapter I -	Overview of Biodiversity Status, Trends and Threats
Chapter II -	Current Status of National Biodiversity Strategies and Action Plans
Chapter III -	Sectoral and cross-sectoral integration or mainstreaming of biodiversity considerations
Chapter IV -	Conclusions: Progress Towards the 2010 Target and Implementation of the Strategic Plan
Appendix I -	Information concerning reporting Party and preparation of national report
Appendix II -	Further sources of information

Appendix III -	Progress towards Targets of the Global Strategy for Plant Conservation and Programme of Work on Protected Areas
Appendix IV -	National indicators used in the report (optional)

Output

The main output of the preparation process will be an approved fourth national report prepared in accordance with the CBD guidelines ready to be submitted to the CBD Secretariat and in both hard and electronic format as not later than 3 months from the time funds are received by the country.

ANNEX B: Review Team Details

NAME	QUALIFICATIONS	EXPERTISE	EMPLOYMENT
Talanoa Fuka Kitekei'aho	MSc, MBA, Bsc	Geology, Environment, Business Administration, EIA	Geocare & Petroleum Consult, Team Leader
Kaveinga Fa'anunu	BSc	Forestry, Agroforestry, Business Finance andAdministration	CEO, Tonga Timber Limited (TTL)
Poasi Ngaluafe	MSc	Marine Science	Fisheries Division of MAFFF
Pila Kami	Ph.D Student	Agriculture	Quarantine Division of MAFFF

APPENDIX 1A.1. Land Classification

Note:

Total land area of Tonga is 69,100 ha. If area of lakes(6523 ha) is included total will be 75,623 ha (NBSAP 2006)
Total land area of Tonga is 75,210 ha. The residual of 6523 ha is lakes not included in the analysis(TNFP 2009)

Island group	Land Class	NBSAP 2006		TNFP 2009		MOVEMENT
		Area (ha)	%	Area (ha)	%	Area (ha)
Tongatapu	Woodland	862.0		618.7	2	(243.3)
	Coconut*			22,339.7	82	-
	Mangroves and wetland **			1,318.7	5	-
	Other			2,808.9	11	-
	Sub Total	**26,844.0**		**27,086.0**	**100**	**-**
Vava'u	Woodland			1,133.4	9	-
	Coconut*			10,078.6	79	-
	Mangroves and wetland**			372.9	3	-
	Other			1,112.8	9	-
	Sub Total			**12,697.7**	**100**	**-**
Eua	Woodland	3,827.0		1,454.3	17	(2,372.7)
	Coniferous plantation	800.0		371.7	4	(298.5)
	Non-coniferous plantation			129.8	2	
	Coconut*			6,552.5	74	-
	Other			300.3	3	-
	Sub Total	**8,900.0**		**8,808.6**	**100**	**-**
Ha'apai	Woodland			2,450.4	19	-
	Coconut*			8,198.7	63	-
	Other			2,329.6	18	-
	Sub otal			**12,978.7**	**100**	**-**
Niua's	Woodland			801.9	11	-
	Coconut*			3,923.9	55	-
	Wetland			75.5	1	-
	Other			2,314.9	33	-
	Sub Total			**7,116.2**	**100**	**-**
Total	Woodland	8,000.0	11.5	6,458.7	9.4	(1,541.3)
	Coniferous plantation	800.0	1.2	371.7	0.5	(298.5)
	Non-coniferous plantation			129.8	0.2	
	Coconut*	48,000.0	69.5	51,093.4	74.4	3,093.4
	Mangroves and wetland **	2,963.0	4.3	1,767.1	2.6	(1,195.9)
	Other	9,337.0	13.5	8,866.5	12.9	(470.5)
	Total	**69,100.0**	**100**	**68,687.2**	**100**	**(412.8)**

Notes: * Includes grassland, shrub land & cropland ** Saline & Estuariune. Source: 2006 figures-Tonga NBSAP, 2009 figures- National Forest Policy for Tonga (Draft, 2009).

ANNEX 1A.2: PARKS AND RESERVES

DOAF AGRICULTURE **DOE** EIA , TERRESTRIAL FAUNA AND FLORA, AND COORDINATORS **DOFi** MARINE ECOSYSTEM **No.**		**Type of Conservation area**	**Area (ha) 2006**	**Area (ha) 2009**	**Change (ha)**
	Reserves (6)				
1	Ha'atafu Beach	**ü**	80	80	-
2	Hakaumama'o Reef	**P**	260	260	-
3	Malinoa Island Park & Reef	**P**	73	73	-
4	Monuafe Island Park & Reef	**P**	33	33	-
5	Mui Hopo Hoponga Coastal Reserve	r			-
6	Pangaimotu Reef	**P**	49	49	-
	Parks/Managed Historical Sites (2)				-
7	Ha'amonga Trilithon Park	**P**	23	23	-
8	Vava'u Coastal Gardens Marine Park	r	-	-	-
	Faunal Reserve (1)				-
9	Volcanic Island Forest Reserve	r	-	-	-
	Marine Reserves (1)				-
10	Fanga'uta and Fanga kakau Lagoons	**P**	2,835	2,835	-

ANNEX 1A.3: FOREST SPECIES

Threatened Plant Species – NBSAP 2006

Tongan Names	Threatened State	Scientific Names
Threatened Plants		
Ovava Tonga	CE	*Ficus oblique*
Fangu	CE	*Benincasa hispida*
Fonua malala	CE	*Homalanthus nutuns*
Pua tonga	E	*Fagraea berteroana*
Pukovili	CE	*Gyrocarpus americanus*
Tongota'ane	E	*Rhizophora mangle, Rhizophora stylosa*
Pipitui	E	*Atuna racemosa*
Fisi'uli	E	*Bidens pilosa*
Hangale	CE	*Lumnitzera littorea*
Huni	E	*Phaleria disperma*
Takafalu	CE	*Micromelum minutum*
Te'ete'emanu	E	*Ervatamia obtusiuscula*
Ake	CE	*Zanthophyllum pinnatum*
Filimoto	CE	*Xylosma obbiculatum Thaman (1976)*
		Xylosma simulans Wiser (1999)
Futu	E	*Barringtonia asiatica*
Kotone	E	*Myristica hypargyraea*
Manaui	E	*Garunga floribunda*
Masikoka	CE	*Glochidion ramiflorum*
Mau	CE	*Crytocarya fusca*
Mo'otakula	E	*Disoxylum forsteri*
Pipi	E	*Atuna racemosa*
Piu tonga	E	*Pritchardia pacifica*
Puopua	E	*Cebera floribunda*
Tamatama	E	*Achyranthes asperav*
Tatangia	E	*Acacia mangium*
Toto	E	*Cerbera manghas*
Unuoi	E	*Eugenia reinwardtiana (samoa unuoi)*
Volovalo	E	*Premna serratifolia*
Apele Tonga	E	*Annona squamosa*
Falahola	V	*Pandanus orbiculatum*
Fanakio	E	*Sterculia fanaiho*
Feto'omaka	E	*Garcinia myrtifolia*
Hakato	V	*Acrostichum aureum*
Hea	E	*Parinarium insularum*
Heavula	E	*Syzygium richii*
Kau	V	*Syzygium neurocalyx*
Kolivai	V	*Syzygium corynocarpium*
Kulukona	E	*Polyscias multijuga*
Lalatahi	V	*Vilex trifolia*
Ma'ama'alava	E	*Elaeocarpus tonganus*

Masalumaka	V	*Schizaea dichotoma*
Masi'ata	V	*Ficus oblique (Thaman 1976)*
		Ficus tinetori (Wiser 1999)
Mo'onia	CE	*Garcinia spp*
Mo'otamea	E	*Dysoxylum tongense*
Motou	V	*Cryptocaria spp*
Olomaka	E	*Canthium barbatum (Thaman 1976)*
		Canthium vitiensis (Thaman 1976) mentioned twice same text. Cyclophyllum barbatumm (Wiser 1999)
Olonga	CE	*Pipturus argenteus*
Fao	V	*Neisosperma oppositifolium*
Kavakava'ulie	V	*Macropiper puberulum*
Kolitoto	E	*Syzygium neurocalyx*
Monomono'ahina	V	*Mussaenda raiateensis*
Ngatata	E	*Ellatostachys falcate*
Vavaetonga	E	*Gossypium barbadense*
Sialetafa	E	*Bikkia tetrandra*
Kakamika	E	*Siegesbeckia orientalis*
Kukuvalu	V	*Pandanus spp*
Polotonga	E	*Solanum viride*
Alu	E	*Epipremnum pinnatum*
Sialetonga	E	*Gardenia taitensis*

Annex 1A.4. Threatened plant species of Tonga as at 31 December 2009

TONGAN NAMES	SCIENTIFIC NAME	THREATENED	THREATENED
		LEVEL	**LEVEL**
		2006	**2009**
A) IUCN RED LIST OF ENDANGERED SPECIES			
A.3 Timber Plant			
Uhiuhi	Podocarpus pallidus	**CE**	**V**
A.4 Medicinal, Ornamental, Cultural & Fruet Plant			
Langakali Vao	Aglaia heterotricha	**CE**	**E**
B) NATIONAL LIST OF ENDANGERED SPECIES (60 species declared in 2006)			
1. CRITICALLY ENDANGERED (CE)			
1.1 Medicinal Plant			
Ovava Tonga	Ficus oblique	CE	CE
Fangu	Benincasa hispida	CE	CE
Fonua malala	Homalanthus nutuns	CE	CE
Pukovili	Gyrocarpus americanus	CE	CE
Masikoka	Glochidion ramiflorum	CE	CE
Mamea	Heritiera littoralis	CE	CE
Takafalu	Micromelum minutum	CE	E
1.2 Ornamental, Cultural & Fruit Plant			
Mau	Crytocarya fusca	CE	E
1.3 Timber Plant			
Olonga	Pipturus argenteus	CE	CE
Filimoto	Xylosma obbiculatum Thaman (1976)	CE	E

	Xylosma simulans Wiser (1999)		
Ake	Zanthophyllum pinnatum	CE	CE
1.4 Medicinal, Ornamental, Cultural & Fruet Plant			
Mo'onia	Garcinia spp	CE	CE
1.5 Timber, Ornamental, Cultural & Fruit Plant			
Hangale	Lumnitzera littorea	CE	E
1.6 Medicinal & Timber Plant			
Mo'otamea	Dysoxylum tongense	**CE**	**V**
2. ENDANGERED (E)			
2.1 Medicinal Plant			
Kolitoto	Syzygium neurocalyx	E	V
Puopua	Cebera floribunda	E	E
Kakamika	Siegesbeckia orientalis	E	E
Te'ete'emanu	Ervatamia obtusiuscula	E	V
Futu	Barringtonia asiatica	E	V
Tamatama	Achyranthes asperav	E	V
Unuoi	Eugenia reinwardtiana (samoa unuoi)	E	V
Volovalo	Premna serratifolia	E	V
Fisi'uli	Bidens pilosa	E	A
Polotonga	Solanum viride	E	V
2.2 Ornamental, Cultural & Fruit Plant			
Manaui	Garunga floribunda	E	V
Alu	Epipremnum pinnatum	E	E
Sialetafa	Bikkia tetrandra	E	E
Sialetonga	Gardinia toitensis	E	E
Huni	Phaleria disperma	E	V

Kulukona	Polyscias multijuga	E	V
Hea	Parinarium insularum	E	A
2.3 Timber Plant			
Vavaetonga	Gossypium barbadense	E	V
Piu tonga	Pritchardia pacifica	E	V
Feta'umaka	Garcinia myrtifolia	E	E
Tatangia	Acacia mangium	E	V
Kotone	Myristica hypargyraea	E	A
Mo'otakula	Dysoxylum forsteri	E	A
Ngatata	Ellatostachys falcate	E	A
2.4 Medicinal, Ornamental, Cultural & Fruet Plant			
Pipitui	Atuna racemosa	E	E
Pipi	Atuna racemosa	E	V
Pua tonga	Fagraea berteroana	E	A
Apele Tonga	Annona squamosa	E	A
2.5 Timber, Ornamental, Cultural & Fruit Plant			
Tongota'ane	Rhizophora mangle, Rhizophora stylosa	E	V
Fanakio	Sterculia fanaiho	E	A
Heavula	Syzygium richii	E	V
2.6 Medicinal & Timber Plant			
Ma'ama'alava	Elaeocarpus tonganus	E	E
Olomaka	Canthium barbatum (Thaman 1976)	E	E
	Canthium vitiensis (Thaman 1976)		
	Cyclophyllum barbatumm (Wiser 1999)		
Toto	Cerbera manghas	E	V
3. VULNERABLE (V)			

3.1 Medicinal Plant			
Lalatahi	Vilex trifolia	V	V
Masalumaka	Schizaea dichotoma	V	V
Masi'ata	Ficus oblique (Thaman 1976)	V	V
	Ficus tinetori (Wiser 1999)		
Kavakava'ulie	Macropiper puberulum	V	V
Monomono'ahina	Mussaenda raiateensis	V	V
3.2 Ornamental, Cultural & Fruit Plant			
Falahola	Pandanus orbiculatum	V	V
Hakato	Acrostichum aureum	V	V
Kukuvalu	Pandanus spp	V	V
3.3 Timber Plant			
Kau	Syzygium neurocalyx	V	E
3.4 Medicinal, Ornamental, Cultural & Fruet Plant			
Kolivai	Syzygium corynocarpium	V	V
Fao	Neisosperma oppositifolium	V	**A**
3.5 Timber, Ornamental, Cultural & Fruet Plant			
Motou	Cryptocaria spp	V	V
4. NEW THREATENED SPECIES 2009			
4.1 Medicinal Plant			
Kanume	Diospyros elliptica		CE
Mangele	Trema cannabina		CE
Pukovai	Gyrocarpus sp		CE
Puopua	Guettarda speciosa		E
Unuoi	Eugenia reinwardtiana		E

Motelolo	Polyalthia laddiana		E
Lekileki	Xylocarpus gradatum		E
Manonu	Tarenna sambusina		V
Uhi	Euodia hortensis		V
Ahi Vao	Vavaea amicorum		V
4.2 Ornamental, Cultural & Fruit Plant			
Fue fai lolo	Piper graeffei Warb		V
4.3 Timber Plant			
Oke	Grevillea robusta		E
Kulukulufa	Meryta macrophylla (Rich ex A. Gray) Seem		V
Pualiki	Crataeva religiosa Forst.f		V
Pasivaka	Stenochlaena palustris (Burn)		V
Malamala'atoa	Memecylon harveyi Seem		V
4.4 Medicinal, Ornamental, Cultural & Fruit Plant			
Heilala	Garcinia cessilis		V
Ahi	Santalum yasi		V
Hehea	Syzygium corynocarpum		V
4.5 Timber, Ornamental, Cultural & Fruet Plant			
Tava Tonga	Pometia pinnata		V
Motou	Cryptocaria hornei		V
Feifai	Schleinitzia insularum		V
Koka	Bischofia javanica		V
4.6 Medicinal & Timber Plant			
Fekika Vao	Syzygium dealatum		V
Fekika Vao	Syzygium culsifolium		V

ANNEX 1B.1:

Table 1. Reviewed offshore fisheries marine species (stocktake vs 2009)

The Species Status level is indicated with CE – critical endangered, E – endangered, R – rare, VE – vulnerable to endangered, U – unknown, LA – low abundant.

Local Names	Common Names	Scientific Names	Threatened Level		Comment
			2005	2009	
Pelagic Species (Offshore/Oceanic)					
Takuo	Yellowfin Tuna	*Thunnus albacares*	**U**	**E**	Landing catch decline
Pikiai	Bigeye Tuna	*Thunnus obesus*	**U**	**E**	Landing catch decline
Deepwater Slope Species					
Palu Tavake	Flame snapper	*Etelis coruscan*	**U**	**VE**	Landing catch decline
Mohuafi	Convict grouper	*Epinephelus octofasciatus*	**U**	**VE**	Landing catch decline
Palu malau	Ruby snapper	*Etelis carbunculus*	**U**	**VE**	Landing catch decline
	Gurnards	Triglidae			New Species
	Armored searobins	Peristediidae			New Species
Marine Mammals					
Tofua'a	Hampback whale	*Megaptera novaeangliae*	**E**	**E**	Protected
Tofua'a	Blue whale	*Balaenoptera musculus*	**E**	**E**	Protected

Tofua'a	Bottlenose whale	*Tursiops truncates*	**CE**	**CE**	Protected
Fonuleta	Leatherback turtle	*Dermochelys coriacea*	**CE**	**CE**	Protected for fishing all years.
Fonu tu'akula	Green turtle	*Chelonia mysdas*	**E**	**E**	Protected but fishing is seasonal (March to July)
Fonu koloa	Hawksbill turtle	*Eretmochelys imbricate*	**E**	**E**	Protected but fishing is seasonal (March to July)
Fonu	Loggerhead turtle	*Lepidochelys olivacea*	**E**	**E**	Protected but fishing is seasonal (March to July)

ANNEX 1B.2

Table 2: Reviewed inshore marine species (stocktake 2005 vs 2009)

The Species Status level is indicated with CE – critical endangered, E – endangered, R – rare, VE – vulnerable to endangered, U – unknown, LA – low abundant.

Local Names	Common Names	Scientific Names	Threatened Level		Comment
			2005	2009	
Inshore Species					
Finfish					
Sikatoki/Tangafa	Humphead wrasse	*Cheilinus undulatus*	**E**	**E**	*Open to harvest live for Hong Kong market recently*
Pokumei/O	Rabbitfish	*Siganus niger*	**U**	**VE**	*Endemic to Tongan water as confirmed under ProcFish 2008*
Hohomo	Parrotfish	Scaridae	**U**	**LA**	*Sizes decreased at coastal areas throughout Tongatapu Groups Only*
'Ume	Surgeon fish	Acanthuridae	**U**	**LA**	*Sizes decreased at coastal areas throughout Tongatapu Groups Only*
Tukuku	Angelfishes	*Stegates spp*	**E**	**E**	*Population has declined dramatically*
Ngatala	Rock cod	*Epinephelus sp*	**R**	**E**	*Very rare at Ha'apai groups*
Fai Pala	Black spotted sting-ray	*Taeiura melanospila*	**R**	**E**	*Very rare at Ha'pai groups*
Toke pokulu	Marbled moray eel	*Uropterygius marmoratus*	**R**	**E**	*Very rare at Ha'apai groups*
'Ava	Milkfish	*Chanos chanos*	**U**	**E**	*Euryhaline species*

					(Found both marine blackish water – swamp areas)
Mollusc Species (Shellfish)					
Vasuva saieniti	Giant clam	*Tridacna gigas*	**U**	**CE**	*Introduced species*
Tokonoa	Smooth giant clam	*T.derasa*	**Extinct**	**E**	*Never extinct*
Toki/Nge'esi manifi	Deepwater or devil clam	*T.tevoroa*	**CE**	**CE**	*Endemic*
Matahele	Scally giant clam	*T.squamosa*	**E**	**CE**	*Aquaculture*
Kukukuku	Elongated giant clam	*T.maxima*	**U**	**CE**	*Aquaculture*
	Bored giant clam	*T.crocea*	**U**	**CE**	*Introduced species*
Vasuva topuva'e'I hoosi	Horse's hoof or strawberry clam	*Hippoppus hippoppus*	**CE**	**CE**	*Extinct in late 1970s but re-introduced in early 1990s*
'Elili lanumata	Green snail	*Turbo marmolatus*	**Unknown**	**CE**	*Introduced species but Protected*
Takaniko	Trochus (topshell)	*Trochus niliticus*	**Unknown**	**VE**	*Introduced species but Protected*
To'o teka	Cockle	*Gafrarium tumidum*	**Unknown**	**LA**	*Re-located due to detrimental effect and totally extinct at certain areas*
Kuku	Mussel	*Modiolus sp*	**E**	**E**	*Overexploited in some areas*
Kele'a	Trumpet triton	*Charonia triton*)	**U**	**R**	*Harvested mostly for souvenirs*
Crustaceans Species					

‘Uo	Lobster	*Panularis sp*	**E**	**E**	*Protected in terms of size limit*
Paka ve’e’uli	Dark-finger coral crab	*Etisus dentatus*	**E**	**CE**	*Very rare*
Tapatapa	Slipper lobster	*Scyllarides squamosas*	**E**	**E**	*Protected in terms of size limit*
Corals Species					
Feo	Stony corals	*Micromussa amakusensis*	**U**	**R**	*Harvest for aquarium markets*
Feo	Branching corals	*Alveopora catalai*	**U**	**R**	*Harvest for aquarium markets*
Feo	Massive corals	*Psammocora haimeana*	**U**	**R**	*Harvest for aquarium markets*
Feo	Stony corals	*Blastomussa merletti*	**U**	**R**	*Harvest for aquarium markets*
Feo	Stony corals	*Blastomussa wellsi*	**U**	**R**	*Harvest for aquarium markets*
Feo	Stony corlas	*Acanthastrea bowerbanki*	**U**	**R**	*Harvest for aquarium markets*
Feo	Massive corals	*Podabacia crustacea*	**U**	**R**	*Harvest for aquarium markets*
Feo	Stony corals	*Euphyllia ancora*	**U**	**R**	*Harvest for aquarium markets*
Feo	Stony corals	*Physogyra lichtensteini*	**U**	**R**	*Harvest for aquarium markets*
Toatahi	Black corlas	*Antipatharia sp*	**E**	**CE**	*Totally protected*
Seaweed/Seagrass					
Limu Tanga’u	Angel-hair seaweed	*Cladosiphon sp*	**E**	**E**	*Seasonal*
Limu Fuofua	Grabe seaweed	*Claurlepa sp*	**Unknown**	**LA**	*Extinct in some areas*
Echinoderms species (Sea cucumbers)					

Nga'ito	Golden sandfish	*Holothuria versicolor scabra*	**E**	**CE**	*Seasonal with quotas system*
Teleheakula loloto	Deep Surf redfish	*Actinopyga echinites*	**E**	**CE**	*Seasonal with quotas system*
Loli fulufulu	Hairly blackfish	*Actinopyga miliaris*	**E**	**CE**	*Seasonal with quotas system*
Pulukalia	Pricky redfish	*Thelenota ananas*	**E**	**CE**	*Seasonal with quotas system*
Huhuvalu 'uli'uli	Black teatfish	*Holothuria nobilis*	**E**	**CE**	*Seasonal with quotas system*
Huhuvalu hinehina	White teatfish	*Holuthuria fuscogilva*	**E**	**CE**	*Seasonal with quotas system*
Lomu matala	Flowerfish	*Pearsonothuria graeffei*	**E**	**CE**	*Seasonal with quotas system*
Mangrove Species					
Tongo Lei		*Rhizophora mangle (L)*	**E**	**E**	
Tonga Ta'ane		*Brugulera gymnorrhiza (L)*	**E**	**E**	
Lekileki		*Xylocarpus moluccensis (L)*	**CE**	**CE**	*Destroyed for fire wood*
Hangale		*Lumnitzera torealot*	**E**	**CE**	*Destroyed for fire wood*

ANNEX 1B.3

Table 3. Total marine species recorded in Tongan Coastal Waters

Common Name	Family name	No. of species recorded in Tonga
Finfishes - Pelagic		
Tuna, mackerel and horse mackerel	Scombridae	7
Mackerel	Carangidae	1
Barracuda	Spyraenidae	3
Dolphin fish, mahimahi	Coryphaenidae	1
Flying fish	Exocoetidae	4
Garfish	Hemiamhidaer	1
Anchovies	Engraulididae	1
Herring, Sprat, sardine	Lupeidae	8
Scad, trevally	Carangidae	6
Billfish, swordfish, wahoo, sailfish		6
Octopus, squids, cuttlefish	Cephalopoda	7
Marine Mammals		
Whales	Cetacea	12
Turtles		6
Deepwater Species (Snapper and groupers)		
Deepwater snapper		7
Groupers	Serranidae	9
Emperor		8
Coastal marine Species		
Corals Species		

Hard coral	Scleractinian	192+
Soft coral		7
Black coral		3
	Non-Scleractinian corlas	Unknown species
	Scyphozoans	Unknown species
Jellyfish	Cassiopea spp	1
Reef fish Species		
Finfish		300+
Sharks and Rays	Elasmobranch	17
Eel	Muraenidae	7
Wrasses	Labridae	41
Damsel fish	Pomacentridae	35
Butterfly fish	Chaetodontidae	24
Parrotfish	Scaridae	19
Surgeon fish	Acanthuridae	12
Goatfish	Mullidea	10
Blennies	Blennidea	9
Gobies	Gobbide	8
Mollusc		
Shellfish	Bivalve	57
Shellfish	Gastropoda	85
Chiton	Polyplacophora	1
Echinoderms		
Sea star or star fish	Asteroidae	5
Sea urchin	Echinoidea	4
Sea cucumbers	Holothuridea	20

Feather star	Cronoidea	2
Brittle star	Ophiuroidea	3
Crustaceans		
Crabs	Decapodia	20
Lobster	Panularis	4
Prawn	Prawns	2
Seaweed and seagrass		
Sea grapes		4
Seagrass		7
Seaweed		6+
Phytoplankton		
Phytoplankton & Zooplankton		4+
Micro-algae (Tropical species)		5+

ANNEX 1C.1

Table 3: Comprehensive Species list showing the trends by which agro-biodiversity (including those mentioned in the NBSAP) is moving

Scientific names	Common names	Tongan names	Trends	
1. Pouteria caimito	Abiu	apiu	NM	**RE**
2. Mangifera minor	Mango	mango kai mata	NM	A
3. Mangifera minor	Mango	mango akau	NM	A
4. Mangifera minor	Mango	mango ai	NM	**RE**
5. Mangifera minor	Mango	mango lesi	NM	A
6. Mangifera minor	Mango	mango Australia	NM	**RE**
7. Spondias edulis	Vi apple	vi	RE	**RE**
8. Annona atemoya	Atemoya	apele tonga/ kolosi	NM	A
9. Annona squamosa	Sugar apple	apele tonga	NM	A
10. Rollinia deliciosa	Rollinia	lolinia	NM	**RE**
11. Annona muricata	Soursop	apele initia	NM	A
12. Annona reticulata	Bullock heart apple	apele mafu	NM	**RE**
13. Areca catechu	Betelnut	niu kula	NM	**RE**
14. Cocos nucifera	Coconut	niu	NM	A
15. Pachira aquatica	Peanut tree	pinati	NM	**RE**
16. Ananus comosus	Pineapple (rough skin)	faina	NM	A
17. Ananus comosus	Pineapple (smooth skin)	faina	NM	**RE**
18. Canarium indicum	Galip nut (single kernel/nut)	‘ai	NM	A
19. Canarium indicum	Galip nut (two kernel)	‘ai	NM	**RE**
20. Hylocersus megalantus	yellow pitaya	kakatusi pingiki	NM	**RE**
21. Hylocersus undatus	pink pitaya	kakatusi engenga	NM	**RE**
22. Carica papaya	Papaya	lesi tonga	NM	**RE**
23. Carica papaya	Papaya	lesi hawaii	NM	**RE**
24. Carica papaya	Papaya	lesi thailand	NM	**RE**
25. Terminalia catappa	Pacific almond	telie	NM	A
26. Diospyros digyna	Black sapote	sapote uliuli	NM	**RE**
27. Baccaurea motleyana	Rambai	lamapai	NM	**RE**
28. Aleurites moluccana	Candle nut	tuitui	NM	A
29. Inocarpus fangifera	Polynesian chestnut	ifi	NM	A
30. Tamarindus indica	Tamarind-sour	tamaline-mahi	NM	A
31. Tamarindus indica	Tamarind - sweet	tamaline melie	NM	**RE**
32. Ingus edulis	Ice cream bean	misimisi	NM	A
33. Garcinia xanthochyus	Yellow mangosteen	mangostini	NM	**RE**
34. Persea americana	Avocado (green/round)	afoka	NM	**RE**
35. Persea americana	Avocado (grn/pear shape)	afoka	NM	**RE**
36. Persea americana	Avocado	afoka	NM	**RE**

	(purple/pearshape)			
37. Persea americana	Avocado (small aligatorskin)	afoka	NM	**RE**
38. Barringtonia edulis	Cutting nut	nati ta	NM	**RE**
39. Santoricum koetjape	Santol	santolo	NM	**RE**
40. Artocarpus altilis	Breadfruit	mei fisi	NM	A
41. Artocarpus altilis	Breadfruit	mei mafala	NM	**RE**
42. Artocarpus altilis	Breadfruit	mei loutoko	NM	A
43. Artocarpus altilis	Breadfruit	mei kea	NM	A
44. Artocarpus altilis	Breadfruit	mei maopo	NM	**RE**
45. Artocarpus altilis	Breadfruit	mei kea tala	NM	**RE**
46. Artocarpus altilis	Breadfruit	mei puou	NM	A
47. Ficus carica	Fig tree	fiki palangi	NM	**RE**
48. Artocarpus heterphyllus	Jackfruit	mei initia	NM	**RE**
49. Morus nigra	Mulberry	fua melie	NM	**RE**
50. Musa spp	Banana	siane	NM	A
51. Eugenia brasiliensis	Grumichama	kramajama	NM	**RE**
52. Psidium guajava	Guava	kuava palangi	NM	A
53. Syzygium malaccense	Malay apple	fekika	NM	A
54. Eugenia brasiliensis	Brazillian cherry	seli	NM	**RE**
55. Feijoa sellowiana	feijoa	kuava loi	NM	**RE**
56. Syzigium spp	syzygium	hehea	NM	A
57. Syzygium jambos	Rose apple	fekika kuava	RE	**RE**
58. Syzygium clussifolium		fekika vao/mafua	RE	**RE**
59. Syzygium deaatum		fekika vao	RE	**RE**
60. Syzygium inophyoides		fekika vao	RE	**RE**
61. Syzygium brackenridgei		fekika vao	RE	**RE**
62. Averrhoa carambola	Star fruit- sweet	tapanima melie	NM	**RE**
63. Averrhoa carambola	Star fruit - sour	tapanima mahi	NM	A
64. Averrhoa bilimibi	Bilimbii	akau kukampa	NM	**RE**
65. Pheonix spp	pigmy date palm	pame niu kula	NM	**RE**
66. Passiflora quadrangularis	Garandilla	pasione	NM	**RE**
67. Passiflora edulis	Passionfruit-yellow	vaine henghenga	NM	A
68. Passiflora edulis	Passionfruit-purple	vaine violeti	NM	**RE**
69. Bambusa vulgaris	Bamboo	pitu	NM	A
70. Macademia integrifolia	Macademia	nati	NM	A
71. Prunus pesica	Peach	pisi	NM	**RE**
72. Prunus pesica	Nectarine (smooth)	nektaline	NM	**RE**
73. Cofee arabica	Coffee	kofi	NM	A
74. Morinda citrifolia	Indian mulberry	nonu	NM	A
75. Citrus reticulata	Mandarin	moli vai keli	**RE**	**RE**
76. Citrus aurantifolia	Mexican lime	laimi meksika	**RE**	**RE**
77. Citrus sinensis	Orange	moli kai	**RE**	**RE**
78. Citrus macrophylla	Sour kumquat	kola filipaini	**RE**	**RE**
79. Citrus latifolia	Tahitian lime	laimi tahiti	**RE**	**RE**
80. Citrus macrophylla	Cola citrus	kola	**RE**	**RE**
81. Citrus paradisi	Pomelo	moli tonga	**RE**	**RE**
82. Citrus jambhiri	Rough lemon	lemani	**RE**	**RE**
83. Citrus spp	Tangelo	moli kolosi	**RE**	**RE**
84. Fortunella crassifolia	Sweet kumquat	kola melie	NM	**RE**

85. Casimiroa edulis	White sapote	sapte hinehina	NM	**RE**
86. Litchi chinesis	Lychee	tava palangi	NM	**RE**
87. Nephelium lappceum	Rambutan	tava filipaini	NM	**RE**
88. Dimocarpus longana	Longans	tava siaina	NM	**RE**
89. Pometia pinnata	Pacific lychee	tava moli	NM	**RE**
90. Pometia pinnata	Pacific lychee	tava kula	NM	**RE**
91. Pouteria campechiana	Canistel	kanisiteli	NM	**RE**
92. Manilkara zapodilla	Sapodila	sapotila	NM	**RE**
93. Pouteria sapota	Mamey sapote	mami sapote	NM	**RE**
94. Chrysophyllum cainito	Star apple	apele feitu'u	NM	**RE**
95. Theobroma cacao	cacao	koko	NM	A
96. Abelmoschus manihot	Aibika	Pele		A
97. Amaranthus spp.	Tropical spinach		NM	**RE**
98. Basella spp.	Creeping spinach		NM	**RE**
99. Artocarpus altilis	Breadfruit	Mei	NM	A
100. Manihot esculenta	Cassava	Manioke	NM	A
101. Capsicum frutescens	Chilli	Polo fifisi	NM	A
102. Brassica chinensis	Chinese cabbage	Kapisi Siaina	NM	A
103. Vigna unguiculata	Cowpea		NM	**RE**
104. Moringa oleifera	Horse radish tree		NM	**RE**
105. Brassica oleracea	European cabbage		NM	**RE**
106. Athyrium esculentum	Fern		NM	**RE**
107. Gnetum gnemon	Spinach		NM	**RE**
108. Morinda citrifolia	Indian mulberry tree		NM	**RE**
109. Ipomoea aquatica	Swamp cabbage		NM	**RE**
110. Cucurbita moschata	Pumpkin		NM	**RE**
111. Hibiscus sabdariffa	Roselle		NM	**RE**
112. Ipomoea batatas	Sweet potato	Kumala	NM	**RE**
113. Colocasia esculenta	Swamp taro	Talo Tonga	NM	A
Stable crops of Tonga				
114. Dioscorea alata	Larger yams	Kahokaho Siamane	NM	**RE**
115. Dioscorea alata	Larger yams	Kahokaho 'Ulumaka	NM	**RE**
116.Dioscorea alata	Larger yams	Kaumeile kula	NM	RE
117.Dioscorea alata	Larger yams	Kaumeile hina	NM	**RE**
118.Dioscorea alata	Larger yams	Kapakau'ikava	NM	**CE**
119.Dioscorea alata	Larger yams	Laumahi	NM	RE
120. Dioscorea alata	Larger yams	Kafiu	NM	RE
121.Dioscorea alata	Larger yams	Kivi	NM	A
122. Dioscorea alata	Larger yams	Mahoa'a Lotuma	NM	RE
123. Dioscorea alata	Larger yams	Mahoa'a Leleva	NM	RE
124. Dioscorea alata	Larger yams	Mahoa'a	NM	A
125. Dioscorea alata	Larger yams	Voli	NM	A
126. Dioscorea alata	Larger yams	Kulo	NM	A
127. Dioscorea alata	Larger yams	Paholo	NM	A
128. Dioscorea alata	Larger yams	Palai	NM	**CE**
129. Dioscorea esculenta	Sweet Yams	'Ulilei fie'ufi	NM	**CE**
130. Dioscorea esculenta	Sweet Yams	'Ufilei vai	NM	RE
131. Dioscorea bulbifera	Hoi	Hoi kula (non-edible)	NM	**CE**
132. Dioscorea bulbifera	Hoi	Hoi hina (edible)	NM	**CE**
133. Dioscorea pentaphylla	Five-leafed yam	Lena (edible)	NM	**CE**

134. Colocasia esculenta	Taro	Lau'ila	NM	RE
135. Colocasia esculenta	Taro	Sikavi	NM	RE
136. Manihot esculenta	Cassava	Mataki'eua	NM	RE
137. Manihot esculenta	Cassava	Engeenga leka	NM	RE
138. Manihot esculenta	Cassava	Engeenga	NM	RE
139. Manihot esculenta	Cassava	Manioke Fisi	NM	A
140. Manihot esculenta	Cassava	Silika	NM	RE
141. Cordyline fruticosa	(edible)	Si tongotongo	NM	RE
142. Musa spp.	Siaine	Siaine Tonga	NM	RE
143. Musa spp.	Siaine	Siaine Ha'amoa	NM	A
144. Musa spp.	Siaine	Siaine Hauai'i	NM	A
145. Musa spp.	Plaintain (hopa)	Feta'u	NM	RE
146. Musa spp.	Plaintain (hopa)	Uho taha	NM	RE
147. Musa spp.	Plaintain (hopa)	Mamae	NM	RE
148. Musa spp.	Lady finger	Misipeka	NM	RE
149. Musa spp.	Plaintain (Pata)	Pata Tonga	NM	RE
150. Musa spp.	Plaintain (Pata)	Pata tea	NM	RE
151. Musa spp.	Plaintain (Pata)	Pata kolosi	NM	A
152. Heliconia latispatha	Heliconia	Fusi faikakai	NM	A
153. Amorphophallus paeoniifolius		Teve (edible)	NM	CE

ANNEX 1C.2.Revised NBSAP Priority List

NBSAP priority species	Revised NBSAP priority list		Review (2010)	Trends
Yams:	***Scientific names***	***Tongan names***		
Dioscorea alata	*D. alata*	*Lauvehi*	**CE**	**CE**
Dioscorea alata	*D. alata*	*Malekini*	**CE**	**CE**
Dioscorea esculenta	*D. esculenta*	*Paholo hina*	**CE**	**CE**
Dioscorea bulbifera	*D. bulbifera*	*D. bulbifera*	**CE**	**CE**
Dioscorea pentaphylla	*D. pentaphylla*	*D. pentaphylla*	**CE**	**CE**
Dioscorea nummularria	*D. nummularria*	*D. nummularria*	**CE**	**CE**
Dioscorea rotundata	*D. rotundata*	*D. rotundata*	**RE**	**RE**
Colocasia esculenta	*C. species*	Lau'ila	**NM**	**CE**
	C. species	Sikavi	**NM**	**CE**
	C. species	Talo Niue	**NM**	**CE**
	C. species	'Alifa	**NM**	**A**
	C. species	'Omeka	**NM**	**A**
	C. species	Holoitoung	**NM**	**A**
	C. species	Laulelei	**NM**	**A**
	C. species	Akamama'o	**NM**	**A**
	C. species	Alafua	**NM**	**A**
Xanthosoma spp	*X. species*	Talo tea	**CE**	**CE**
	X. species	Talo mahele 'uli	**CE**	**CE**
	X. species	Talo kula	**CE**	**CE**
	X. species	Talo kape	**CE**	**CE**
Alocasia macrorrhiza	*A. species*	Kape hina	**CE**	**CE**
	A. species	Fohenga enga	**CE**	**CE**
	A. species	Fohenga 'uli	**CE**	**CE**
Ipomoea batatas	*I. batatas*	Tongamai	**CE**	**CE**
	I. species	Siale	**CE**	**CE**
	I. species	Palu	**CE**	**CE**
	I. species	Hauai'i	**A**	**A**
	I. species	Mele Fakahau	**A**	**A**
	I. species	Mahina Tolu	**A**	**A**
Cyrtosperma chamissionis	*C. chamissionis*	Pula'a/Pulaka	**CE**	**CE**
Tacca leonopetaloides	*T. leonopetaloides*	Mahoa'a koka'anga	**CE**	**CE**
Amorphophallus campanulatus	*A. campanulatus*	Teve	**CE**	**CE**
Citrus spp.	*C. jambhiri*	Lemani petepete	**RE**	**RE**
	C. macrophylla	Kola	**RE**	**RE**
	C. paradise	Moli tonga	**RE**	**RE**
	C. macrophylla	Moli kai	**RE**	**RE**
	C. latifolia	Laimi Tahiti	**RE**	**RE**
	C.olia	Laimi NTT?	**CE**	**CE**
Saccharum officinarum	*S. officinarum*	Au	**RE**	**RE**
	S. species	To Ngata	**RE**	**RE**
	S. species	To Mahele 'uli	**RE**	**RE**
Sysygium malaccense	*S. malaccense*	Fekika kai	**RE**	**RE**

	S. jambos	Fekika palangi	**RE**	**RE**
	S. clussifolium	Fekika vao	**RE**	**RE**
	S. deaatum	Fekika vao	**RE**	**RE**
	S. inophyoides	Fekika vao/mafua	**RE**	**RE**
	S. brackenridgei	Fekika vao/hehea	**RE**	**RE**
Spondius cytherea	*S. cytherea*	Vi	**RE**	**RE**
Broussonetia papayrifera	*B. species*	Lau mahaehae	**A**	**A**
	B. species	Lau maopo	**A**	**A**
Musa spp.	*M. species*	Siaine Tonga	**RE**	**RE**
	M. species	Mamae	**RE**	**RE**
	M. species	Misipeka	**RE**	**RE**
	M. species	Feta'u	**RE**	**RE**
Coconut nucifera	*C. nucifera*	Ta'okave	**RE**	**RE**
	C. nucifera	Niu vai	**RE**	**RE**
	C. nucifera	Niu kafa	**RE**	**RE**
	C. nucifera	Niu 'utongau	**RE**	**RE**
	C. nucifera	Niu matakula	**RE**	**RE**
21		**59**		

ANNEX 2A.1. List of People Consulted

‘Asipeli Palaki	Acting CEO, MECC
Viliami Manu	Acting CEO, MAFFF
Tevita Faka’osi	Head of Forestry Division, MAFFF
Leody Vainikolo	Head of Corporate Division, MAFFF
Tupe Samani	MECC
Seini Fotu	MECC
Peni Koloamatangi	OIC, MAFFF, Niuafo’ou
Taniela Hakaumotu	OIC, MAFFF, Niuatoputapu
Sitiveni Hamani	OIC, Forestry Division, ‘Eua
Tevita Fonokalafi	OIC, Forestry Division, Vava’u
Heimuli Likiafu	OIC, Forestry Division, Tongatapu
Ketoni ‘Akau’ola	Supervisor, Forestry Division, Tongatapu
‘Isileli Kamaloni	Owner, Private Tree Nursery, Hofoa
Sunia Napa’a	OIC, Forestry Division, Ha’apai
Sione Faka’osi	Managing Director,TCDT
Lopeti Faka’osi	Civil Society
Hauoli Vi	Langa Fonua ‘a Fefine Tonga
Lusio Vaka	OIC, Extension Division, East District, Ttp
‘Unaloto Kava	Cirriculum Unit, Ministry of Education
Talahiva Fine	Cirriculum Unit, Ministry of Education

ANNEX 3A1: Existing Legislation, and new legislation and policies for each Sector - 2009

SECTOR	EXISTING LEGISLATION	NEW LEGISLATION	RESPONSIBLE MINISTRY
Forest Ecosystem	Noxious Weeds Act (CAP 128) Plant Quarantine Act (CAP 127) Birds and Fish Preservation Act (CAP 125)	2009 Forest Act Draft	Ministry of Forests (MOF)
Marine Ecosystems	Royal Proclamation 1887 Royal Proclamation 1972 The Continental Shelf Act of 1970 (CAP. 63) The Territorial Sea and Exclusive Economic Zone Act 1978 Mineral Acts 1949 The Land Act 1927 Birds and Fish Preservation Act (amended in 1974)		Ministry of Land, Survey and Natural Resources
	Fisheries Act 1989 Fisheries Regulation Fisheries Management Act 2002	-Deepwater snapper and Grouper Plan 2007 (Review in 5 year basis) -Sea cucumbers Management plan 2008 (Review on yearly basis) -Aquaculture Management Regulation 2008 -Fisheries Management and Conservation Regulation 2008 -National Tuna Management Plan 2010 (Review in 5 year basis since year 2002) -Aquaculture Development Management Plan	Ministry of Fisheries

		2010 - 2015	
	Marine Pollution Act 2002		Ministry of Marine & Ports (MM&P)
	Environmental Impact Assessment Act 2003 Waste Management Act 2005		Department of Environment
	Quarantine Act 1970		Ministry of Agriculture and Food

Agro-biodiversity	Crop Compensation Act The Plant Quarantine Act, Vol. 4, 1988 The Pesticide Act and Regulations, Vol. 4: 2002 Land Act Tax Allotment Holder		Ministry of Agriculture and Food(MAF)
	Land Tenure Act		Ministry of Land, Survey and Natural Resources (MLSNR)
Species Conservation (Terrestrial Eco-systems)	The Land Act 1927 Birds and Fish Preservation Act, amended in 1974 Parks & Reserve Act 1976		Ministry of Land, Survey and Natural Resources
	Terrestrial and Fisheries (Conservation and Management) Regulation 1994		Ministry of Fisheries (MOFI)
	Environmental Impact Assessment Act 2003	Biosafety Act	Department of Environment(DOE)
	Quarantine Act Rhinoceros Beetle Act		Ministry of Agriculture and Food

Annex 3A.2: Civil Society Projects

Project Number	Project Name	Grantees	Starting Date	Total Grant amount (USD)	Donor
TON/SGP/OP4/CORE/07/01	Mitigating Climate Change Impacts in Ha'apai	Tonga Community development Trust	May-09	$ 50,000.00	GEF/Core
TON/SGP/OP4/CORE/08/01	Tatakamotonga Coastal Protection and Muinahafu Community Based Conservation Area	Kalapu Kolokakala Inc	Sep-09	$ 50,000.00	GEF/Core
TON/SGP/OP4/CORE/09/01	Protecting Eua's Biodiversity	Eua Youth Congress	Dec-09	$ 50,000.00	GEF/Core
TON/SGP/OP4/CORE/09/02	Lagoon for Generations	Halaleva Free Wesleyan Youth	Mar-10	$ 50,000.00	GEF/Core
TON/SGP/OP4/CORE/09/03	Fonuatanu Tree Planting	Lapaha Women in Development group	Mar-10	$ 50,000.00	GEF/Core
TON/SGP/OP4/CORE/09/04	Youth Conservation & Environmental Stewardship	Tonga National Youth Congress	Apr-10	$ 50,000.00	GEF/Core
TON/SGP/OP4/NZAID/09/01	Kolovai's Climate Change Nature Calling Project	Kalapu Toa Ko Pouvalu	Mar-10	$ 49,270.00	NZAID/PEF
Total Grant approved (USD)				**$ 349,270.00**	

CIVIL SOCIETY PROJECTS-CONT

Project Number	Project Name	Grantees	Starting Date	Total Grant amount (USD)	Donor
TON/SGP/OP4/CORE/10/02	Strengthening of Community-based resource management effort in Ovaka Coastal Special Management Area (SMA)	Ovaka Coastal Community Management Committee	Apr-10	$ 2,000.00	GEF/Core
TON/SGP/OP4/CORE/10/03	Strengthening of Community-based resource management effort in Átata Coastal Special Management Area (SMA)	Atata Coastal Community Management Committee	Apr-10	$ 2,000.00	GEF/Core
Total Planning Grant approved				$ 6,000.00	
TON/SGP/OP4/CORE/10/04	Strengthening of Community-based resource management effort in Felemea Coastal Special Management Area (SMA)	Felemea Coastal Community Management committee	April	no planning grant	

Annex 3A.3: Tonga Trust Projects

Tonga Community Development Trust Projects related to Biodiversity Conservation in Tonga

Project Title	Timeframe	Aim/Scope	Achievement/Output	Cost (USD)	Donor
1. Community consultation on Tonga's Important Birds Areas (IBA)	Aug – Oct 2007	**Objectives**: 1. to identify, inform and engage governmental and civil society stakeholders in Tonga regarding the IBA process; 2. to undertake provincial government and community visits to three priority IBAs – Niuafo'ou, Vava'u and Ha'apai	- community workshops conducted in Vava'u, Ha'apai, 'Eua and Niua's visiting Tongatapu to raise awareness on birds conservation needs - Report submitted to Environment Consultants Fiji based on community consultation and priorities (appended as part of the Final Report of Tonga's IBA to Birdlife International).	$5,500	Environment Consultants Fiji
2. Development of Model Species Recovery Plans in Tonga	Jul 2009 – Dec 2010	**Goal**: To secure the population of globally threatened species in Tonga. **Objective**: To develop e model species recovery plan, focus initially on malau (Polynesian megapode) and later on other threatened species in Tonga.	- Review Report of work undertaken on protection of Niuafo'ou megapode - draft communication strategy - species survey and community-based survey yet to be conducted (April/May 2010) - Recovery Plan to be developed (August 2010)	$50,000	Critical Ecosystem Partnership Fund
3. Development and declaration of Protected Areas for Megapode in Niuafo'ou and (to be confirmed)	Jul 2009 – Dec 2010	**Goal**: To improve management and protection of Tongan Megapode as one of the endemic and endangered species of land birds in Niuafo'ou. **Objective**: To engage the people of Niuafo'ou in developing, implementing and monitoring of effective management options for the protection of the Tongan Megapode from depletion.	- community workshops to discuss co-management options with GoT (April 2010) - identify and support the development of a sustainable alternative livelihoods project (April – July 2010) - facilitate development of policy, legislative and effective co-management mechanisms (November 2010)	$15,000	PoWPA though MECC

ANNEX 4A.1: Strategic Plan

Decision VIII/15, Annex 1, provides a framework for monitoring overall progress towards the 2010 goal. This is mostly relevant at the global level, but progress clearly depends on what each of the CBD's Parties is doing individually and collectively to achieve the set goals.

STRATEGIC GOALS AND OBJECTIVES	POSSIBLE INDICATORS
Goal 1: The Convention is fulfilling its leadership role in international biodiversity issues.	
1.1 The Convention is setting the global biodiversity agenda.	CBD provisions, COP decisions and 2010 target reflected in work plans of major international forums.
1.2 The Convention is promoting cooperation between all relevant international instruments and processes to enhance policy coherence.	
1.3 Other international processes are actively supporting implementation of the Convention, in a manner consistent with their respective frameworks.	
1.4 The Cartagena Protocol on Biosafety is widely implemented.	
1.5 Biodiversity concerns are being integrated into relevant sectoral or cross-sectoral plans, programmes and policies at the regional and global levels.	Possible indicator to be developed: Number of regional/global plans, programmes and policies that specifically address the integration of biodiversity concerns into relevant sectoral or cross-sectoral plans, programmes and policies. Application of planning tools such as strategic environmental assessment to assess the degree to which biodiversity concerns are being integrated. Biodiversity integrated into the criteria of multilateral donors and regional development banks.
1.6 Parties are collaborating at regional and sub-regional levels to implement the Convention.	-

STRATEGIC GOALS AND OBJECTIVES	POSSIBLE INDICATORS
Goal 2: Parties have improved financial, human, scientific, technical, and technological capacity to implement the Convention.	
2.1 All Parties have adequate capacity for implementation of priority actions in national biodiversity strategy and action plans.	
2.2 Developing country Parties, in particular the least developed and the small island developing States, and other Parties with economies in transition, have sufficient resources available to implement the three objectives of the Convention.	Official development assistance provided in support of the Convention (OECD-DAC Statistics Committee).
2.3 Developing country Parties, in particular the least developed and the small island developing states (SIDS/LDS) among them, and other Parties with economies in transition, have increased resources and technology transfer available to implement the Cartagena Protocol on Biosafety.	
2.4 All Parties have adequate capacity to implement the Cartagena Protocol on Biosafety.	
2.5 Technical and scientific cooperation is making a significant contribution to building capacity.	Indicator to be developed consistent with VII/30.
Goal 3: National biodiversity strategies and action plans and the integration of biodiversity concerns into relevant sectors serve as an effective framework for the implementation of the objectives of the Convention.	
3.1 Every Party has effective national strategies, plans and programmes in place to provide a national framework for implementing the three objectives of the Convention and to set clear national priorities.	Number of Parties with national biodiversity strategies.
3.2 Every Party to the Cartagena Protocol on Biosafety has a regulatory framework in place and functioning to implement the Protocol.	
3.3 Biodiversity concerns are being integrated into relevant national sectoral and cross-sectoral plans, programmes and policies.	To be developed. Percentage of Parties with relevant national sectoral and cross-sectoral plans, programmes and policies in which biodiversity concerns are integrated.

STRATEGIC GOALS AND OBJECTIVES	POSSIBLE INDICATORS
3.4 The priorities in national biodiversity strategies and action plans are being actively implemented, as a means to achieve national implementation of the Convention, and as a significant contribution towards the global biodiversity agenda.	To be developed. Number of national biodiversity strategies and action plans that are being actively implemented.
Goal 4: There is a better understanding of the importance of biodiversity and of the Convention, and this has led to broader engagement across society in implementation.	
4.1 All Parties are implementing a communication	Possible indicator to be developed: Number of Parties implementing a communication, education and public awareness strategy and promoting public participation. Percentage of public awareness programmes/projects about the importance of biodiversity. Percentage of Parties with biodiversity on their public school curricula
4.2 Every Party to the Cartagena Protocol on Biosafety is promoting and facilitating public awareness	
4.3 Indigenous and local communities are effectively involved in implementation and in the processes of the Convention	To be developed by the Ad Hoc Open-ended Working Group on Article 8(j).
4.4 Key actors and stakeholders	To be developed Indicator targeting private sector engagement, e.g. Voluntary type 2 partnerships in support of the implementation of the Convention.

Annex 4A.2: CBD Goals and Objectives

In terms of defining national targets for significantly reducing the rate of biodiversity loss by 2010, Decision VII/15, Annex II, provides a useful framework that can be directly applied at national level.

GOALS AND TARGETS	RELEVANT INDICATORS
Protect the components of biodiversity	
Goal 1. Promote the conservation of the biological diversity of ecosystems, habitats and biomes	
Target 1.1: At least 10% of each of the world's ecological regions effectively conserved.	Coverage of protected areas. Trends in extent of selected biomes, ecosystems and habitats. Trends in abundance and distribution of selected species.
Target 1.2: Areas of particular importance to biodiversity protected	Trends in extent of selected biomes, ecosystems and habitats. Trends in abundance and distribution of selected species. Coverage of protected areas.
Goal 2. Promote the conservation of species diversity	
Target 2.1: Restore, maintain, or reduce the decline of populations of species of selected taxonomic groups.	Trends in abundance and distribution of selected species. Change in status of threatened species

GOALS AND TARGETS	RELEVANT INDICATORS
Target 2.2: Status of threatened species improved.	Change in status of threatened species. Trends in abundance and distribution of selected species. Coverage of protected areas.
Goal 3. Promote the conservation of genetic diversity	
Target 3.1: Genetic diversity of crops, livestock, and of harvested species of trees, fish and wildlife and other valuable species conserved, and associated indigenous and local knowledge maintained.	Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socio-economic importance. Biodiversity used in food and medicine (indicator under development). Trends in abundance and distribution of selected species.
Promote sustainable use	
Goal 4. Promote sustainable use and consumption.	
Target 4.1: Biodiversity-based products derived from sources that are sustainably managed, and production areas managed consistent with the conservation of biodiversity.	Area of forest, agricultural and aquaculture ecosystems under sustainable management. Proportion of products derived from sustainable sources (indicator under development). Trends in abundance and distribution of selected species. Marine trophic index Nitrogen deposition Water quality in aquatic ecosystems.
Target 4.2. Unsustainable consumption, of biological resources, or that impacts upon biodiversity, reduced.	Ecological footprint and related concepts.

GOALS AND TARGETS	RELEVANT INDICATORS
Target 4.3: No species of wild flora or fauna endangered by international trade.	Change in status of threatened species.
Address threats to biodiversity	
Goal 5. Pressures from habitat loss, land use change and degradation, and unsustainable water use, reduced.	
Target 5.1. Rate of loss and degradation of natural habitats decreased.	Trends in extent of selected biomes, ecosystems and habitats. Trends in abundance and distribution of selected species. Marine trophic index.
Goal 6. Control threats from invasive alien species	
Target 6.1. Pathways for major potential alien invasive species controlled.	Trends in invasive alien species.
Target 6. 2. Management plans in place for major alien species that threaten ecosystems, habitats or species.	Trends in invasive alien species.
Goal 7. Address challenges to biodiversity from climate change, and pollution	
Target 7.1. Maintain and enhance resilience of the components of biodiversity to adapt to climate change.	Connectivity/fragmentation of ecosystems.
Target 7.2. Reduce pollution and its impacts on biodiversity.	Nitrogen deposition. Water quality in aquatic ecosystems.

GOALS AND TARGETS	RELEVANT INDICATORS
Maintain goods and services from biodiversity to support human well-being	
Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods	
Target 8.1. Capacity of ecosystems to deliver goods and services maintained.	Biodiversity used in food and medicine (indicator under development). Water quality in aquatic ecosystems. Marine trophic index. Incidence of Human-induced ecosystem failure.
Target 8.2. Biological resources that support sustainable livelihoods, local food security and health care, especially of poor people maintained.	Health and well-being of communities who depend directly on local ecosystem goods and services. Biodiversity used in food and medicine.
Protect traditional knowledge, innovations and practices	
Goal 9 Maintain socio-cultural diversity of indigenous and local communities	
Target 9.1. Protect traditional knowledge, innovations and practices.	Status and trends of linguistic diversity and numbers of speakers of indigenous languages. Additional indicators to be developed.
Target 9.2. Protect the rights of indigenous and local communities over their traditional knowledge, innovations and practices, including their rights to benefit sharing.	Indicator to be developed.
Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources	
Goal 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources	
Target 10.1. All access to genetic resources is in line with the Convention on Biological Diversity and its relevant provisions.	Indicator to be developed.

GOALS AND TARGETS	RELEVANT INDICATORS
Target 10.2. Benefits arising from the commercial and other utilization of genetic resources shared in a fair and equitable way with the countries providing such resources in line with the Convention on Biological Diversity and its relevant provisions.	Indicator to be developed.
Ensure provision of adequate resources	
Goal 11: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention	
Target 11.1. New and additional financial resources are transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with Article 20.	Official development assistance provided in support of the Convention.
Target 11.2. Technology is transferred to developing country Parties, to allow for the effective implementation of their commitments under the Convention, in accordance with its Article 20, paragraph 4.	Indicator to be developed.

ANNEX 5:

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- Pesticides Act (1981)
- Plant Quarantines Act (1981)
- Tourism Act (1976)
- Water Board Act (1966)

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- International Plant Protection Convention
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