

# TIMOR-LESTE'S FIFTH NATIONAL REPORT TO THE CONVENTION ON BIOLOGICAL DIVERSITY 2015



DEMOCRATIC REPUBLIC OF TIMOR-LESTE

Timor-Leste's Fifth National Report to the UN Convention on Biological Diversity was prepared by the National Biodiversity Working Group coordinated by the Ministry of Commerce, Industry and Environment (MCIE) with support from the United Nations Environment Programme (UNEP) and the Global Environment Facility (GEF).

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## Abbreviations

<b>ABD</b>	Agricultural Biodiversity
<b>ABS</b>	Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization
<b>ADB</b>	Asian Development Bank
<b>AT</b>	Aichi Target of the CBD Strategic Plan
<b>BIP</b>	Biodiversity Indicators Partnership
<b>CBD</b>	Convention on Biological Diversity
<b>CBFM</b>	Community-Based Forest Management
<b>CDU</b>	Charles Darwin University
<b>CEPA</b>	Communication, Education and Public Awareness
<b>CEPF</b>	Critical Ecosystem Partnership Fund
<b>CHM</b>	Clearing House Mechanism
<b>CI</b>	Conservation International
<b>CITES</b>	Convention on International Trade in Endangered Species of Flora and Fauna
<b>CTSP</b>	Coral Triangle Support Partnership
<b>DAPPN</b>	Department of Protected Areas and National Parks
<b>DNCN</b>	National Directorate of Nature Conservation
<b>DNE</b>	National Directorate of Statistics
<b>DNEPCC</b>	National Directorate of Roads, Bridges and Flood Control
<b>DNFGBH</b>	National Directorate of Forestry and Watershed Management
<b>DNMA</b>	National Directorate for the Environment
<b>DNPRB</b>	National Directorate of Biodiversity Protection and Restoration
<b>DNSAS</b>	National Directorate of Water and Sanitation Services
<b>EBA</b>	Endemic Bird Area
<b>EBL</b>	Environmental Basic Law
<b>EIA</b>	Environmental Impact Assessment
<b>ELL</b>	Environmental Licensing Law
<b>GEF</b>	Global Environment Facility
<b>IBA</b>	Important Bird Area
<b>JICA</b>	Japan International Cooperation Agency
<b>JICS</b>	Japan International Cooperation System
<b>KBA</b>	Key Biodiversity Area
<b>ILO</b>	International Labour Organization
<b>IPM</b>	Integrated Pest Management
<b>IUCN</b>	International Union for Conservation of Nature
<b>MAB</b>	Man and Biosphere Programme
<b>MAF</b>	Ministry of Agriculture and Fisheries
<b>MCIA</b>	Ministry of Commerce, Industry and Environment
<b>MDG</b>	Millennium Development Goal
<b>MEA</b>	Multilateral Environmental Agreement
<b>MED</b>	Ministry of Economy and Development
<b>MOT</b>	Ministry of Tourism
<b>MPA</b>	Marine Protected Area
<b>MPW</b>	Ministry of Public Works
<b>NEGA</b>	National Ecological Gap Assessment
<b>NGO</b>	Non-Governmental Organization

<b>PNNKS</b>	Nino Konis Santana National Park
<b>PoWPA</b>	Programme of Work on Protected Areas (under the CBD)
<b>RAP</b>	Rapid Assessment Programme
<b>RTTL</b>	National Radio and Television of Timor-Leste
<b>TEK</b>	Traditional Ecological Knowledge
<b>ToT</b>	Training of Trainers
<b>TPES</b>	Total Primary Energy Supply
<b>TWG</b>	Thematic Working Group
<b>PA</b>	Protected Area
<b>PNTL</b>	National Police of Timor-Leste
<b>SCMP</b>	Site Conservation Management Plan
<b>SEMA</b>	State Secretariat for the Environment
<b>SEPFOP</b>	State Secretariat for Professional Training and Employment Policy
<b>SoL</b>	Seeds of Life
<b>TL</b>	Timor-Leste
<b>UN</b>	United Nations
<b>UNCCD</b>	United Nations Convention to Combat Desertification
<b>UNDP</b>	United Nations Development Programme
<b>UNEP</b>	United Nations Environment Programme
<b>UNFPA</b>	United Nations Population Fund
<b>UNTAET</b>	United Nations Transitional Administration for East Timor
<b>UNTL</b>	National University of Timor-Lorosa'e

## Executive Summary

This report updates biodiversity status in Timor-Leste, provides an assessment on implementation of the national biodiversity strategy and action plan (NBSAP), and reflects on the country's progress towards achievement of the Aichi Biodiversity Targets. Hence, the report supplements the 4<sup>th</sup> National Report on Biodiversity of Timor-Leste that was published in October 2011. The information it contains has mainly been collected through participatory processes, involving four thematic working groups on (1) agricultural biodiversity, (2) forest and drylands biodiversity, (3) aquatic biodiversity, and (4) communication, education and public awareness (CEPA). The process was guided by a Steering Committee comprising of senior officials from different government agencies and organizations, and supported by wider stakeholder consultations.

In Part I, the report reflects on the importance of biodiversity, changes in status and trends of the country's biodiversity since the last report was issued, the main threats to it, the consequences for human well-being, and possible scenarios for future changes, with a particular focus on the areas of the four thematic working groups.

The report features new information on Timor-Leste's agro-biodiversity, including a list of well adapted crop species recommended for use in agriculture such as black mung and black soy bean. The agro-biodiversity database elaborated by the Ministry of Agriculture and Fisheries (MAF), GIZ/AMBERO, National University of Timor-Lorosa'e (UNTL) and the non-governmental organization (NGO) Permatil lists 200 crop species in 555 varieties that are cultivated and/or used by Timorese farmers. Other new information refers to extension of land and forest cover and the rate of deforestation and forest degradation. Approx. 59% of the total land area of the country is covered by forest, but only 1.7% by remaining primary forests found mainly in Lautem and Covalima districts. Between 2003 and 2012, there has been a significant reduction in Timor-Leste's forest cover. Approx. 184,000 ha of forest, i.e. 17.5% of the forest area of 2003, had been lost in that 9-year period.

Additional information is given on the country's native flora and fauna, in particular for inland freshwater areas and coastal-marine ecosystems. A conspicuously high diversity of aquatic plants and freshwater invertebrates has been found in Lake Iralalaru and the Irasequiro River that originates from it. Several endemic and new species have been discovered in these freshwater habitats including a new species of hardyhead, a fish endemic to the Irasequiro River. Nevertheless, a lot of gaps remain with regard to invertebrates and Timor-Leste's freshwater biodiversity and limnoecology.

The report further elaborates on the major issues that threaten the conservation and sustainable use of the country's biodiversity. Climate change poses an overarching threat with potential impact on the entire biodiversity in Timor-Leste. Deforestation and slash and burn practices continue to be widespread leaving behind bare land which is prone to erosion and landslides. A recent forest inventory conducted by the Japan International Cooperation System (JICS) confirms that many of Timor-Leste's forests have been heavily affected by human induced deforestation and forest degradation and that the measures to stop and reverse these tendencies are lacking. Intensive grazing by domesticated animals exacerbates this pressure and threatens in particular remaining stands of natural forest as well as riparian vegetation across all elevation ranges leading to pollution of freshwater ecosystems. Moreover, a number of noxious invasive alien weed species, such as Siam Weed, Bellyache Bush, Big Sage and Prickly Acacia, today grow freely in

Timor-Leste's agricultural lands and grasslands produce huge numbers of seedlings and established plants every year thereby greatly reducing the productivity of farm lands and the land available for grazing. This may have considerable negative consequences for human health and well-being. The country's coastal and marine ecosystems have also been impacted by these environmental deteriorations. The loss of the country's mangroves, for instance, is alarming. In addition, several surveyed coral reef sites show clear signs of sedimentation stress from the soil erosion in the hinterlands.

Part II of the report looks at the NBSAP, its implementation, and the mainstreaming of biodiversity. The NBSAP that has been designed for the period of 2011 to 2020 and was published in October 2011 remains valid as a guiding document on biodiversity conservation and management in Timor-Leste. Moreover, the NBSAP is well aligned with the Aichi Biodiversity Targets. Several factual mistakes and inaccuracies reported in the NBSAP and 4<sup>th</sup> National Report on Biodiversity, however, have been addressed and corrected by this report.

So far, only a small percentage of the identified priority activities have been addressed satisfactorily (11%), while almost half of them have so far received little or no attention (45%) and a similar percentage has only made some progress (44%). Good progress has been achieved in CEPA related activities such as conducting workshops, conferences, exhibits and public dialogues, and establishing a Centre for Climate Change and Biodiversity; in sensitizing, mobilizing and organizing communities and creating pilot sites; as well as in improving and diversifying subsistence agriculture in rural areas. The country has advanced its preparations for accession of Timor-Leste to the Nagoya Protocol. On the other hand, the Clearing House Mechanism (CHM) has not been made operational despite the progress that had been made previously.

The thematic working groups have not reported back on the 161 further actions that had also been identified during the NBSAP process. A review of them, however, revealed a substantial amount of redundancies and inconsistencies with regard to the priority actions. These have been eliminated resulting in a significantly reduced number of 111 further actions.

Two case studies have been included in this section of the report that are of particular relevance to Timor-Leste: one on the traditional Tara Bandu jurisdiction that is still actively applied in villages all over the country and how it can support biodiversity conservation; the other on the management of Timor-Leste's Saltwater Crocodile populations in the context of social perceptions, beliefs and scientific realities.

In Part III, the report reflects on the progress that has been made towards achievement of the Aichi Biodiversity Targets and concludes with some specific recommendations for future priorities. Timor-Leste's contributions towards the Convention on Biological Diversity (CBD) strategic goals for over 60% of evaluated actions appear to have achieved moderate or higher progress, with one exception: CBD strategic goal B that is about reducing the direct pressures on biodiversity and promoting sustainable use for over 50% of evaluated actions comes out as having made little or no progress. Together with the finding that CBD strategic goal D on enhancing the benefits to all from biodiversity and ecosystem services scored best in the analysis, this seems to well capture the overall situation of the country and may be used as a basis for future planning.

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## PART I

# AN UPDATE ON BIODIVERSITY STATUS, TRENDS, AND THREATS AND IMPLICATIONS FOR HUMAN WELL-BEING

## 1. Importance of biodiversity

It is increasingly understood that the biodiversity of genes, species, and ecosystems is an essential contributor to healthy, resilient environments and should be protected, conserved and used sustainably for the benefit of mankind.

Some components of biodiversity, such as the diversity and varieties of agricultural crops (agrobiodiversity) that have been used and developed over centuries by rural people under specific environmental conditions, are directly related to human needs and activities. Other components of biodiversity form parts of natural or semi-natural ecosystems, such as forests, drylands, inland freshwater areas, and coastal and marine habitats.

An increasing number of studies from environmental economists are aiming to identify monetary values of potential conservation benefits as well as their investment costs, including costs of missed opportunities, which can serve as guidelines for investments in nature conservation in a competitive funding environment (e.g., Hussain *et al.*, 2011). A number of recent working papers for identifying and prioritizing the most worthwhile biodiversity targets in the context of the post-2015 development agenda and based on the Convention on Biological Diversity (CBD) Aichi Targets (ATs), dated 21/22 October 2014, found that reducing the loss of coral reefs, forests and wetlands by (at least) 50% have excellent benefit-to-cost ratios (Markandya, 2014; Brander, 2014; McVittie, 2014).

Given that coral reefs, tropical dry and moist forests, and wetlands (mainly coastal habitats but also some large inland freshwater areas like Lake Iralalaru) are important features of Timor-Leste, it goes without saying that these findings are very relevant for the country and for the whole region. In this regard, Timor-Leste also has a global responsibility to protect and conserve these ecosystems comprehensively and sustainably.

Timor-Leste is situated in an important transition region known as Wallacea. This region, situated between the Australian and Asian continents is confined to the area between the Wallace and the Weber/Lydekker faunal boundaries separating the Asian and Australian ecozones. The Wallacea region covers the region east of Bali and west of New Guinea, including the island groups of Sulawesi, Lesser Sundas, and Maluku. Wallacea is a known biodiversity “hotspot” where species from Asia and Australia meet and mingle and has been presented as the epicentre for speciation of several taxonomic groups (Tornabene *et al.*, 2015). Not only is Timor-Leste located at the south-eastern boundary of Wallacea, it also lies in the heart of the Coral Triangle, a global centre of marine diversity (Veron *et al.*, 2009).

Important Bird Areas (IBAs) form the core of a network of sites for all wildlife: Key Biodiversity Areas (KBAs). So far, 16 IBAs have been identified and confirmed in Timor-Leste: 14 on the mainland and two on offshore islands (Atauro and Jaco islands). They cover a total area of 1,852 square kilometers, about 12.5% of Timor-Leste’s total land area. All 16 IBAs support populations of some of the restricted-range birds of the Timor and Wetar Endemic Bird Area (EBA), and 10 of them are known to support populations of globally threatened bird species.

Of the threatened species, Yellow-crested Cockatoo is known from eight of the IBAs, Timor Green Pigeon from six, Timor Imperial Pigeon from two, and Wetar Ground Dove from a single IBA (Trainor *et al.*, 2008).

Five possible additional IBAs have been identified as well, however, the available biological information is currently insufficient to judge whether they qualify for an IBA or not. Thus, further ornithological surveys are required to help develop the IBA network and to improve understanding of the status of threatened and restricted-range birds.

The country's IBA network currently covers all major terrestrial habitats found in Timor-Leste, including extensive areas of lowland monsoon forest, tall evergreen forest and montane forest. Several IBAs retain small areas of coastal forest and strand vegetation. There are nationally important wetlands in eight IBAs, including freshwater and saline lakes, intertidal mudflats, swamps, mangroves, rivers and streams. Other habitats present in the IBAs are savanna woodland, shrub land, grassland and agricultural land (Trainor *et al.*, 2008). Thus, the sentence given in Timor-Leste's 4<sup>th</sup> National Report report saying that none of the country's wetland areas are large enough to support the number of birds required for consideration as an IBA (Democratic Republic of Timor-Leste, 2011b) is misleading.

### **1.1 Agricultural Biodiversity**

Some components of biodiversity are immediately related to human needs and activities. For predominantly rural societies such as in Timor-Leste it is essential to conserve and sustainably use the country's agricultural biodiversity in well managed agro-ecological landscapes, particularly in the context of changing climatic conditions.

### **1.2 Forest and Drylands Biodiversity**

Forests provide invaluable protective and purifying functions as well as important recreational services for local residents and visitors alike. And they provide refuge for innumerable species of wild animals and plants, especially tropical rainforests and coastal forests. Given the diversity of tropical forests in Timor-Leste, the steep slopes and long coastlines, this is indeed relevant for the country. At the same time, growing forests take up carbon dioxide from the air and produce oxygen. Forests store carbon and can lock it away for decades and centuries. The studies mentioned above (Markandya, 2014; Brander, 2014; McVittie, 2014) suggest that reducing global forest losses by 50% is likely to produce a tenfold return on investment: no doubt, an excellent investment for the future.

### **1.3 Aquatic Biodiversity**

Moving from the ocean inland, the country is noticeably divided into two distinct regions by a mountainous spine which transverses its territory from west to east creating different rainfall patterns in Timor-Leste's north and south coast (Gertil, 2002). Timor-Leste's north coast is rocky and steep with arid woodlands being the dominant vegetation type. When present, coastal plains moving towards the Banda Sea tend to be very narrow.

There are two exceptions: Dili and the Manatuto Districts where the coastal plains are slightly wider than elsewhere along this coast (Boggs *et al.*, 2009).

Most rivers on the north coast only flow during the rainy season and are choked by gravel on the way to the coast. Because of the very steep off-shore gradient few deltas are found here. On the north coast, the sediments that reach off-shore zones are deposited in deep water (Sandlund *et al.*, 2001).

It has been proposed that river inputs to the coastal zone along the north coast are limited to rapid wet season pulses that extend as a confined plume perpendicular to the mouths of the rivers (Alongi *et al.*, 2009). Moreover, it is believed that the nutrients in these plumes lead to limited plankton blooms and to reproductive synchrony of some fish and epibenthic organisms. Most marine productivity other than the one in coral reefs appears to happen in the surf zone where fish and other edible items are easily caught (Alongi *et al.*, 2009).

Slope inclination in the coastal plains extending towards the Timor Sea often range from 3% to 6% (Gertil, 2002) making river deltas, lagoons, floodplains and swamps characteristic features of this coast. Long stretches of sandy beaches with heavy waves are common in the south coast rendering the near shore waters turbid throughout the year (Sandlund *et al.*, 2001). The entire south coast lies in an important water basin that accumulates sediments and produces hydrogen (Tomascik *et al.*, 1997). This is where most of the off-shore oil and gas of Timor is found.

Additionally, the wider, shallower shelf of the south coast naturally retains river-borne sediments and nutrients, and stimulates benthic and pelagic productivity (Alongi *et al.*, 2009). However, more research needs to be done to test this hypothesis. The persistent current and wave actions of the south coast have created beach ridge plains which run parallel to the shore. These ridge plains often form lagoons and are important zones for mangrove colonization. Unlike the mangrove forests of the north coast, mangroves of the south coast are sparse and cover smaller areas (Alongi *et al.*, 2009). An overview of the biodiversity of mangroves, seagrass beds and meadows in Timor-Leste can be found in Pinto (2014b).

### **1.3.1 Biodiversity of inland wetlands**

Wetlands provide significant protective and purifying functions, as well as important recreational services. And they provide refuge for a significant number of species of wild animals and plants. This is again very relevant for Timor-Leste as inland freshwater and coastal-marine wetlands are important features of the landscape. Wetlands, in particular peatlands, store carbon and can lock it away over a long time. Studies suggest that reducing global wetland losses by 50% are likely to produce the same benefit-to-cost ratio as forests do: a tenfold return on investment (Markandya, 2014; Brander, 2014; McVittie, 2014).

### 1.3.2 Coastal and marine biodiversity

According to the above mentioned studies, saving coral reefs is the best investment. Not only do coral reefs provide shelter, homes and nurseries to an abundance of different species. Their fringing barriers provide protection to coastal communities and their amazing beauty has the potential to attract national and international visitors and thereby create substantial tourism revenues and employment opportunities for local people.

The said analyses show that reducing global coral loss by 50% may cost about US\$ 3 billion per year but the total benefits are likely around US\$ 72 billion, with other words: a US\$ 24 return on every invested dollar (Markandya, 2014; Brander, 2014; McVittie, 2014).

The first systematic attempt to promote the conservation and management of marine biodiversity in Timor-Leste was done through the Lesser Sunda Marine Protected Areas Network Design (Wilson *et al.*, 2009). Subsequent desk reviews (Grantham *et al.*, 2011) and prioritization exercises (Pinto, 2014a) have highlighted some of the issues with the proposed marine protected area (MPA) boundaries presented in the Lesser Sunda MPA Network. Pinto (2014a) provided an updated version to Wilson and colleagues (2009) and incorporated data published after Wilson and colleagues' seminal work (Wilson *et al.*, 2009).

A recent review of biodiversity data by the Critical Ecosystem Partnership Fund (CEPF) for the Wallacea hotspot identified several marine KBAs in Timor-Leste (CEPF, 2014). These areas tend to match closely the prioritized areas mentioned above (Pinto, 2014a).

Part of Timor-Leste's unique marine heritage comes from the fact that this country is bathed by two distinct seas: the Timor Sea in the south and the Banda Sea in the north. Both seas converge at the eastern part of Timor-Leste resulting in an interesting area that supports diverse marine biota. This area has been incorporated into the country's first and only National Park, the Nino Konis Santana National Park (PNNKS).

## 2. Changes in status and trends of biodiversity since the last national report

The NBSAP of Timor-Leste (2011-2020) and related 4<sup>th</sup> National Report on Biodiversity (Democratic Republic of Timor-Leste, 2011a/b) already report on the available data of the country's flora and fauna. In addition to what had been documented there, this report contains new information on agricultural biodiversity, including a list of well adapted crop species recommended for use in agriculture (see Table 1). New information is also provided for changes in land and forest cover and the extent of deforestation and forest degradation.

With regard to Timor-Leste's native fauna, some main species groups such as mammals, birds, reptiles and amphibians have been studied to some degree at some locations. Best documented is as usual bird life. At least 262 bird species are known from Timor; 169 are considered resident, 76 regular migrants and 17 vagrants. Since all major habitats exist on both sides of the border, all birds listed for Timor island could be expected to occur in Timor-Leste (and vice versa), but this may not be true. Two resident West Timor land birds remain unknown from the East: Elegant Pitta (*Pitta elegans*) and Timor Bush Warbler (*Bradypterus timorensis*). The pitta appears genuinely absent from the East, but can be locally abundant in the West, while the Timor Bush Warbler may be rediscovered on either side. Two species known only from Timor-Leste are Orange-footed

Megapode (*Megapodius reinwardt*; present on Atauro and Jaco islands as a breeding resident, and visitor to the extreme eastern tip of the eastern mainland) and Pheasant (Timor) Coucal (*Centropus (mui) phasianinus*) which is apparently restricted to Lautem district in the extreme east (Trainor *et al.* 2007).

The non-bird fauna of Timor-Leste and associated islands, though, remains poorly known, in particular invertebrates. For terrestrial habitats, this situation has not much changed since the 4<sup>th</sup> National Report on Biodiversity was published. For aquatic systems, however, including inland wetlands and coastal-marine ecosystems, the report at hand contains significant additional information.

## 2.1 Agricultural Biodiversity

According to Timor-Leste's 4<sup>th</sup> National Report on Biodiversity (Democratic Republic of Timor-Leste, 2011b), the main cereal crops in Timor-Leste are rice and maize, and the main cash crop is coffee. There is little agricultural diversification. Upland agriculture faces additional challenges in the form of 'slash and burn' methods and the loss of soil during heavy rains. Improved breeding materials of key food crops such as maize, sweet potato, cassava, peanuts, and rice have been introduced into the country through the Seeds of Life Programme (cf. SoL Annual Research Report 2007). Later, the number of examined species was expanded to include potatoes, mung beans and climbing beans (cf. SoL Annual Research Report 2009). Rice is commonly grown in the warmer lowland areas while maize is grown at medium altitudes. Other crops such as root crops are grown at even higher elevations.

It is estimated that 1,740 square kilometers (29%) of approx. 6,000 square kilometers of suitable land for agricultural production, including livestock, are used for crop production only. An additional 1,240 square kilometers are estimated to be available for agricultural use. However, this additional land is still covered with shrubs, making the land unsuitable for farming. Soil depletion in upland areas is heavy and 'slash and-burn' is still widespread, further jeopardizing already low levels of agricultural production and productivity in the country. Non-farm rural employment opportunities are practically non-existent except where public works projects (for roads, bridges, flood control, etc.) hire local manpower. Insufficient diversification and lack of rural infrastructure (e.g., irrigation, markets, extension, roads, energy, and rural credit) as well as recurrent natural disasters and social unrest further contribute to low agricultural productivity and rural poverty. Moreover, climate change is impacting on the country in terms of erratic rainfall, drought and floods (Democratic Republic of Timor-Leste, 2011b).

The 4<sup>th</sup> National Report mentions that approx. 85 percent of Timor-Leste's population subsists on agriculture and that about 50 percent of the population lives in rural areas (Democratic Republic of Timor-Leste, 2011b). The latter figure, however, is not accurate. According to the latest population census of 2010, 70.4% of Timor-Leste's population lived in rural areas (DNE/UNFPA, 2011). The newer Draft Medium Term Operation Plan (2014-18) of the MAF even gives a higher ratio saying that "approximately 75% of Timorese live in rural areas, a majority of whom derive their livelihoods from agriculture" (National Directorate of Policy and Planning, 2013).

According to recent observations, the main cereals continue to be maize and rice, with the main cash crop being coffee. There is, however, a great deal of biodiversity in agriculture. The agrobiodiversity database elaborated by MAF, GIZ/AMBERO, UNTL and Permatil lists 200 crop species in 555 varieties that are cultivated and/or used by Timorese farmers. This database only includes data from 26 pilot villages (sucos) distributed over five districts. Actual diversity is likely much higher. Cultivation of more resistant crops from local varieties can render unproductive soils more productive. Moreover, local varieties are more resistant to many pests and diseases. They are often highly nutritious (e.g., black mung and black soy bean) and are continuously adapting to climate change. The use of local varieties proved to be good agricultural practices. Black and red rice, for example, as well as local mung beans produced up to 3 tons / ha, while local soy beans produced up to 2,5 tons / ha (information from MAF/GIZ/AMBERO and MAF/GIZ/RDP IV demonstration plots).

**Table 1** – Important crop species recommended for use in agriculture (from ABD booklet under preparation: Agro-Biodiversity in Timor-Leste – Important plants for the life of Timorese People)

Scientific name	English name	Tetun name	Crop type
<i>Oryza sativa</i>	Black Rice	Hare Metan	grain
<i>Oryza sativa</i>	Red Rice	Hare Mean	grain
<i>Eleusine coracana</i>	Millet	Fotan	grain
<i>Sorghum sp.</i>	Sorghum	Batar Ai Naruk	grain
<i>Zea mays</i>	Maize	Batar	grain
<i>Coix lacryma-jobi</i>	Jobs Tears	Batar Fatuk	grain
<i>Phaseolus aureus</i>	Black Mung Bean	Fore Mungu	bean
<i>Mucuna pruriens</i>	Velvet Beans	Lehe	bean
<i>Cajanus cajan</i>	Pigeon Pea	Tunis	bean
<i>Arachys hypogea</i>	Peanut	Fore Rai	bean
<i>Capsicum grossum</i>	Chili	Ai Manas	spice / aromatic plant
<i>Zingiber officinale</i>	Ginger	Ailia	spice / aromatic plant
<i>Curcuma longa</i>	Tumeric	Kinur	spice / aromatic plant
<i>Piper retrofractum</i>	Wild Pepper	Ai Manas Aileten	spice / aromatic plant
<i>Coffea sp.</i>	Coffee	Kafe	spice / aromatic plant
<i>Piper nigrum</i>	Black Pepper	Pimenta	spice / aromatic plant
<i>Cinnamomum verum</i>	Cinnamon	Ai Kanela	spice / aromatic plant
<i>Centella asiatica</i>	Gutocola	Dareta	herb
<i>Mentha cordifolia</i>	Mint	Ortalaun	herb
<i>Ocimum basilicum var.</i>	Basil	Ruku	Herb
<i>Cymbopogon citratus</i>	Lemongrass	Dut Morin	herb
<i>Moringa oleifera</i>	Moringa	Marungi	tree / shrub
<i>Aloe vera</i>	Aloe Vera	Karau Nanal	tree / shrub
<i>Theobroma cacao</i>	Cocoa	Kakao	tree / shrub
<i>Indigofera tinctoria</i>	Indigo	Taun	tree / shrub
<i>Gossampium arboreum</i>	Cotton	Kabas	tree / shrub
<i>Dioscorea ssp.</i>	Lesser Yam	Kumbili	root crop
<i>Colocasia esculenta</i>	Taro	Talas	root crop
<i>Canna edules</i>	Canna	Kontas	root crop
<i>Discorea alata</i>	Greater Yam	Uhi	root crop
<i>Amorphophallus paeoniifolius</i>	Elephant Foot Yam	Maek	root crop
<i>Aegle marmelos</i>	Bael Fruit	Aidila Fatuk	fruit
<i>Phortinia japonica</i>	Loquat	Nespra	fruit

<i>Annona squamosa</i>	Custard Apple	Aiata Kiik	fruit
<i>Rubus villosus</i>	Blackberry	Ai Amora	fruit
<i>Pouteria sapote</i>	Sapoti	Diospiro	fruit
<i>Punica granatum</i>	Pomgranade	Rumaun	fruit
<i>Ananas comosus</i>	Pineapple	Ainanas	fruit
<i>Artocarpus heterophyllus</i>	Jack Fruit	Kulu Jaka	fruit
<i>Carica papaya</i>	Papaya	Aidila Funan Fuan	fruit
<i>Musa spp.</i>	Red Banana	Hudi	fruit
<i>Arenga pinnata</i>	Sugar Palm	Tua Meatan/Fuik	palm / bamboo
<i>Cocos nucifera</i>	Coconut Palm	Nu	palm / bamboo
<i>Bambusa lako</i>	Black Bamboo	Au Metan	palm / bamboo
<i>Metroxylon sagu</i>	Sagu Palm	Tali Akar	palm / bamboo
<i>Calamus sp.</i>	Rattan	Rotan	palm / bamboo
<i>Ruta graveolens</i>	Arruda	Aruda	medicinal plant
<i>Morinda citrifolia</i>	Noni	Mengkudu	medicinal plant
<i>Aspeliun nidus</i>	Birds Nest	Bukae/Manu Huluk	medicinal plant
<i>Alstonia scholaris</i>	Devil Tree	Ai Hanek	medicinal plant
<i>Solanum melongena</i>	Eggplant	Brinzela	vegetable
<i>Solanum lycopersicum</i>	Tomato	Tomate	vegetable
<i>Amaranthus sp.</i>	Amaranthus	Bayam Mutin	vegetable
<i>Pleurotus ostreatus</i>	Oyster Mushroom	Kulat	vegetable

## 2.2 Forest and Drylands Biodiversity

For plants, in particular forests, the generic situation is well documented but there are no comprehensive floral and forest inventories. Based on a preliminary survey of the flora and fauna of Timor-Leste conducted in collaboration with Birdlife International, more than 251 tree species had been identified as native. At the species level, there could be high levels of endemism. Most valuable native species are sandalwood (*Santalum album*; considered critically endangered) and rosewood (*Pterocarpus indicus*). Three native forest species appear to be dominant: *Eucalyptus alba*, *Eucalyptus urophylla* and *Pterocarpus indicus* (Democratic Republic of Timor-Leste, 2011b). *Eucalyptus alba* and *Acacia sp.* are the dominant dry forest species. They are widely distributed in the districts of Liquiça, Dili, Manatuto, Baucau and Lautem (JICS and NDF, 2013a).

The dominant natural vegetation of Timor-Leste originally consisted of closed forest with areas of natural sedge and grassland vegetation on the floodplains of Lake Iralalaru. The primary forests around Los Palos and in the Lake Iralalaru basin have extensively been converted by humans into grassland, cropland and secondary forests (Democratic Republic of Timor-Leste, 2011b). According to the country's first detailed forest cover maps realized under a JICS grant aid by Japan, total cover of forest is 58.9%, of grassland 27.4%, of very sparse forest 4.2%, of bare land 3.3%, rice paddies 2.8%, water bodies 1.6%, dry farmland 1.5% and settlements 0.2%. The new forest maps include dense (>60% crown density) and sparse cover forests (20-60% crown density), but exclude forests with very sparse cover (<5% crown density). Mosaic land use areas, i.e. small-sized forests, dry fields and grasslands, interspersed with some residential areas, cover approx. 44% of the whole country.

Coffee plantations are concentrated in Liquiça, Ermera, Aileu, Ainaro and Manufahi districts. The biggest mangrove forest area is located in Dili district (JICS and NDF, 2013a).

Altogether, the area of sparse forest is almost 1.8 times the size of the area of dense forest. Between districts, in general, forest cover does not markedly differ. Based on these national forest maps, only 1.7% of the total land area of Timor-Leste is still covered by primary forest (cf. Figure 1). Significant areas can be seen in Lautem and Covalima districts. The last major stretches of old primary forest are mainly located in the Tutuala sub-district of Lautem (JICS and NDF, 2013a; cf. Figure 2).

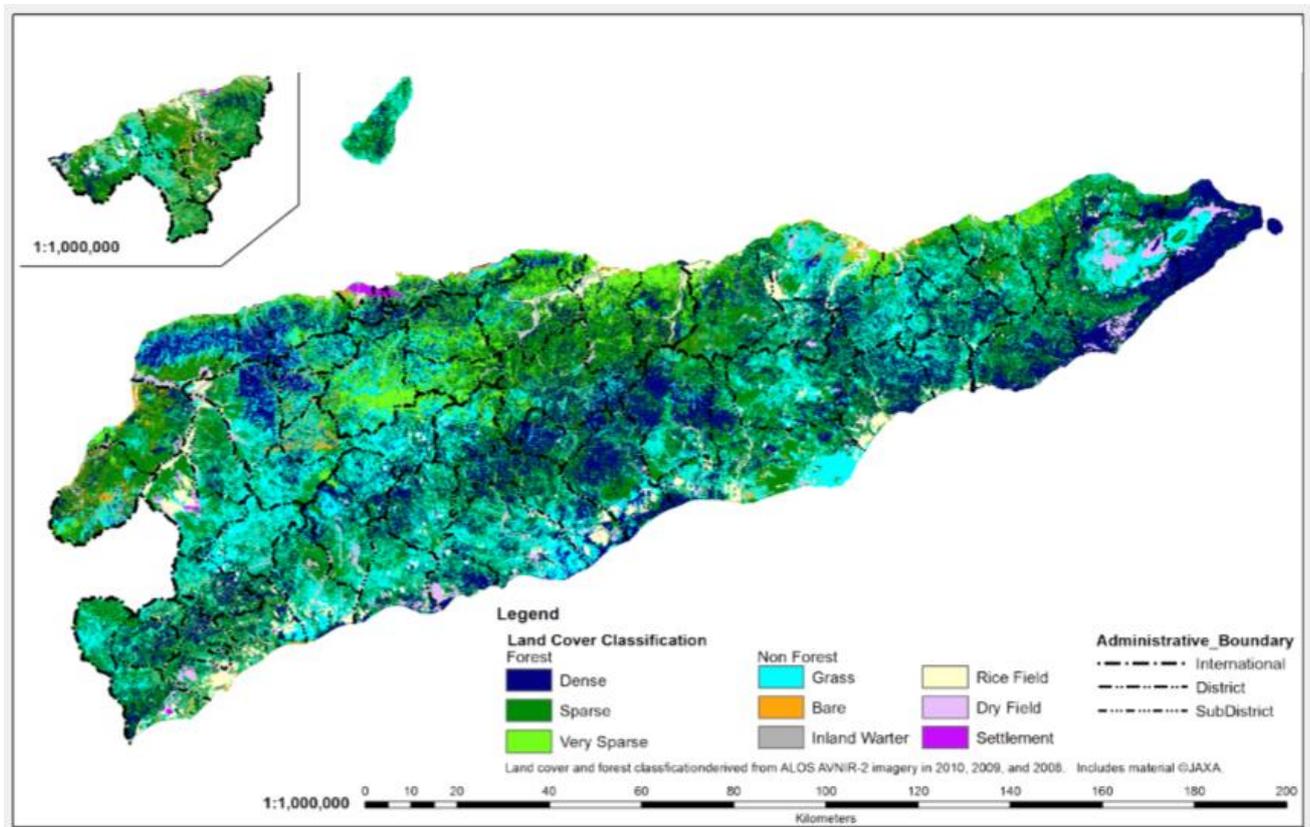
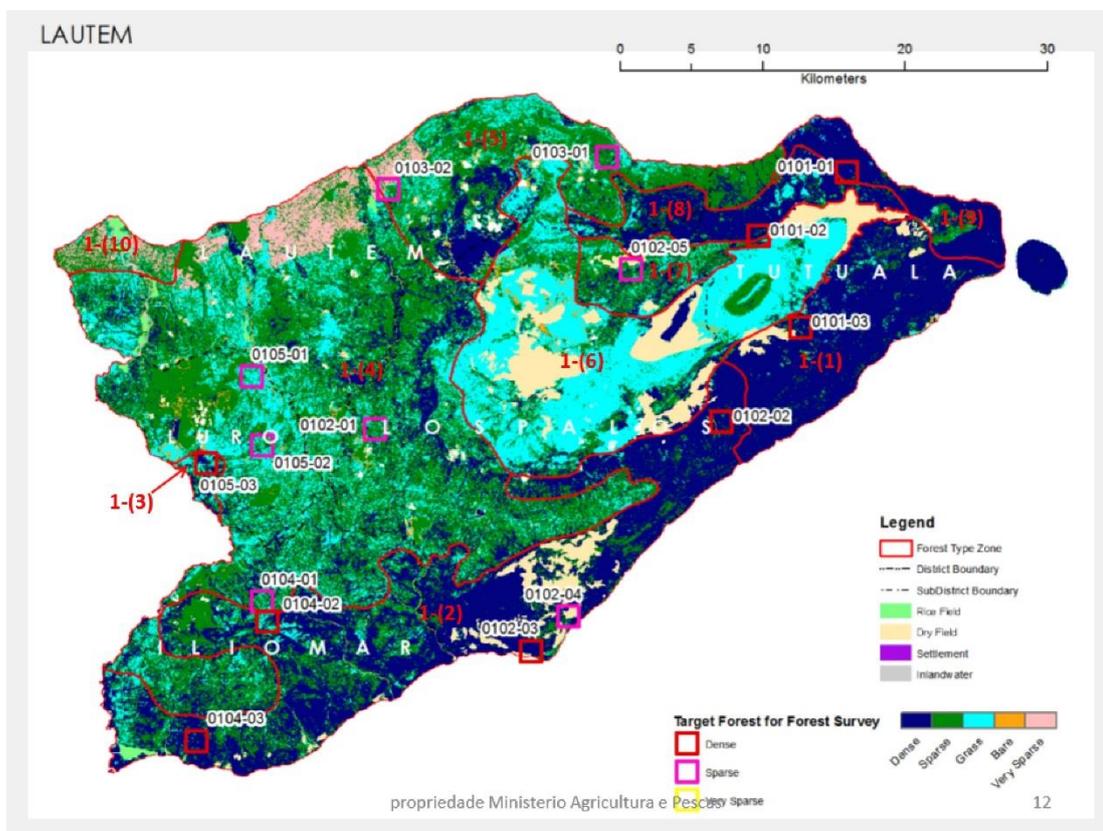


Figure 1 – National Forest Map (source: JICS and NDF. 2013c)



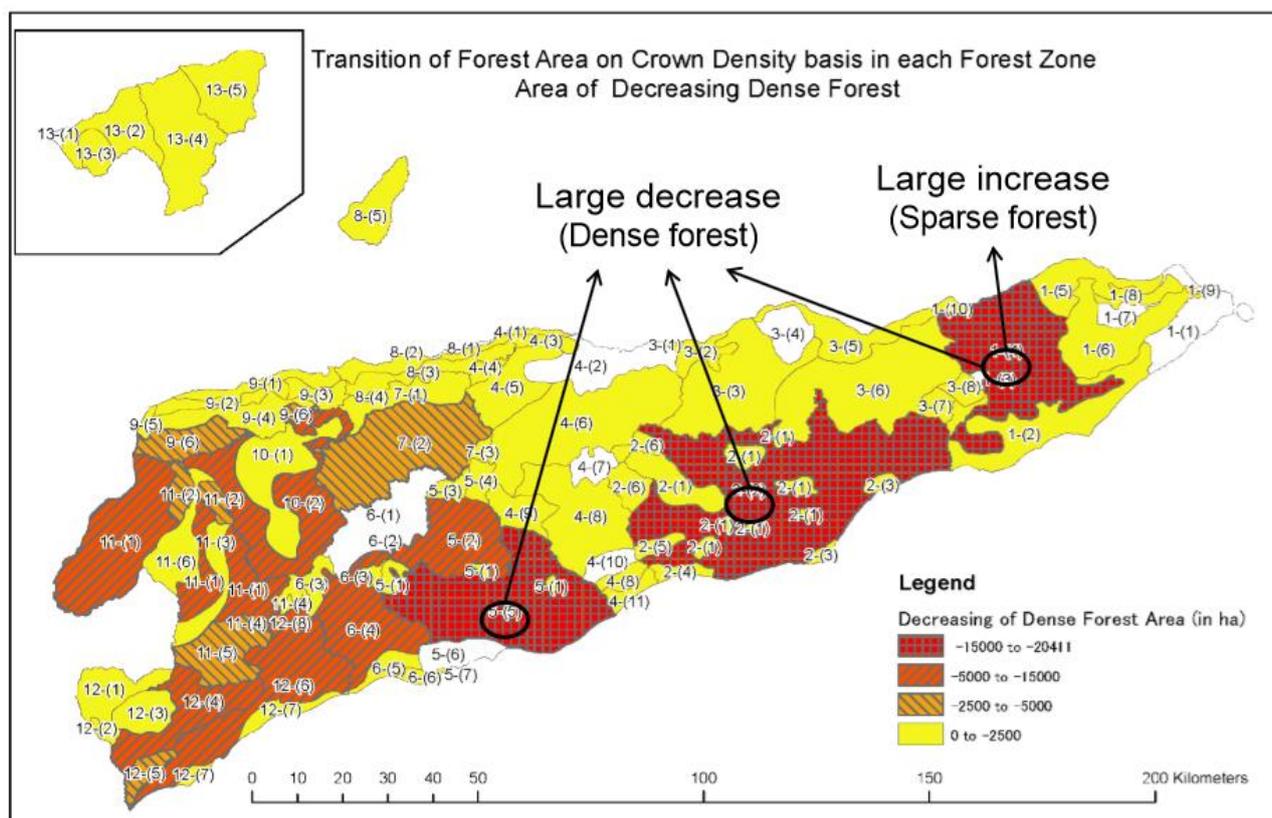
**Figure 2** – Land cover map of Lautem district (source: JICS and NDF. 2013a)

The JICS forest and land cover survey documents a significant reduction in Timor-Leste’s forest cover between 2003 and 2012 concluding that deforestation is widespread in all districts for dense and sparse forests and that the reduction in dense forest cover has been particularly high in the districts of Lautem, Viqueque, Bobonaro, Covalima and Manufahi (cf. Figure 3).

The area of dense forest decreased in almost all sub-districts while the area of sparse forest increased in some sub-districts (altogether, decrease of sparse forest also outweighs the increases). Ermera district showed consistent large decreases in sparse forest. The study estimates that 184,000 ha of forest, i.e. 17.5% of the forest area of 2003, had been lost in that 9-year period (171,000 ha / 16.2% of dense forest and 13,000 ha / 1.2% of sparse forest), a trend that could be seen in all districts. According to this and another recent study, fragmented forests (mosaic land use) are widespread in Viqueque, Baucau, Manufahi, Liquiça and Covalima districts (JICS and NDF, 2013b; Marques *et al.*, 2010).

Timor-Leste’s 4<sup>th</sup> National Report on Biodiversity mentions that based on earlier analyses of satellite images forest cover in Timor-Leste had decreased by almost 30 percent from 1972 to 1999 (Democratic Republic of Timor-Leste, 2011b). Other figures on deforestation and forest cover given in that report, however, are not consistent with the newer more elaborate and

reliable JICS assessments, results of which are reported above<sup>1</sup>. Based on the national forest maps and other recent data such as on the proposed protected area network, a draft forest conservation plan has been elaborated that helps to identify important forest areas for biodiversity conservation (Figures 4 and 5) and allows to project future scenarios (JICS and NDF, 2013a/c; see chapter 5).



**Figure 3 – Forest zones with significant deforestation of dense forest (source: JICS and NDF. 2013b)**

<sup>1</sup> Consequently, inconsistent figures have been replaced in the revised edition of NBSAP by figures from the JICS assessment.

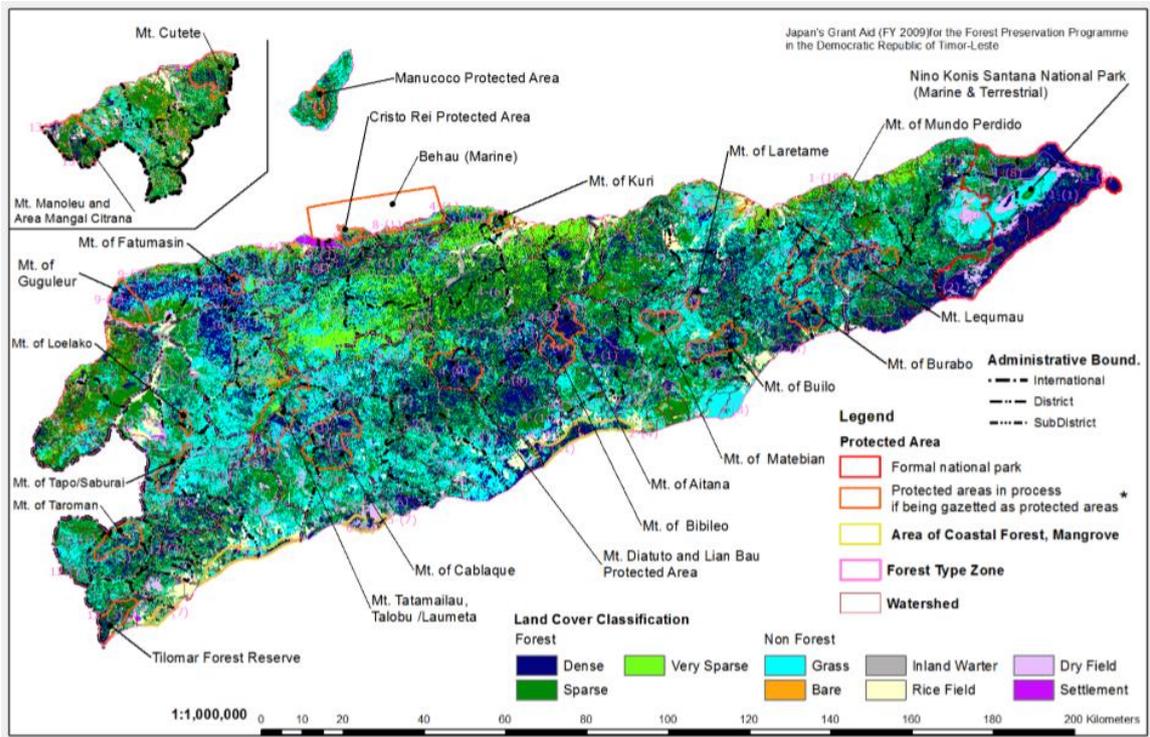


Figure 4 – Important forest areas for biodiversity conservation (source: JICS and NDF. 2013c)

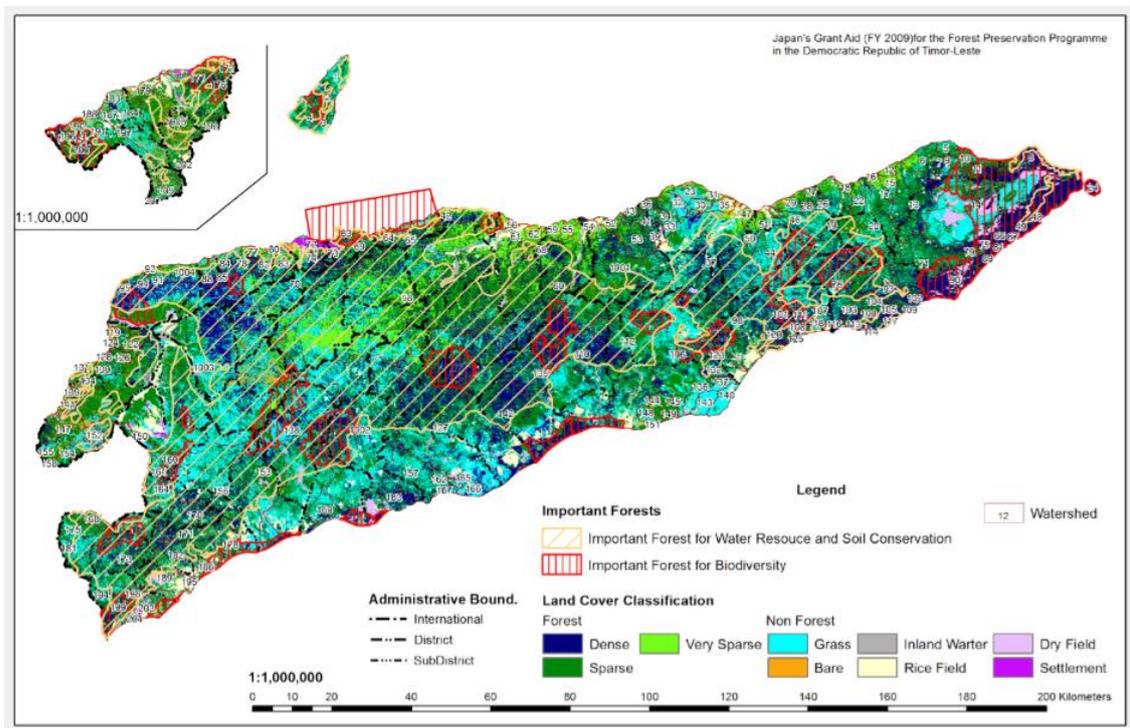


Figure 5 – Important forest areas for biodiversity, watershed and water and soil conservation (source: JICS and NDF. 2013c)

## 2.3 Aquatic Biodiversity

### 2.3.1 Biodiversity of inland wetlands

There is very little information on the inland wetlands of Timor-Leste. Even the most basic data such as pH values are missing (Monk *et al.*, 1997). During the Indonesian occupation, Timor was given little to no attention with regard to limnoecology (Giesen, 1991). To date, no ecological study of aquatic plants in Timorese freshwater systems has been published. Giesen (1991) lists the possible occurrence of 241 species in Nusa Tenggara (which previously included Timor-Leste). The same author also notes the existence of 63 introduced species. Table 2 gives a checklist of rare aquatic plants that are known to occur in Timor.

**Table 2** – Rare aquatic plants suspected to occur in Timor-Leste (adapted from Monk, 1997)

Scientific species name	Publication/specimen held in
<i>Aldrovanda vesiculosa</i>	Santapau (1969)
<i>Anagallis fumila</i>	Specimen in the Australian National Museum <sup>2</sup>
<i>Caldesia parnassifolia</i>	Specimen in the Australian National Museum <sup>3</sup>
<i>Cladium mariscus</i>	Specimen in the Australian National Museum <sup>4</sup>
<i>Cyperus alopecuroides</i>	Musée Nationale D’Histoire Naturelle <sup>5</sup>

Cowie (2006) provides the first overview of the herbaceous and aquatic vegetation in Lake Iralalaru and the Irasequiro River that originates from it, the largest freshwater system of Timor-Leste with a particularly high diversity of aquatic plants (White *et al.*, 2006). He found *Ceratophyllum demersum* and *Ottelia alismoides*, floating leaved *Potamogeton distinctus* and the emergent sedge *Schoenoplectus mucronatus* to be dominant.

#### a) Freshwater vertebrates

Larson and Pidgeon (2004) were amongst the first authors to provide a comprehensive checklist of freshwater fish in Timor-Leste. This work was followed by the discovery of a new species of freshwater fish (Larson *et al.*, 2005) and an updated checklist of freshwater vertebrates (Larson *et al.*, 2007) which remain the most comprehensive datasets available for Timor-Leste. Adapted from Larson *et al.* (2007), Table 3 provides a summary of native freshwater fish found in Timor-Leste.

<sup>2</sup> <http://biocache.ala.org.au/occurrences/4e1fb550-fa0b-4401-815c-f87deb466ca6;jsessionid=BB3CEEE51B1C7CB6EA08A43DD127A24>

<sup>3</sup> <http://avh.ala.org.au/occurrences/search?q=Isid:urn:lsid:biodiversity.org.au:apni:taxon:395565&fq=assertions:%22decimalLatLongConverted%22&start=160>

<sup>4</sup> <http://biocache.ala.org.au/occurrence/search?q=Isid%3Aurn%3Aalsid%3Abiodiversity.org.au%3Aapni:taxon%3A744568>

<sup>5</sup> <http://science.mnhn.fr/institution/mnhn/list?order=null&genus=Cyperus&specificEpithet=alopecuroides>

Nevertheless, many freshwater systems of Timor-Leste are not yet surveyed with Atauro Island being a prominent example. Population studies on endemics of the Timor Island such as *Oryzias timorensis*, another freshwater fish species (family Adrianichthyidae), are currently underway (per. comm., Dr. Satoshi Hamaguchi), however, there has been little interest and effort so far to expand the currently limited knowledge of Timor-Leste's freshwater biodiversity and limnoecology.

**Table 3** – Native freshwater fish found in Timor-Leste (adapted from Larson *et al.*, 2007)

Scientific species name	English species/family name
<i>Anguilla celebesensis</i>	Celebes longfin eel
<i>Anguilla marmorata</i>	Giant mottled eel
<i>Anguilla reinhardtii</i>	Speckled longfin eel
<i>Lamnostoma mindora</i>	?
<i>Craterocephalus laisapi</i>	Laisapi (Fataluku)
<i>Kuhlia marginata</i>	Dark-margined flagtail
<i>Kuhlia rupestris</i>	Rock flagtail
<i>Liza melinoptera</i>	Otomebora mullet
<i>Belobranchus belobranchus</i>	Throat-spine gudgeon
<i>Bunaka gyrinoides</i>	Greenback gauvina
<i>Eleotris fusca</i>	Dusky sleeper
<i>Giuris margaritacea</i>	Snakehead gudgeon
<i>Awaous melanocephalus</i>	Largesnout goby
<i>Glossogobius celebius</i>	Celebes goby
<i>Mugilogobius cavifrons</i>	?
<i>Sicyopterus caeruleus</i>	Red-tailed goby
<i>Sicyopterus hageni</i>	Hagen's goby
<i>Sicyopterus micrurus</i>	Clinging goby
<i>Sicyopterus longifolis</i>	?
<i>Sicyopus zosterophorum</i>	?
<i>Stiphodon semoni</i>	?
<i>Stenogobius blokzeyli</i>	?
<i>Rhyacichthys aspro</i>	Loach goby

#### **b) Freshwater invertebrates**

Polhemus and Helgen (2004) provided a first insight into the diversity of some freshwater invertebrates. While their work was focused on three major groups, they were able to find at least seven new species to science. Freshwater invertebrate biodiversity in Timor-Leste was found to be moderately high compared to regional standards. Conspicuously high is the number of invertebrates in Lake Iralalaru and Irasequiro River where 57 invertebrate families had been counted (White *et al.*, 2006). More such research is required on freshwater invertebrates in general, and on the karst cave formations of Lautem (White *et al.*, 2006) and Baucau districts as well as the high altitude freshwater systems, in particular.

### 2.3.2 Coastal and marine biodiversity

Estuaries are semi-enclosed coastal bodies of water that have free connection to the open sea. In these water bodies, seawater tends to be more diluted with freshwater from terrestrial drainage. There have been few studies on estuaries in Timor-Leste but historical data from collections indicate the possible existence of *Arthrocnemum indicum*, a succulent halophyte plant of salt marshes (Monk *et al.*, 1997).

Altogether, location and biodiversity of Timor-Leste's estuaries remains greatly understudied. While some surveys mention work in marshes (e.g., Trainor *et al.*, 2007), few of them have actually been described.

There are no scientific studies of beach type or of the north coast's morphology. However, Creeping Beach Vine (*Pes caprae*) is found along many of its sandy beaches, and grasses such as *Spinifex sp.* are common on drier sections of the coast (Pinto, 2014b).

Contrary to what had previously been reported to the UN CBD Secretariat, most of the coral reefs and mangrove habitats in Timor-Leste are found in the northern Banda Sea and not in the southern Timor Sea. The 4<sup>th</sup> National Report, p.15, however, reports that "the north coast of Timor has very few coral reef, seagrass and mangrove habitats" (Democratic Republic of Timor-Leste, 2011b). The first comprehensive technical report summarizing biophysical data and providing insights into the country's marine biodiversity has corrected this mistake (Pinto, 2014b)<sup>6</sup> and better data has been collected during several field surveys (NOAA, 2012/2013; Catlin Seaview Survey, 2014) showing that the vast majority of the coral reefs, i.e. about 98%, are found on Timor-Leste's north coast.

First insights into the biodiversity of reefs (corals and coral reef associated fishes) can be found in Erdmann and Mohan (2013) with still more data on coral cover being in press (part of the NOAA 2013 fish biomass surveys). The cover of living hard corals averaged 28% in different sections of the north coast while dead coral cover in average was 9%, so overall the ratio of live to dead hard coral cover was positive (3:1) indicative of a reef tract in moderate to good condition in terms of coral cover (Erdmann and Mohan, 2013).

In spite of the growing interest in coral reef studies in Timor-Leste, more surveys are required in the "Atapupu Reefscape" and in what DeVantier *et al.* (2008) call the "Fatu Reefscape" which remain greatly unsurveyed. Different qualitative and quantitative data suggest also the existence of a reefscape in Baucau District (NOAA, in press).

The first data point from the long-term reef monitoring of the NOAA Autonomous Reef Monitoring Structures (ARMS) project in Timor-Leste is currently being processed. It will provide baseline data for cryptic invertebrates and for overall trends in reef biodiversity in the years to come.

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<sup>6</sup> <http://www.adb.org/sites/default/files/publication/42394/state-coral-triangle-timor-leste.pdf>

### 3. Main threats to biodiversity

#### a) Climate change

An overarching threat that impacts on all land- and seascapes of Timor-Leste and severely affects its biodiversity is climate change. A comprehensive recent update on these threats can be found in Timor-Leste's Initial National Communication for the United Nations Framework Convention on Climate Change (State Secretariat for Environment, 2014).

Although the MAF, some NGOs and bilateral agencies support the use of biodiversity-friendly farm practices that aim to conserve ecosystem services through climate smart agriculture, the significant threats and challenges of a changing climate for agriculture, in particular in upland areas, received little attention so far. Urgent measures required include terracing, slope and spring protection, as well as agricultural diversification based on native crop varieties.

#### b) Deforestation and forest degradation

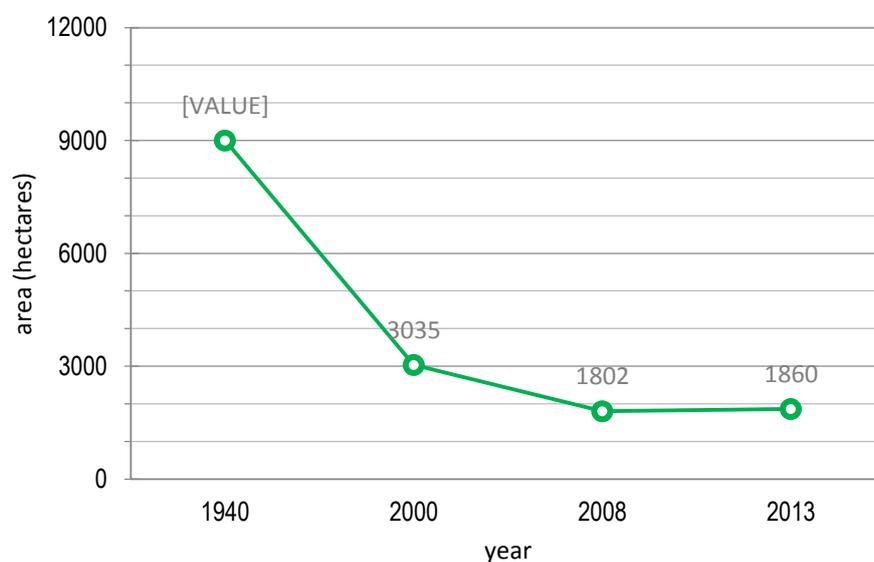
Deforestation and slash and burn practices continue to be widespread and leave behind bare land which results in landslides and further destruction of the natural capital and its biodiversity. In the medium and long term, this development negatively impacts as well on the high potential lowland agricultural areas.

Depletion of the country's forests proceeds in varying degrees across the island, often with only small pockets of dense primary forest remaining around the traditionally important sacred areas. Ebony, sandalwood and teak trees have almost completely been eliminated, yet illegal logging of these species continues. Non-availability of adequate land for cultivation continues to put pressure on forests by forcing people to cut down trees to meet their needs for arable land and fuel wood (Democratic Republic of Timor-Leste, 2011b).

In Timor-Leste, in 2011, the formal and informal forest sectors, mainly roundwood production, contributed 0.1% to the country's GDP (formal sector value: approx. 4 million US\$; and informal sector value: approx. 1 million US\$). Altogether, around 1000 people were employed in the formal and informal forest sectors (0.3% of the total labour force).

Non-mangrove coastal forests have been reduced to areas smaller than 100 ha with most of the remnants not exceeding 16 ha. The mixed structural groups of coastal open forest and closed palmland – dominated by *Corypha utan*, *Tamarindus indica*, *Borassus flabellifer* and *Schleichera oleosa* – tend to be decreasing with significant areas along Timor-Leste's north coast being converted for human settlements. There is currently no legislation protecting closed palmlands.

The loss of the country's mangrove and riparian vegetation has happened at an alarming rate (Pinto, 2014b). Coastal habitat mapping exercises (Boggs *et al.*, 2009; CDU, 2013) have shown a 40% loss of mangroves from 2000 to 2008 and an alarming 80% loss since 1940 (Boggs *et al.*, 2009; see Figure 6). Mangroves continue to be illegally harvested for fuel, food and construction, despite some local attempts at rehabilitation (Pinto, 2014b).



**Figure 6** – Mangrove area trend line since 1940 (not linear; adapted from Bouma & Kobryn, 2002; Boggs *et al.*, 2009; and CDU, 2013)

The JICS forest inventory survey confirms the assumptions that many of Timor-Leste’s forests continue to be heavily affected by deforestation and forest degradation through human interventions and that the measures to stop and reverse these developments are lacking (JICS and NDF, 2013a).

Other disturbances affecting the health and vitality of forests and consequently the Timorese people include forest fires, pests and diseases (Democratic Republic of Timor-Leste, 2011b). Recently there has been a programme under the MAF on controlling forest fires, including awareness raising through radio and TV broadcasts.

### **c) Erosion, sedimentation and pollution**

Intensive grazing by gregarious domesticated animals remains a major environmental pressure in Timor-Leste causing increased erosion throughout the sloping landscapes of inland Timor-Leste. Grazing also constitutes a major threat to small stands of native forest scattered over the upper reaches of the central highlands (Polhemus & Helgen, 2004).

Many of Timor-Leste’s coastal and marine ecosystems have negatively been impacted by erosion from deforestation, forest degradation and the loss of vegetation cover. The trends of fast growing human populations and increased population densities along Timor-Leste’s north coast, where the vast majority of the country’s coral reefs lie, are associated with increased pressures on biodiversity and adversely affect the integrity of the ecological services provided by the mangrove and coral reef ecosystems. DeVantier and Turak found that several surveyed coral reef sites show strong signs of sedimentation stress from soil erosion in the hinterlands (Erdmann and Mohan, 2013).

#### **d) Degradation of freshwater ecosystems**

Catchment degradation due to overgrazing by domesticated ungulates in the lowlands and water buffalo in the highlands of Timor-Leste have also damaged riparian zones across all elevation ranges, thereby impacting stream ecology and ecological services provided by freshwater systems (Polhemus & Helgen, 2004).

While there has been an increase in the use of fences and some protection of waterways, most efforts of the government have targeted springs and a small area around them rather than protecting entire waterways. Data from the 2010 census showed a marked increase in livestock. Without improvements in animal husbandry techniques and the protection of waterways, the degradation of freshwater systems and resulting loss of biodiversity will likely continue.

#### **e) Unsustainable use of natural resources**

A newly discovered species of Lake Iralalaru, the freshwater turtle *Chelodina timorensis* (McCord *et al.*, 2007), is seen by community members as on the decline. They have linked this development with the collection of eggs and individuals for food as well as the perceived increase of the lake's Saltwater Crocodile (*Crocodylus porosus*) populations.

Different projects have used Rapid Rural Appraisal (RRA) and Participatory Action Research (PAR) methods (CTSP, CT-Pacific) to assess resource user perception of coral health. This data, available from field reports, tends to focus on (1) PNNKS, (2) Lamsana inlet, (3) Batugade and (4) Atauro Island which are proposed under the Lesser Sunda MPA design. Overall, resource users noted a decrease in coral reef health – judged mainly by fish abundance – since the 1970's, with the lowest rankings during the Indonesian occupation (1975-1998) followed by a perceived improvement of reef health from 2002 to 2006 and again by a steady decrease in health from 2007 to 2013. The qualitative data (1970's until 2007) seem to match quantitative analysis and reconstruction of data from capture fisheries in Timor-Leste for the same time period (Barbosa & Booth, 2009). Data collected by NOAA (in press) has shown fish biomass to be relatively small displaying the classic features of overfishing (e.g., reduction in size and abundance of predator, high biomass of small herbivorous fish). Barbosa *et al.* (2014) have also highlighted some of these trends.

An ongoing review of the reproductive biology of fish being caught and sold by artisanal fishermen in local markets has shown that 80% of the species sold are known to display spawning aggregations (Pinto, unpublished report). Since spawning aggregations are predictable in time and space (Domeier, 2012), and fishermen are known to fish out these aggregations, the species displaying this particular reproductive trait are vulnerable to local extinctions (DeMitcheson & Erisman, 2012). Examples include several groupers currently listed in the IUCN Red List.

#### **f) Invasive alien species**

During Portuguese and Indonesian occupation of Timor-Leste, due to the lack of knowledge and awareness and of effective quarantine measures, a number of notorious exotic invasive weeds (pests) such as Siam Weed (*Chromolaena odorata*), Bellyache Bush (*Jatropha gossypifolia*), and Big Sage (*Lantana camara*), all species native to the American tropics, as well as Prickly Acacia (*Vachellia nilotica*), native to Africa, the Middle East and the Indian sub-continent and an invasive species of significant concern in Australia, had been introduced to Timor-Leste either as medicinal or garden ornamental plants and have spread widely into the country's agricultural lands and

grasslands. They produce huge numbers of seedlings, new plants and established plants every year.

The invasion of these noxious exotic weeds has significant adverse impacts on agricultural production, livelihoods and food security of Timorese subsistence farming communities. In particular, they are toxic to livestock and able to form dense thickets which, if left unchecked, can greatly reduce the productivity of farmland. Some farmers have been forced to abandon their land and shift to new areas for agricultural production. When invading agricultural areas these invasive plants often out-compete other more desirable species, leading to a reduction in biodiversity. They have become the dominant plant species over extensive areas of Timor-Leste. In many villages, 60% or more of the arable land is now covered by exotic weeds that are able to thrive over a wide range of soil types and altitudes. Not only do they threaten local livelihoods but also the economy, including tourism development.

The intrusion of these highly invasive alien plant species also negatively affects animal production. Under Portuguese administration, Bali cattle have been introduced to Timor-Leste to promote commercial livestock. The cows were highly adaptable to the island's seasonal drought conditions and exhibited consistent annual calving rates. During Indonesian occupation, increased numbers of livestock were exported to Indonesia, particularly to Java. In Timor-Leste cattle constitute the primary wealth of rural families. Every major traditional event involves cattle for feasting and reassuring social bonds and commitments for continued peaceful and supportive coexistence. Hence, the rearing and holding of cattle and the economies and wealth of rural households are closely interlinked.

In this context, the loss of available feed stocks for freely grazing cattle and buffalo as a consequence of the notorious invasion of noxious weeds is causing severe damage to rural families. All parts of these exotic plants are unpalatable and toxic for the livestock. The decline of available feed for livestock across the rangelands of Timor-Leste is thus directly related to the expansion of these exotic weeds and the increased shading they cause. Through competition with crops for moisture, nutrients and light they also directly reduce crop yields in the farming plots. Heavy infestation of these weeds can cause complete crop failures and in some cases the land cannot be used any further for agricultural production. Sweet potato, cassava, pumpkin, taro and maize are grown as monsoon crops and can be severely affected during the monsoon season when exotic weeds also thrive. In riparian habitats the exotic weeds directly compete with native plants in the early stages of development. By doing so, they replace the native colonizers and prevent subsequent colonization by secondary native shrub and tree species.

Native wildlife such as parrots, possums and bats also do not seem to have any benefits from these alien weeds. It is very likely that they are toxic to them as well. In this way, the spread of exotic weeds is degrading native wildlife habitat and posing a threat to the biodiversity of Timor-Leste, in general.

It has been reported that some amphibian and reptile species have entered Timor-Leste through transport of goods from Asia or Australia (Trainor *et al.*, 2007, Democratic Republic of Timor-Leste, 2011b) or other channels. This is true as well for the Cane Toad (*Bufo marinus*), however, there is no evidence that this has actually happened. In fact, all the photos that have been shared with

Australian experts in this respect refer to the Black-spined Toad (*Bufo melanostictus*), an Asian invasive alien species that has spread from Indonesia (see [canetoadsinoz.com](http://canetoadsinoz.com) for details), which nevertheless also constitutes a threat to water courses and inland wetlands.

In less than a decade after its discovery, not a single specimen of the freshwater hardyhead *Craterocephalus laisapi* (family Atherinidae), a fish species endemic to the Timorese Irasequiro River (Larson *et al.*, 2005), has been fished or seen by local communities from 2010 to 2012<sup>7</sup>. Community members pointed out that the increasing numbers of freshwater fish that have accidentally been introduced to Lake Iralalaru nicely matched its population decrease.

#### **g) Destructive development activities**

Ongoing human development activities that are not well planned are expected to have significant negative impacts on the biodiversity and integrity of forest, freshwater, coastal and marine ecosystems and the services these ecosystems provide.

With more people relying on marine resources, destructive fishing practices appear to have increased, and so have the reports on illegal fishing activities<sup>8</sup>.

## **4. Possible scenarios for future changes**

Based on GIS analyses, a draft Forest Conservation Plan (JICS and NDF, 2013c) identified and recommended a national target of 500,000 ha of important forest area of significant size (total: 507,173 ha; dense forest: 228,174 ha; sparse forest: 278,999 ha) to conserve the country's invaluable forest biodiversity resources. This is equivalent to 58% of the total forest area (73% of dense forests and 50% of sparse forests) remaining in Timor-Leste and 34% of the total land area. For dense forests, this is consistent with the target formulated in Timor-Leste's Forest Policy which is "to protect the ecological integrity and biological composition of not less than 70% of the area of forests by 2020". The draft Forest Conservation Plan's focus for dense forests is on protection, while for sparse forests it proposes rehabilitation over the next 10 years (2014-23) in the identified 233 sucos of 13 districts that constitute the relevant forest area of significant patch size (JICS and NDF, 2013c).

Under the assumption that protection of dense forests will be done properly in all the 233 sucos over the next 10 years by fully achieving this goal, the current deforestation rate will be significantly reduced. This means that with the forest area of 2008 acting as a baseline (i.e., 100%) the remaining dense forest area predicted for 2023 *without* protection (scenario 1) is 48%, while *with* protection (scenario 2) it is 73% (rehabilitation of sparse forest has not been included in this analysis). Notably, there will still be net deforestation under scenario 2 (JICS and NDF, 2013c; cf. Figure 7).

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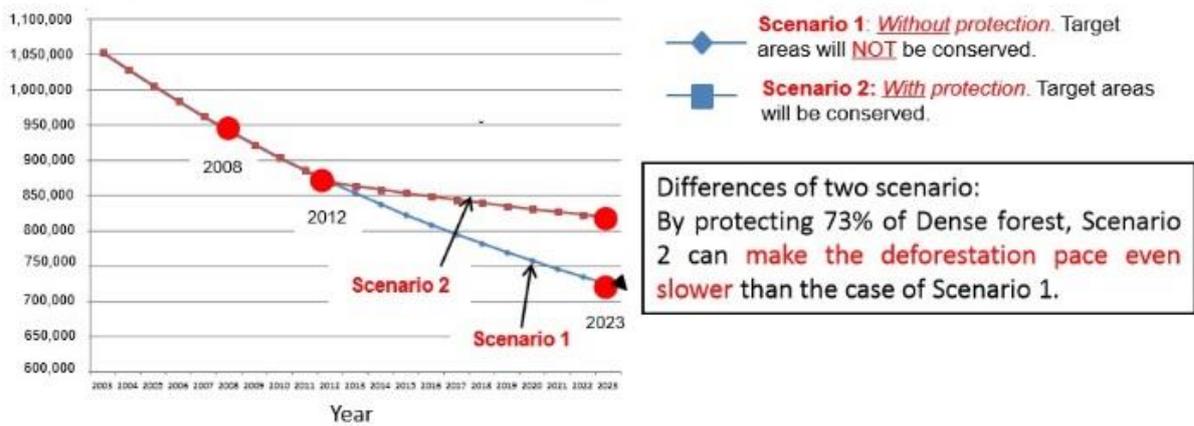
<sup>7</sup> This is based on key information data collected in Bauro, Mehara and Muapitine, as well as problem trees and status and trends for these two species. Data from the Coral Triangle Support Partnership (CTSP)

<sup>8</sup> SPOT reports accessed from [www.peskador.org](http://www.peskador.org)

In general, the target sucos have dense and sparse forests adjacent to them and the draft Forest Conservation Plan assumes that both types of activities, i.e., protection and rehabilitation, will be implemented in parallel based on the main approach of Community-Based Forest Management (CBFM).

Two table below show them in percentage supposing the area in 2008 is 100.

Scenario 1: <i>Without protection</i>				Scenario 2: <i>With protection</i>			
Year	Dense	Sparse	Total	Year	Dense	Sparse	Total
2008	100.00	100.00	100.00	2008	100.00	100.00	100.00
2012	82.40	99.00	92.30	2012	82.38	99.00	92.30
2020	55.91	97.04	80.45	2020	75.21	97.04	88.23
2023	48.34	96.31	76.97 (%)	2023	73.16	96.31	86.98 (%)



**Figure 7** – Projected changes in future forest cover under two scenarios: with (scenario 1) and without (scenario 2) protection of dense forest (source: JICS and NDF. 2013c)





## PART II

# THE NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN (NBSAP), IT'S IMPLEMENTATION, AND THE MAINSTREAMING OF BIODIVERSITY

## 5. Review and update of the NBSAP

During the process of preparing the 4<sup>th</sup> National Report on Biodiversity (Timor-Leste, 2011b), the emphasis has been on elaborating the NBSAP, including participatory stakeholder consultations. The overall goal and vision expressed in the NBSAP is that by 2020 all sectors contribute to conserving and wisely using the country's biodiversity and ecosystems so that these provide food security and contribute to poverty eradication and an improved quality of life of the Timorese people (Democratic Republic of Timor-Leste, 2011a).

According to NBSAP, the priority strategies for biodiversity conservation in Timor-Leste had been identified based on the needs of the Timorese people and the targets set out in the National Strategic Development Plan (2011-2030) and by the CBD. Five priority strategies (i.e., PS 1 - Mainstreaming biodiversity into sectoral plans and programmes to address the underlying causes of biodiversity loss; PS 2 - Protecting biodiversity and promoting sustainable use; PS 3 - Building climate resilient ecosystems through effectively managing protected areas and reducing threats to biodiversity; PS 4 - Enhancing biodiversity and ecosystem services to ensure benefits to all; PS 5 - Enhancing implementation of the NBSAP through participatory planning, knowledge management and capacity building, including district and sub-district and community levels) reflecting five priority targets had been identified through stakeholder processes, together with 21 strategic actions and altogether 65 sub-actions for implementation as a priority by either 2015 or 2020. Unfortunately, the terms "actions" and "targets" have not always been used consistently. Under the same framework of 21 strategic actions, an even higher number of 161 additional sub-actions (termed "further actions") had also been identified, again for implementation by either 2015 or 2020. These "further actions" were not directly visible in the NBSAP, but had to be searched for meticulously among Annexes (i.e., table in Annex 3 of the NBSAP).

To amend this confusion, a totally revised version of the table in Annex 3 has been elaborated and inserted in the revised edition of the NBSAP. Specifically, all the actions identified in the NBSAP process have been included in a single table (priority actions marked by black bold and further actions by black normal fonts). Moreover, logical groupings have been used consistently to reflect groups of actions/sub-actions with similar targets. In this new presentation which can be found in Appendix II (in addition to the revised NBSAP edition), redundancies and inconsistencies have been eliminated as much as possible resulting in a significant reduction in the number of further actions (from initially 161 to 111), and minor reduction of priority actions (from 65 to 64). The mixing of targets from different origin (CBD, Timor-Leste) has been removed.

## **6. Implementation of the NBSAP**

### **6.1 Actions taken and outcomes achieved**

#### **6.1.1 Priority Actions**

Within each of the five priority strategies identified for Timor-Leste to conserve the country's biodiversity, one main target and a varying number of actions and sub-actions had been formulated in the NBSAP. Based on those identified actions that were regarded as a priority (cf. Appendix II), each of the four established thematic working groups (TWGs) compiled the specific activities that were undertaken in their respective areas of responsibility, i.e. agricultural biodiversity, forest and drylands biodiversity, aquatic biodiversity, and communication, education and public awareness (CEPA), since the 4<sup>th</sup> National Report was published in October 2011. Some TWGs also included information referring to some of the other thematic areas. A comprehensive listing of these reported actions can be found in Appendix I.

In the State Secretariat for the Environment (SEMA), a third independent directorate was established and made operational in 2013, the National Directorate of Biodiversity Protection and Restoration (DNPRB; Priority Action 17). Timor-Leste's Biodiversity Decree Law has been drafted, but approval from the Council of Ministers is still pending. It is supposed to be implemented together with the traditional law of Tara Bandu (Priority Action 6; sub-actions 6.1, 6.2 and 6.3). The government of Timor-Leste supports the integration of Tara Bandu traditional jurisdiction to protect forests and other ecosystems from degradation (cf. also Priority Action 9; sub-action 9.1) such as reflected in the above mentioned draft of the Biodiversity Decree Law. With support from the Asian Development Bank (ADB), the country further developed a comprehensive framework for Environmental Impact Assessment (EIA). Scheduled to enter in force in 2014, this legislation package as of January 2015 is still pending approval by the Ministry of Commerce, Industry and Environment (Priority Action 5; sub-action 5.2). Other relevant legal progress are the Draft Law on Forest Management (2007), and the Draft Decree Law on Protected Areas (2011) that, however, have also not been adopted yet by the Council of Ministers. Thus, the current legal bases for environmental issues are the Constitution of Timor-Leste (2002); United Nations Transitional Administration for East Timor (UNTAET) Regulations 17/2000 and 19/2000; Environmental Licensing Decree Law No 5 of 2011; the framework Base Law on Environment No 26 of 2012; and the Organic Law of the MAF of 2013.

Regulations have been put in place by the Ministry of Petroleum and Mineral Resources to limit gravel and sand extraction by private companies (Diploma Ministerial No. 2 of 19 February 2014; Priority Action 4; sub-action 4.3).

As noted earlier, the government is yet to identify research needs and priorities for the different sectors which use and impact biodiversity and ecosystem services nationwide (Priority Action 18; sub-action 18.1). On a related matter, the CHM requires support to enable it to become the platform for knowledge sharing and networking it was originally conceived to be. While there is some geo-referenced data at the National Directorate of Water and Sanitation Services (DNSAS), such information is not available through the Timor-Leste Clearing House Mechanism, which has not been updated since its inception (Priority Action 19; sub-actions 19.1 and 19.2). No economic valuation studies for direct and indirect goods and services of biodiversity have been conducted to date, with the exception of Pinto (2014c; Priority Action 14; sub-action 14.1).

Much work has been devoted to promoting Traditional Ecological Knowledge (TEK) and local knowledge, however very little has been done in documenting and analyzing local conservation practices (Priority Action 20; sub-action 20.1).

Funding proposals have been prepared for different funding agencies (e.g., European Union, GEF), however, there were few priorities in the NBSAP that have been funded through the Global Environment Facility (GEF) and/or other development partners. Timor-Leste has initiated discussions on accession to the Nagoya Protocol with support from the United Nations Environment Programme (UNEP) and funds from the GEF. There is a degree of uncertainty of whether the country will ratify the Nagoya Protocol in the near future due to planning and prioritization issues in accessing GEF 6 funds. Insufficient donor coordination remains a barrier when it comes to exploring ways for increasing the levels of funding for different programmes. Nevertheless, various collaboration with United Nations (UN) agencies and NGOs has been initiated and is ongoing (Priority Action 21; sub-actions 21.1 and 21.2).

#### **a) Communication, Education and Public Awareness**

The main elements of Timor-Leste's CEPA strategy are given in the NBSAP, including a goal, specific objectives, target audiences, key messages, the framework for an action plan, and specific activities within the categories of lobbying; awareness and education; and public mobilization and participation (cf. Democratic Republic of Timor-Leste, 2011a; chapter 4.3).

Celebrations of World Biodiversity Day (22 May), World Environment Day (5 June), World Food Day (16 October) and the Coral Triangle Day (9 June) have been conducted annually in Timor-Leste. Thereby, distinct public events have been organized and implemented by SEMA, MAF and NGOs in Dili and elsewhere, including expositions, exhibits and fairs on relevant environmental topics; children's drawing competitions and quizzes; as well as public speeches of key national politicians or members of parliament to attract attention (Priority Action 1; sub-action 1.1).

Another focus was on annual tree planting events in different locations with small budget support from the government to community groups and NGOs.

In addition, a broad array of meetings, conferences, seminars, and workshops have been organized and/or supported by government units and NGOs. SEMA, for instance, implemented:

- four workshops (dates: 22-24 January 2013, 28 June 2013, 29-31 July 2013, 14 November 2013) to raise awareness on and build capacity for implementing the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) – this is an international agreement under the CBD “which aims at sharing the benefits arising from the utilization of genetic resources in a fair and equitable way, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding, thereby contributing to the conservation of biological diversity and the sustainable use of its components” (CBD official website on the Nagoya Protocol on ABS);
- several workshops in all districts on the new Decree Laws on Biodiversity and EIA (2013-14);
- stakeholder consultations on the Fifth National Report on Biodiversity / revision of the NBSAP (19 August 2014, 3 February 2015, 26 February 2015);

- Timor-Leste's first Conference on Climate Change Adaptation (5-7 November 2014);
- a workshop/briefing on the country's potential accession to the Convention on International Trade in Endangered Species of Flora and Fauna (CITES; 27 November 2014).

The National Directorates of Forestry and Watershed Management (DNFGBH) and of Nature Conservation (DNCN) of the MAF and SEMA conducted public information and awareness raising activities on forest biodiversity and its importance in Oecussi, Viqueque, Aileu, Los Palos, Baucau and Manatuto reaching approx. 1,200 people. Information was disseminated through radio and television broadcastings (one hour on RTTL), and information boards were set up around protected areas to warn about the consequences of forest degradation (e.g., Tasi Tolu, Cristo Rei). Campaigns on forest education and awareness raising were conducted by MAF for communities in the protected areas of Tasi Tolu and Aitana (suco: Lalini), as well as in Oecussi, Aileu, Los Palos, Viqueque, Baucau and Manatuto. For these and other purposes, a number of brochures and posters has been produced and disseminated such as on marine turtles and tortoises, endangered plants and trees, plantations, and climate change by SEMA. DNFGBH and DNCN, on the other hand, issued information materials on endemic, rare and threatened bird species, and on protected areas such as PNNKS and Tasi Tolu featuring their endangered flag species. Besides conducting expositions and exhibits in the course of World Biodiversity and World Environment Day activities (see above), SEMA also participated in exhibitions and awareness raising events of other Ministries and organizations to showcase the own work. They further used fairs and exhibits to inform on forest and bird conservation, wood and forest products.

In Dili, the Ministry of Tourism (MOT) established a number of public parks for recreation and awareness raising purposes, e.g., 5 de Maio, Balai Prajurit (Priority Action 1; sub-actions 1.1 and 1.2; Priority Action 9; sub-action 9.2).

Other awareness raising activities have been conducted and/or supported by NGOs such as Haburas, Hasatil, Permatil, Halarae, Fraterna and Prospek. A number of CEPA activities have further been conducted to promote and advocate for *agricultural biodiversity*. This includes the establishment of a National Working Group on Agricultural Biodiversity in 2014. To facilitate knowledge management, networking and wider discussions of this forum on the promotion of agro-biodiversity and its knowledge base in Timor-Leste, a LinkedIn group "Promotion of Agricultural Biodiversity (ABD) in Timor-Leste" has been created as well in October 2014. In addition, the NGOs Hasatil and Permatil, together with IMVF conducted a one day workshop in November 2014 in Dili on local seed saving techniques and their promotion for 12 Hasatil members from 12 districts. In this context, a poster and thematic brochure have been produced and a radio interview has been given on guidance for local seed conservation. A brochure, poster and film have also been prepared on food sovereignty. To raise awareness about all these activities, various presentations were given on different occasions (e.g., Biodiversity Day 2013, World Food Days 2013 and 2014) at the national level. Moreover, they have been publicized through diverse media channels, such as radio (3x community radio VQQ, Lautem 2013; 3x national Radio Timor-Leste, November 2014), television (3x national TV), film (film on seed banks and ABD database), and print products (1 ABD brochure, 2 ABD posters, ABD thematic maps). With the theme of food sovereignty and agrarian reform, a march to commemorate Human Rights Day has been supported as well, e.g., by Hasatil, UNAER, FONGTL (Priority Action 1; sub-actions 1.1 and 1.2).

Other CEPA related work has been done to raise awareness on the values of *marine biodiversity*. Conservation International (CI) worked with communities that engaged with scientists and practitioners during the USAID funded Coral Triangle Support Partnership (CTSP) and was able to provide crucial country specific and at times site specific marine biodiversity information. This enabled information, communication and education campaign products to be developed (brochures, radio and TV spots, posters) as well as to improve the information content of awareness raising efforts. Examples of such efforts include the campaign announcing the discovery of Santana's dwarfgoby (*Eviota santanai*) – a fish species of the Goby family (Gobiidae) associated with coral reefs (Greenfield & Erdmann, 2013) – designed to instil a sense of pride in the uniqueness of Timor-Leste's marine biodiversity. This work has been the precursor for different community-led conservation activities in the PNNKS, including partnerships with local business owners (Priority Action 1; sub-actions 1.1 and 1.2).

Paucity of data on the presence and absence of freshwater systems at district level, and on their location and classification, remains the single biggest challenge when it comes to designing effective awareness raising activities. Giesen (1991) and Monk *et al.* (1997) had already highlighted this when reviewing data from different provincial governments in Nusa Tenggara and Maluku. Development partners have helped developing awareness raising campaigns; the effectiveness of such efforts, however, remains untested (Priority Action 1; sub-actions 1.1 and 1.2).

SEMA has also been involved in significant environmental education activities:

- Presentation of specific environmental information designed for children in the form of quizzes at schools;
- Beach and underwater clean-up activity with school children;
- Environmental education seminars at junior high schools organized by SEMA and supported by the Japan International Cooperation Agency (JICA; from June 2014, ongoing), e.g., littering, organic and inorganic wastes, functions of forests, ozone issue;
- "Tempu Labarik Aprende" with RTTL (September and October 2014);
- Participation in drawing contests in Japan about environmental issues supported by JICA (September and October 2014);
- Environmental education lecture on internalizing environmental costs at UNTL with H3R, a local NGO (September, 2014);
- Preparation and use of comics to explain ozone issues to children supported by UNDP (January 2015);
- Ashtray production to reduce littering by cigarette butts in Lautem with Verde, a local NGO (January 2015; ongoing).

Plans to establish a Communication and Education and Information Centre and Library have been realized by establishing a Centre for Climate Change and Biodiversity based on a Memorandum of Understanding between SEMA and UNTL and located at the Faculty of Agriculture of UNTL. The centre was inaugurated on World Biodiversity Day, i.e. 22 May, 2014. In addition, a small library was established at SEMA but not continued (Priority Action 1; sub-action 1.3).

Currently, modules on environment, nature conservation and biodiversity are being developed for integration into the elementary and high school curricula, as well as an educational text book on school gardening, including nine topics: bed design, organic material, tree nurseries, local seeds, horticulture, traditional food, living fences, natural pest control and microorganisms (Ministry of Education, 2014). The Ministry of Education, with support from SEMA, UNICEF and CARE International, also produced the Lafaek Magazine as one of the teaching materials. Other curricula that have been developed are on natural resource conservation and sustainable use (UNPAZ, 2013). A forest programme for children has been created and implemented as well (KSI, 2014). For integration into elementary and high school curricula, an ABD “Training of Trainers” manual is also under preparation (Priority Action 1; sub-action 1.4).

The MOT, State Secretariat for Professional Training and Employment Policy (SEPFOPE) and the NGO Haburas promoted ecotourism, e.g. in the locations of Pantai Walu, Tutuala, Com, and Maubara. The same organizations also installed information boards in potential ecotourism areas of the entire territory of Timor-Leste. Under the MAF, surveys on ecotourism (nature, culture, history) were conducted in PNNKS and the protected area of Lake Modomahud in Manufahi district, sub-district Fatuberliu (Priority Action 3; sub-action 3.2).

#### **b) Agricultural Biodiversity**

The GIZ-AMBERO led project “Promotion of sustainable use of agro-biodiversity” currently operating in 26 pilot sucos of the districts of Bobonaro, Manatuto, Baucau, Viqueque, and Lautem aims at sensitizing, mobilizing and organizing local communities so that they better understand and are motivated to protect the adjacent ecosystems, their values, and biodiversity resources (Priority Action 9, sub-actions 9.1, 9.2 and 9.3). The main pillars of this project are:

- Assessment of ABD in all 26 pilot sucos in 2013 and 2014;
- Establishment of an ABD database (hosted by UNTL) with 500 varieties in 2013 and 2014;
- Establishment and implementation of an ABD monitoring system (starting 2014, every six months);
- Conservation activities and multiplication of local varieties by the 26 pilot groups.

Since its start in 2013, the project supports the economic development of farmer groups and applies biodiversity-friendly farm practices such as erosion control, water harvesting, mulching, terracing, compost preparation, Integrated Pest Management (IPM), and organic farming in the 26 pilot sites (Priority Action 2; sub-action 2.2). To help conserve genetic diversity, seed fairs for local seed exchange have been conducted in the mentioned districts which reached approx. 700 farmers and 550 rural families (Lautem: 2013, other districts: October to December 2014). In addition, ABD aspects have been included in national rice, beans and vegetable campaigns as well as food security policies. National policies on seeds and food security and sovereignty (draft) have been developed by the MAF. An ABD implementation guide currently is in progress (Priority Action 2; sub-actions 2.1).

Terracing of existing farm land is used as a means to safeguard ecosystem services, and local seeds of diverse crops are used as the genetic basis for plant breeding as they naturally adapt to changing climatic conditions over long time periods and are thus more drought and flood resistant, in this way reducing the risks and effects of extreme weather conditions. In 2013,

Permatil and Fundeso have also supported small scale water canalization and set up water management committees in two sucos (Sagadati and Saelari).

In 2014, the MAF conducted a study on food species such as cassava, potato, maize, and on dryland rice paddies. Other research has been undertaken in 2014 by Seeds of Life (SoL) and MAF on the identification of wild plants (e.g., fruits, roots, berries) that can be used for human consumption. In early 2015, a study has been initiated on local crops in Baguia and Baucau by Verdade and UNTL Tourism Faculty (Priority Action 18; sub-actions 18.1).

In 2014, the 26 pilot groups have begun to plant 5000 local fruit tree seedlings, thus contributing to the rehabilitation of degraded critical habitats and ecosystems through tree planting (Priority Action 7, sub-action 7.3) and the implementation of sustainable livelihood activities for rural communities (Priority Action 9, sub-action 9.4). In Viqueque, Lautem and Baucau, the project has started production and marketing of ABD crops such as black and red rice, as well as implementation of forest edge based value chains for chili pepper and native species value chains for sugar palm (i.e. processing palm sap to syrup), thus linking monetary benefits with the conservation of forest ecosystems and ecosystem services. SoL supported the MAF in maintaining the originality of crop seeds and by promoting techniques such as IPM, Integrated Crop Management and System of Rice Identification (Priority Action 12, sub-actions 12.1 und 12.2). Camoes, MAF and GIZ supported in twelve districts the establishment of 313 community-based nurseries for high value tree species such as mahogany, teak, and sandalwood as well as 182 nurseries for coffee. And MAF and NCBA disseminated 64,000 Marungi seeds (a local vegetable) in 2014 for planting in school gardens (Priority Action 7, sub-actions 7.1, 7.3).

The “Promotion of sustainable use of agro-biodiversity” project is further contributing to the effective management of representative samples of biodiversity in the 30 declared protected areas (Priority Action 10), namely by conserving local agricultural species and varieties in 6 sucos within PNNKS (e.g., Tutuala, Muapitine, Com) and other protected areas (e.g., Ossu Rua, Ossu de Cima, Saburai) through in-situ cultivation in pilot sites, e.g. for black rice, red rice, black soy bean, millet, black mung bean, job’s tears (*Coix lacryma-jobi*), diverse varieties of beans, medicinal plants, and root crops (sub-action 10.6), and by monitoring local species in the same sucos (as well as 18 others) every 6 months (sub-action 10.2) – after one year, monitoring results show an average increase of ABD by 15%. In 2014, the UNTL-based AKAHANA (“academy loves nature”) group conducted conservation activities to protect endangered tree species (sub-action 10.3).

Altogether, 26 farmer groups (i.e., 550 families) have been trained in the ABD conservation activities. Capacity of staff of the MAF at district and suco levels has also been enhanced in 2013 and 2014 through ToT trainings on ABD conservation activities, one in each of 5 districts (Priority Action 17). Moreover, a monitoring system for agro-biodiversity was established and implemented in the 26 pilot sucos.

Under the MAF, a number of soil and water conservation activities were conducted for agricultural purposes, including construction of infiltration wells and a traditional dam in Matadoru (Priority Action 2, sub-action 2.2). Specific actions have been undertaken to promote traditional knowledge and practices relevant to biodiversity conservation: 26 participatory two-year plans on ABD (2013-2015) have been worked out at farmer group levels, one for each pilot suco, and have been shared

with officials of sucos and MAF at district level. Local, native vegetables have been promoted by FAO in 2013 and 2014 in support of the MAF's agricultural conservation programme. Traditional knowledge and practices have also been applied to protect water bodies, soils, and forests, etc., and to promote the local species and varieties used in traditional ceremonies together with the indigenous knowledge about them. Two meetings were further held on the topic of "slow food" – in contrast to "fast food" – emphasizing and advertising the food prepared and consumed in Timor-Leste during the resistance period. This area of work has been initiated in 2014, inter alia, to conserve endangered seed crops (Priority Action 20, sub-action 20.2).

Once in a while, the MAF organizes health check-up sessions for cattle of local farmers throughout Timor-Leste using a mobile clinic (Priority Action 12; sub-action 12.4).

Mercy Corps, together with SEMA, supported sustainable rural livelihoods, e.g., through introduction of cooking stoves made from soil and mud. Natural stoves (made from red soil), solar stoves, and biogas have been promoted as well in Aileu, Viqueque, Dili and Ermera (2012-2014; Priority Action 9; sub-action 9.4).

## Case study: **Tara Bandu as a Conservation Effort to Protect Nature and People**

By Francisco Neto

### ***The meaning and origins***

In Tetun, the official language of Timor-Leste, Tara Bandu means “hanging prohibition.” It is a customary law that has been practiced in Timor-Leste for many centuries. It developed during the long history of Timorese interacting with their environment and managing their survival in the context of the unpredictable natural challenges of an isolated island environment. Tara Bandu provides a means for Timorese to refrain from unsustainable land use practices such as unsustainable hunting, fishing, felling of trees and overharvesting the natural resources in a particular location. Usually, the restriction remains in place for a certain time or until the natural resources have recovered. Back in the pre-colonial era, each village or domain throughout Timor-Leste had traditional administration systems in place. These consisted of independent authorities that supervised and controlled any internal matters and included traditional practices such as Tara Bandu. Today, the benefits from Tara Bandu for conservation and environment are recognized by the government as reflected by its inclusion in the Base Law on Environment.

### ***The ceremonial***

Tara Bandu is practiced throughout Timor-Leste but its ritual ceremony and aim do vary from place to place. Generally, before Tara Bandu is imposed, a discussion needs to take place between the villagers and village elders, such as the head of the village and the traditional leaders. They need to discuss and agree on what resources or activities to prohibit. A ritual involving spoken prohibitions and the slaughtering of an animal typically take place within a ceremony in which everybody participates. This ceremonial involves rituals, food, dancing and singing, and marks the beginning of the prohibition period. The spoken prohibition refers to the specific trees, forests, plantations, or animals, the use of which is temporarily restricted. The slaughtering of an animal symbolizes the commitment and bonds that bind every member of a community (Figure 8). The sacrificed animal establishes the height of the fine for violating Tara Bandu regulations which may take the same form, size and age as the animal being slaughtered or the equivalent in cash. Tara Bandu thus aims to regulate Timorese’s relationship with nature and with each other, and as a consequence paves the way for local environmental restoration. This unique customary practice of Tara Bandu has also caught international attention such as documented by a recent Deutsche Welle broadcasting.

### ***Reviving Tara Bandu in Oecusse***

A rapid forest degradation occurred in the district (municipality) of Oecusse during the Indonesian occupation from 1975 to 1999, mainly due to the logging activities of several Indonesian companies that targeted in particular sandalwood (*Santalum album*). This commercially valuable tree species once was widespread and has been vastly sought after for the distinctive fragrance it produces. From 1999 to 2002, the forests of the area further deteriorated during the transitional period that followed the occupation. After the civil war in 1999 when the Indonesian militias burned down civilian houses, gewang palm (*Corypha sp.*) was drastically over exploited as its leaves were used for roofing in addition to extracting the starch from its trunk for food. This, in turn, affected the forest health and as a consequence human well-being.

Realizing the severe degradation of their forests, in particular the removal of the mentioned two tree species, local villagers in 2001 unanimously agreed to re-introduce Tara Bandu jurisdiction as a way to prevent further damages to the forest ecosystem. Unlike in pre-colonial times when each village had full authority itself in conducting Tara Bandu measures, the process now had to involve the government of Timor-Leste. Reviving Tara Bandu in Oecusse, in fact, led to a strong collaborative approach in addressing forest degradation. Tara Bandu traditional characteristics remained important and the practice was performed by local leaders with specific traditional roles to ensure that the villagers could identify with it. Therefore, the transitional government at the time acknowledged and reinstated the roles of *tobe*<sup>9</sup> or ritual leaders. Traditionally they have the legitimate authority to initiate and conduct a proper Tara Bandu ceremony. Additionally, another benefit of reinstating the role of ritual leaders is that the government of Timor-Leste can promote forest conservation and sustainable resource use and address illegal logging and hunting in remote rural areas with limited financial resources. Since reinstating Tara Bandu was the initiative of the local Oecusse people, bureaucratic costs associated with regulations have been minimal. Forest and environmental conservation are essential for Timor-Leste because a large number of the population lives from hunting and subsistence farming that are dependent on healthy forest and agricultural ecosystems. Without Tara Bandu, the conservation of forests and its biodiversity in Oecusse would require more staff and financial resources. Observations indicate that the illegal and/or unsustainable logging of the two mentioned tree species has indeed been reduced since the reinstatement of Tara Bandu, leading to more green areas in the forests that had been degraded for over four decades. A recent forest inventory study supported by Japan found an increase in sparse forest areas (i.e. forests with 20-60 percent ground coverage) in three of the five forest zones of Oecusse Municipality that can be associated with Tara Bandu practice. Another gain from reviving Tara Bandu jurisdiction lies in the devolution of power to local communities. Local people are encouraged and delegated to implement a suitable “hanging prohibition” for forest and environmental conservation that fits their situation and experiences. Reviving Tara Bandu re-empowers local people to be part of environmental decisions that affect them most and directly.

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<sup>9</sup>Tobe: a ritual figure with specific authority over matters of land and forest, including agricultural ritual, approval of swidden site and sandalwood harvesting. See: Ellen Roy, ed., *Modern Crises and Traditional Strategies: Local Ecological Knowledge in Island Southeast Asia* (New York: Bergahn, 2007) p.220-237.



**Figure 8** – A buffalo to be slaughtered as part of Tara Bandu ritual ceremony in Ira-Bere, Viqueque.  
Photo by Edgar Kaeslin.

In conclusion, Tara Bandu traditional regulations provide the framework for a participatory approach based on which the government and rural communities can cooperate to mutually achieve the conservation and sustainable use of the country's natural resources such as forest and other biodiversity-rich ecosystems. To protect the well-being of poor rural communities is imperative to conserve and sustainably use the natural resources on which they depend in their immediate surroundings.

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### c) Forest and Drylands Biodiversity

While Timor-Leste signed and ratified the United Nations Convention to Combat Desertification (UNCCD) and received funds by the GEF to prepare its National Action Plan and Sustainable Land Use Management Policies, these important documents are still pending approval and endorsement from the MAF prior to being discussed in the Council of Ministers (Priority Action 4; sub-action 4.3). To reduce and sanction the illegal felling of trees for non-commercial and commercial purposes (but not involving international trade), the DNFGBH and DNCN of the MAF, in collaboration with Timor-Leste's National Police (PNTL), conducted joint operations in various districts (Priority Action 6; sub-action 6.3).

DNFGBH and DNCN, in collaboration with NGOs and research institutions, supported the provision of seedlings and reforestation activities as well as studies such as on finding the right places for particular tree species. In cooperation with Mercy Corps they supported communities in developing and planting seedlings in villages of eight districts. Together with JICA they conducted activities to manage waterways/watersheds in the Comoro (Dili) and Laclo (Manatuto) river basins. The Maloa River catchment area was protected through planting trees. In Tibar, mangrove seedlings were planted together with the local community and mangrove trees were planted as well in Ulmera village, Liquiça. On Atauro Island, 6000 trees were planted to protect the watershed. In Zulo village, Zumalai, Covalima and Aidabaleten village, Atabae, Maliana, the borders for industrial forest areas have been demarcated (Priority Action 7; sub-actions 7.1, 7.2 and 7.3).

Little efforts other than donor funded programmes (JICA) have been undertaken to restore degraded catchments in Timor-Leste. The Government is yet to create national guidelines for site and species selection for different restoration activities (Priority Action 7; sub-action 7.3). Pending is also the preparation of a monitoring and evaluation system for rehabilitation activities in Timor-Leste. This, together with the lack of national guidelines for the rehabilitation of degraded catchments, compromises current reforestation work carried out by the government (Priority Action 7; sub-action 7.4). With nearly 80% of the country's catchments being degraded<sup>10</sup>, activities such as awareness raising, reforestation work and the establishment of baselines and proper monitoring and evaluation systems remain grossly underfunded by the State budget<sup>11</sup>. In addition, the lack of biodiversity assessments makes it laborious to establish baselines for important catchment areas (Priority Action 10; sub-action 10.2).

The MAF has initiated the process to register and provide support to community-based groups interested in engaging in restoration and reforestation. Unprecedented funds have been allocated to this project from the State budget showcasing the government's commitment to this cause (Priority Action 9; sub-action 9.1).

Based on Government Resolution no. 9/2007, PNNKS, Timor-Leste's first and so far only national park, has been created in 2007 and its preliminary boundaries have been established. It is being managed under the guidance of the Department of Protected Areas and National Parks (DAPPN),

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<sup>10</sup> Ministry of Agriculture and Fisheries (2007) National Forestry Policy.

<sup>11</sup> Based on the analysis of 2015 State Budget recently approved

DNFGBH and DNCN of the MAF. SEMA supported activities to delineate and map protected areas and identify conservation areas, including lands occupied by local people in PNNKS. The number of Timor-Leste's protected areas (PAs) has meanwhile been increased from 30 to 52. The additional 22 PAs that were identified and listed, however, are not yet confirmed and enacted. Surveys of flora and fauna have been conducted in PNNKS and in the protected area of Makfahek in sub-district Bariki of Manatuto. A committee for the management of PNNKS has been established involving 6 sucos, and for overall coordination and guidance of national parks a management board has been put in place. Preparations for a Protected Area (PA) management system have been initiated as well drawing, inter alia, upon a draft forest conservation plan based on the work done by JICS. In addition, announcement boards to ban the hunting and capture of endangered species (e.g., cockatoo, parrots, native sparrow) have been prepared and installed (Priority Action 10; sub-actions 10.1, 10.3 and 10.4).

In-situ conservation activities began in PNNKS in 2007 under the Forestry Directorate of the MAF and are still continuing. On Jaco Island (PNNKS), drinking water has been provided to deer (Priority Action 10; sub-actions 10.6, 10.7). So far, there were no ex-situ conservation activities. Capacity building of local authorities and community forest guards for protecting PNNKS have been conducted under the MAF and SEMA (Priority Action 17).

DNFGBH and DNCN of the MAF conducted a number of activities to promote PNNKS for nomination as a Biosphere Reserve under the UNESCO MAB Programme:

- Two national workshops (June 2011, September 2012);
- Two workshops in Lautem district (October 2013, September 2014);
- Workshop on mapping of initial conditions in PNNKS and initial zonation (Dili, 26 November 2014);
- Preparation of UNESCO Biosphere Reserve Nomination Dossier for PNNKS, including consultations in 6 sucos (October to December 2014)

Case study:  
**Management of culturally significant wildlife – the Saltwater Crocodile**

By Edgar Kaeslin

***The myth***

The legend tells that long ago, a boy found a stranded crocodile and brought it back to the ocean. The grateful animal offered the boy to accompany it on travel, should he call it three times what he did, and together they undertook many journeys. After some time, the crocodile desired to devour the boy. After having consulted the whale, the tiger and the water buffalo, as well as other animals, he was cursed by the monkey for his craving. Ashamed, the crocodile decided not to devour the boy but to continue travelling with him. The crocodile grew old and realized that it will soon die. It told the boy that out of its body a new country will arise that would belong to the kind boy and his progeny. After its death, the crocodile's dead body grew and formed the mountains of Timor-Leste (UNMIT-JMAC, 2008). In fact, several of the country's rugged coastal landscapes inspire this imagination, one example being the view from Dili towards Cristo Rei (Figure 9).

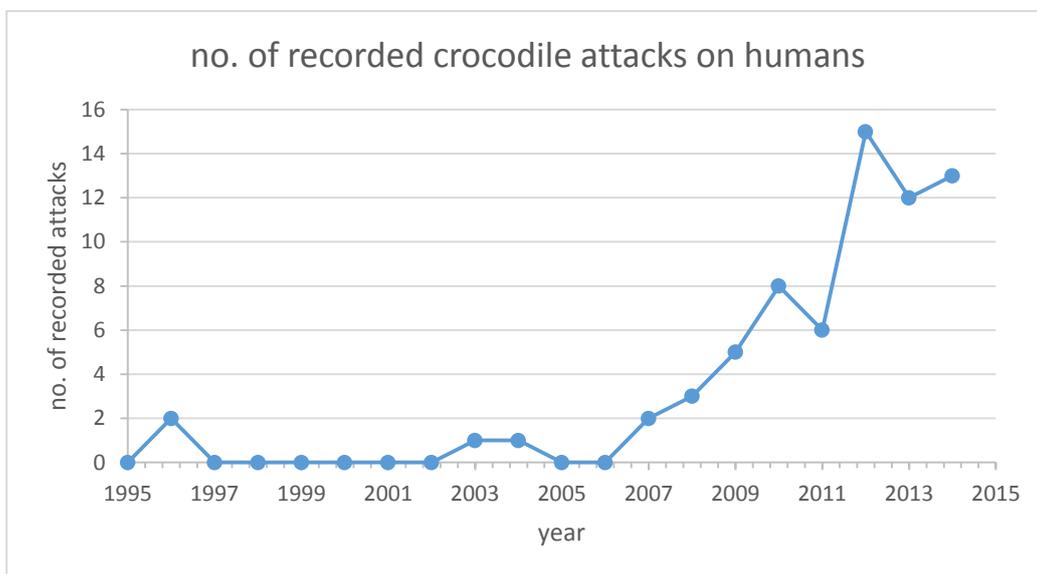


**Figure 9** – Timor-Leste's rugged coastal landscapes inspire the myth of the ancestor crocodile: view from Dili towards Cristo Rei. Photo by Edgar Kaeslin.

Today, this legend about “the good crocodile” (“lafaek diak”) is still very much alive in Timorese people, especially amongst older folks and in rural areas where the saltwater crocodile coexists with humans. In these places it is widely believed that the crocodile is an ancestor and close friend that only attacks to punish evil people guilty of a crime such as stealing a domestic animal from another village, thus acting as a divine and infallible judge. The species is regarded as the nation’s grandfather and, consequently, it is avoided to harm or kill it in general. In case the body of a victim has to be retrieved, the local Lia Nain will usually be consulted who may use his spiritual powers to get into contact with the water and crocodile world by first “opening the gate” through a distinct ceremonial act, subsequently submitting his request, and then “closing the gate” again. This is done in conjunction with a sacrificial offering such as a chicken, pig, goat or the heart of a water buffalo, and often leads to successful recovery of the body, or parts thereof, within only a couple of days. In some instances, the Lia Nain has given permission to shoot the aggressor crocodile, mainly if it was regarded as a non-local migrant and troublemaker not belonging to the village lands. In other cases, the Lia Nain refused to give permission to cull the animal even if it had just killed a village resident (Maritime Police, pers. comm., 2014). In the more urban areas of Dili and Baucau, and especially among the younger generation, however, these spiritual beliefs and traditions seem to be weaker and increasingly replaced by more pragmatic views. In the form of paintings, carvings, traditional weavings (tais), emblems, and souvenirs the iconic animal nevertheless remains omnipresent in Timor-Leste.

### ***The facts***

While in the 1970s, the Saltwater Crocodile (*Crocodylus porosus*) was globally threatened by extinction, today its population is stable and probably growing (Caldicott *et al.*, 2005; GWA-DF, 2012). Long-term monitoring data is available only from northern Australia showing that the saltwater crocodile populations have increased significantly over the last decades. Due to the lack of monitoring data no precise population estimates and trends, however, can be given for Timor-Leste, nor for neighboring West Timor where the situation seems to be very similar. In both countries only the incidences, locations and circumstances of crocodile attacks on humans have been recorded. Based on information from the Centre for Conservation of Natural Resources (BKSDA) and Indonesian government sources, 14 fatal attacks occurred in West Timor over the last four years. In Timor-Leste, our analysis of the available data shows a significant increase in the number of crocodile attacks since independence, especially since 2006 (Figure 10).



**Figure 10** – Synopsis of recorded saltwater crocodile attacks in Timor-Leste from 1995 to 2014. Data compilation by Sebastian Brackhane based on the following sources: [www.peskador.org](http://www.peskador.org); <http://www.crocodile-attack.info>; pers. comm. by Crocodile Management Task Force, Chair, as well as fishermen of Lautem district and village leaders of Viqueque district.

Viqueque, Lautem, Cova Lima, Manatuto, Manufahi and Bobonaro are the districts with highest numbers of recorded crocodile incidences. In particular the Irabere River in Viqueque (Figure 3) and, oddly, the large freshwater areas of Lake Ira Lalaro in Lautem, appear to constitute premium habitat for Timorese crocodiles. Nevertheless, the saltwater crocodile exhibits a high potential for migration and hence can potentially be found in all major water bodies of the lowlands all along the Timorese coast.

### ***The speculations***

Because the saltwater crocodile is known to migrate over hundreds of kilometers, it is possible that some individuals of the abundant northern Australian populations travel all the way across Timor Sea to reach the coasts of Timor-Leste, thereby adding to the Timorese population and leading to new areas being colonized (Read *et al.*, 2007). In general, one can expect conflicts between resident highly territorial males and the “floaters”, often young males in search of unoccupied territories, and the behaviour of these different components of the crocodile population could well be differing, a belief that has been supported by local people from different problem areas. But these remain hypotheses that need to be tested scientifically.

At a meeting of the Crocodile Management Task Force held in December 2014 in Dili, possible causes behind the increasing trend in crocodile attacks were controversially discussed. Several village leaders from problem areas in Viqueque and Los Palos reminded that before independence there were no crocodile attacks but that during Indonesian occupation many people were

relocated to remoter lands to weaken the resistance and thus many new people moved in and settled on their village lands who were not familiar with their traditional beliefs and customs such as Tara Bandu that restricted fishing in some sections of the rivers to once a year and only after special ceremonies had been conducted. As a consequence, the number of attacks has markedly increased since. Along with the new immigrants came large numbers of cattle that today freely roam in the wetlands and mangroves where previously only wild hogs and deer constituted potential crocodile prey. The cattle are sometimes herded by children who also catch small fish with sieves in the river, a potentially dangerous activity that has led to several fatalities. As a remedy, the village elders pledge to respect and reinstate their traditional rules which would be the natural solution to diminish the problem. Another reason why crocodiles were rarely seen in previous times is that they had been hunted and accordingly were very shy.

### ***Implications for conservation***

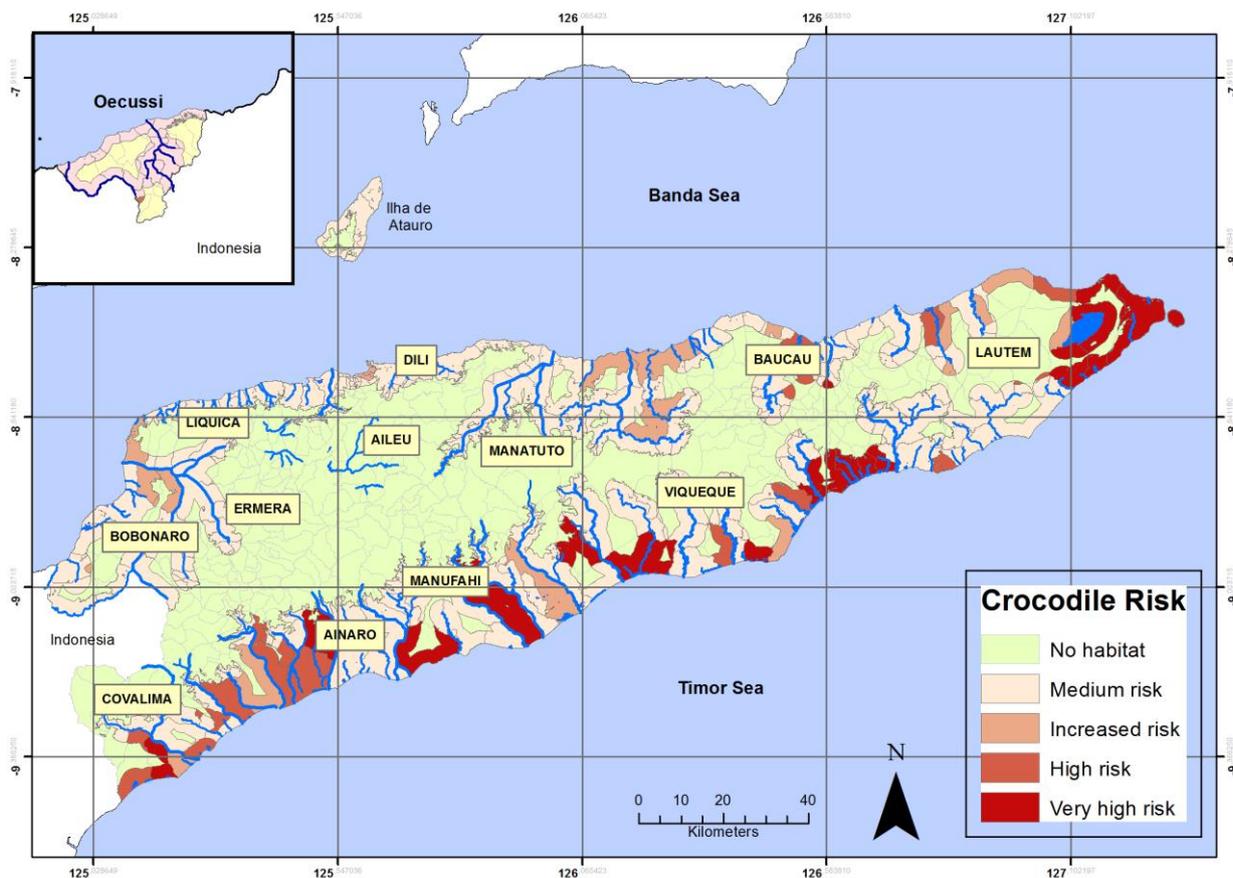
The Saltwater Crocodile is currently legally protected in Timor-Leste (UNTAET, 2000; Diploma Ministerial 2005). Identification and development of programmes to support endangered species including those that are commercially and culturally valuable has been identified as a priority activity in Timor-Leste's NBSAP (Democratic Republic of Timor-Leste, 2015; cf. sub-action 10.3). The management of human-crocodile conflict is of high priority in the Timorese government. The prime minister of the 5<sup>th</sup> government, Mr. Kay Rala Xanana Gusmao himself, was concerned about the regular reporting of fatal crocodile attacks on humans and asked why people were still dying in his country after the war for independence finally came to an end. This led to establishment of a Crocodile Task Force in 2013 recruited from members of the Ministry of Commerce, Industry and Environment (MCIE) and the Ministry of Agriculture and Fisheries (MAF). The group's current priorities are an enclosure for problem animals, the compilation of information on attacks, implementation of safeguarding measures such as warning signs and waterhole protection, as well as local workshops for awareness raising and discussion. In December 2014, a national workshop had been organized in Dili to discuss the issues and potential solutions with national and local stakeholders, and to present the Task Force's ongoing work.

Given the particular beliefs of Timorese people and the respect they show towards iconic animals such as crocodiles or large snakes (e.g., boas), a successful approach to managing the country's crocodile population and the dangers and risks they pose for humans would naturally combine the traditional beliefs and scientific facts in a way that they mutually support each other. In a first instance, the traditional management system (e.g., Tara Bandu) could be applied. This approach could be strengthened by regular patrols for gathering up-to-date information and monitoring the crocodile population to obtain reliable data that would underlie further management measures. Local risk maps could be elaborated and disclosed at community centers.

Access to highly problematic areas could be restricted, at least seasonally. Non-local problem animals could be removed and relocated to enclosures managed by the government. Based on the frequencies of reported attacks and the species' habitat preferences, a preliminary risk map has been prepared for the whole of Timor-Leste within the framework of ongoing Master's Thesis on Human-Crocodile Conflict by Sebastian Brackhane, University of Freiburg, Germany (Figure 12).



**Figure 11** – Prime crocodile habitat in the lower Irabere River on Timor-Leste’s southeastern coast.  
Photo by Edgar Kaeslin



**Figure 12** – Potential risks of saltwater crocodile attacks on humans in Timor-Leste based on the frequencies of reported attacks and the species’ habitat preferences. Map by Sebastian Brackhane.

### ***Implications for tourism***

Today it is not totally safe to swim, snorkel or dive in several places of Timor-Leste that are being developed for ecotourism (e.g., Jaco Island, Com). The chances of encountering a crocodile may be small but when attacked in the water the chances of escape are minimal. This applies to rural people in search of local resources and tourists enjoying the beaches, coastal waters, coral reefs and inland freshwater pools alike. Thus, there is an urgent need for managing the imminent threats that saltwater crocodiles pose for the developing beach, snorkeling and diving tourism sector before an accident happens.

Some areas of Timor-Leste’s southern coast may also be suitable for developing crocodile watching tourism, but this needs to be evaluated first and potential locations need to be identified. A preliminary survey among tourists, fishermen and tourist operators indicates that tourists are not fully aware of the threats posed by crocodiles but, on the other hand, would be interested in and willing to pay a reasonable amount for joining such wildlife watching tours (Brackhane, S.T., pers. comm.).



**Figure 13** – Crocodile watching tourism: a potential source of income and support to biodiversity conservation. In Australia’s Northern Territory, this proved to be a significant boost for the regional economy. Photo by Peter Pechacek.

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UNTAET. 2000. UNTAET Regulation No. 2000/19 – On protected places. 30 June 2000. Websites: [www.peskador.org](http://www.peskador.org), <http://www.crocodile-attack.info>

#### d) Aquatic Biodiversity

SEMA conducted three meetings on crocodile management (5 Nov 2013, 6-8 June 2014, and 5 Dec 2014) and established a Crocodile Management Task Force (Priority Action 11; sub-actions 11.1 and 11.2) to address the increasing number of attacks on humans that have been reported. SEMA is collaborating with the owner of a local company in Loes to adapt and rebuild an existing enclosure for temporarily keeping Saltwater Crocodile problem animals (Priority Action 10; sub-action 10.8).

There has been an increase in the use of living fences in FAO conservation agriculture sites (Priority Action 2; sub-action 2.2). There is little data, however, to back-up the claim that the percentage of fenced animals has increased and/or that small-scale farmers are now more receptive to penning their livestock. This problem, originally described by Polhemus and Helgen (2004), thus persists. There is little or no evidence showing that small-scale farmers understand the impacts of overgrazing of riparian vegetation and the overall effects on catchments and waterways.

A tourism policy framework has been approved in 2014 (Priority Action 3; sub-action 3.1), however, given the current fragmentary nature of State institutions, coordinated efforts and State budget investments are likely to have little impact on the overall implementation of this policy. There has been a proliferation of government departments outside the MOT with mandates to aid development of tourism (MAF, SEPFOPE). This has not actually translated into an increase of investments or the promotion of nature-based tourism. Initial studies by Edyvane *et al.* (2009) provided some ideas to the government about the ecotourism potentials on the north coast. Building upon them, the International Labour Organization (ILO) in 2013 explored the potential for cultural tourism. The first economic valuation studies on the contributions of ecotourism (more specifically SCUBA diving tourism) in Timor-Leste have shown the importance of conserving marine biodiversity and highlighted some of the pressures witnessed in common dive destinations of Timor-Leste (Pinto, 2014c; Priority Action 3; sub-action 3.2). This work is part of the government's initial discussions to generate a Marine Tourism Master Plan originally proposed by Erdmann and Mohan (2013). While letters of endorsement for the development of this plan had been signed by government in 2013, this work has not moved since then.

Little to no work has been done to control invasive species that use waterways such as the Asian Black-spined Toad (*Duttaphrynus melanostictus*) as well as the Bellyache Bush (*Jatropha gossypifolia*) which has invaded significant coastal areas of Timor-Leste's north coast (Priority Action 8; sub-action 8.2).

Different partners have worked with the government since publication of the NBSAP on sustainable livelihood issues, despite so this data is extremely scattered with different programmes having elements of livelihood strengthening. A proposed tool to identify and develop sustainable livelihood practices has been piloted in Timor-Leste by CI in partnership with the National Directorate for Fisheries and Aquaculture. This tool that was adapted from several resources<sup>12</sup>, however, requires some refinement based on discussions with practitioners in

<sup>12</sup> Author and compiler of this was Hugh Govan with translation and context for Timor-Leste prepared by Rui Pinto. This tool was created using the following main sources:

1. Hugh Govan and Ben Cattermoul. O'Garra, T. 2007. Supplementary livelihood: options for Pacific island communities: a review of experiences. FSPI, Suva, Fiji. Available at: [http://www.sprep.org/att/irc/ecopies/pacific\\_region/422.pdf](http://www.sprep.org/att/irc/ecopies/pacific_region/422.pdf)

different sectors before it can be endorsed and used as the approach to identifying and strengthening sustainable livelihoods at the community level.

WorldFish Centre in 2013 has also introduced some technique to help the National Directorate for Fisheries and Aquaculture conduct some basic socio-economic assessments to aid in the development of more effective socio-economic monitoring tools (Priority Action 9; sub-action 9.4). While Timor-Leste has proposed a protected area network, the initial design did not include important marine areas and communities described in Erdmann and Mohan (2013) based originally on Grantham *et al.* (2011). Timor-Leste's protected area network design is as good as the data being used. When it comes to freshwater systems, there is little to no data available making this the single most underrepresented ecosystem in the proposed PA network. Other than the seminal biodiversity survey work from Polhemus and Helgen (2004) some 10 years ago, and its systematic review by Larson *et al.* (2007), the government of Timor-Leste and development partners have done little to document Timor-Leste's unique freshwater biodiversity. Given the lack of data on plant species occurring in freshwater systems of Timor-Leste and on riparian vegetation and their changes through the altitudinal gradient, nothing has been done in terms of maintaining genetic diversity of freshwater plants and riparian vegetation (Priority Action 10; sub-actions 10.1, 10.2, 10.6).

Timor-Leste currently has an Oceans Policy in draft and is in the process of reviewing its entire Fisheries legal framework (this work is expected to be done in partnership with the WorldFish Centre). The country has also taken significant steps in its pursuit of Integrated Coastal Zone Management (ICZM) through its participation in the Partnership for Environmental Management of the Seas of East Asia (PEMSEA) project, as well as Ecosystem Approach to Fisheries Management (EAFM) through the country's engagement in the Coral Triangle Initiative for Coral Reefs, Fisheries and Food Security (CTI-CFF; Priority Action 11; sub-actions 11.1 and 11.2). Solid waste (plastic and otherwise) is often discarded in mangrove areas and riverbeds, which during the rainy seasons end up being washed to shore. In this respect, there is an urgent need to conduct public awareness campaigns on waste management (Priority Action 13; sub-action 13.1).

The DNSAS in the Ministry of Public Works (MPW) conducted activities on bioengineering and water quality management (Priority Action 15; sub-action 15.3) as well as a rubbish management campaign (Priority Action 13; sub-action 13.1).

There are no wastewater treatment plants in Timor-Leste, most of the water runoff goes straight into the sea. The conversion of important wetland remnants (Caicoli, Be'e Bonuk, Rai-kotu) and increase in impervious layers seem to have impacted nutrient loads reaching the ocean (Priority Action 15; sub-action 15.2). With regard to establishing and enhancing partnerships with regional organizations and programmes, some work has been done through the Coral Triangle Initiative (CTI), with new bilateral and multilateral donors showing some interest to invest in programmes with components in Timor-Leste (Priority Action 21; sub-actions 21.1 and 21.2).

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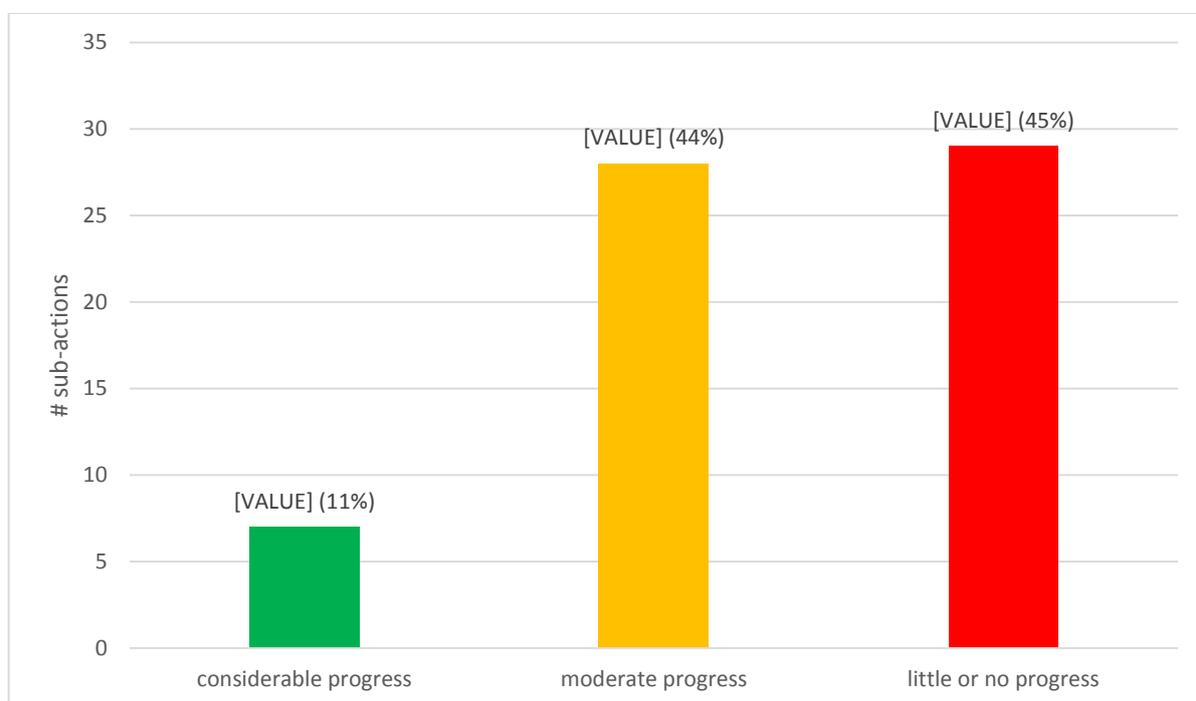
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## 6.1.2 Further Actions

The TWGs have not reported back on these additional actions. A review of them, however, revealed a number of redundancies and inconsistencies with regard to the priority actions. These have been eliminated resulting in a significantly reduced number of further actions (from initially 161 to 111) and a totally revised version of the NBSAP's Annex 3 table in which priority and further actions are now clearly distinguishable and the names of strategic action groups have been realigned (see Appendix II).

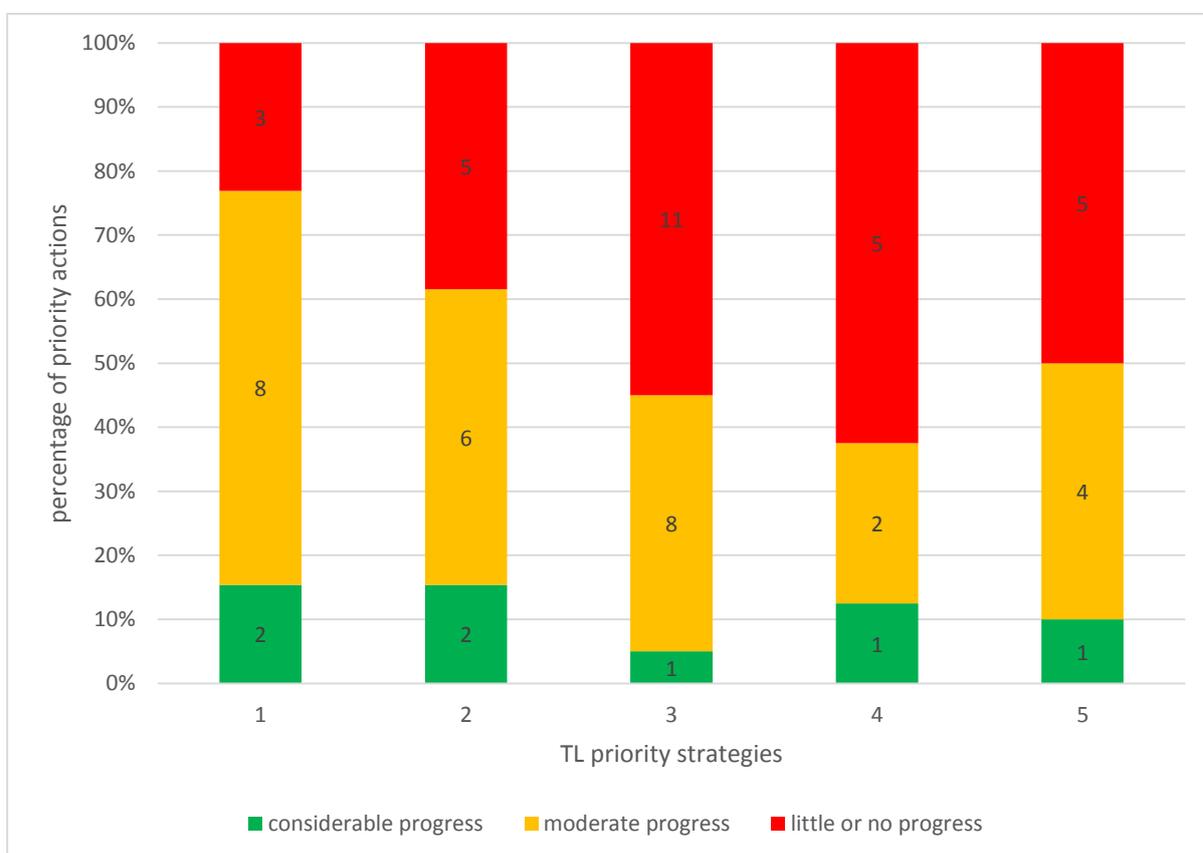
## 6.2 Extent of implementation and challenges

Overall progress in implementing the NBSAP priority actions has been estimated for all 64 sub-actions that were reported on by the TWGs as reflected in the matrix of Appendix I. Thereby, a simple “traffic light” scheme has been used: “green” indicating much, “orange” indicating moderate and “red” little or no progress. Altogether, 7 sub-actions have been rated as green, 28 as orange and 29 as red (see Figure 14) indicating that only a small percentage of the identified priority activities have been addressed satisfactorily (11%), while almost half of them have so far received little or no attention (45%) and a similar percentage has only made some progress (44%). Good progress (green) has been achieved in CEPA activities related to meetings, workshops, conferences and public dialogues, in mobilizing, organizing and sensitizing communities, and creating pilot sites, as well as in improving and diversifying subsistence agriculture in rural areas.



**Figure 14** – Overall implementation progress of NBSAP priority activities (“green” indicates considerable, orange” moderate, and “red” little or no progress; numbers above columns refer to sample sizes; progress has been estimated for all sub-actions based on the reporting from thematic working groups, see Appendix I)

Figure 15 depicts the relative implementation progress of the NBSAP priority actions within the five priority strategies (i.e., PS 1 - Mainstreaming biodiversity into sectoral plans and programmes to address the underlying causes of biodiversity loss; PS 2 - Protecting biodiversity and promoting sustainable use; PS 3 - Building climate resilient ecosystems through effectively managing protected areas and reducing threats to biodiversity; PS 4 - Enhancing biodiversity and ecosystem services to ensure benefits to all; PS 5 - Enhancing implementation of the NBSAP through participatory planning, knowledge management and capacity building, including district and sub-district and community levels). It shows that the Priority Strategies 1 and 2 are further advanced in implementation, in particular Priority Strategy 1, while more effort is needed in the strategy areas 3 to 5.



**Figure 15** – Relative implementation progress of NBSAP priority activities within individual priority strategies (TL = Timor-Leste; PS = priority strategy; “green” indicates considerable, “orange” moderate, and “red” little or no progress; numbers inside columns refer to sample sizes, i.e. the numbers of priority activities within each category; PS 1: Mainstreaming biodiversity into sectoral plans and programmes to address the underlying causes of biodiversity loss; PS 2: Protecting biodiversity and promoting sustainable use; PS 3: Building climate resilient ecosystems through effectively managing protected areas and reducing threats to biodiversity; PS 4: Enhancing biodiversity and ecosystem services to ensure benefits to all; PS 5: Enhancing implementation of the NBSAP through participatory planning, knowledge management and capacity building, including district and sub-district and community levels)

## 7. Actions to mainstreaming biodiversity

### 7.1 Procedures, actions and achievements

Many sectors are relevant to biodiversity conservation in Timor-Leste, in particular fisheries, agriculture, extractive industries, construction and tourism. Biodiversity considerations should thus be incorporated into strategic planning, policies, legislation, programmes and projects, ideally at an early stage. The foundation for mainstreaming biodiversity has been laid in Timor-Leste's National Strategic Development Plan 2011-2030, which includes several targets that are relevant to the CBD global targets (ATs). These include: "raising peoples' awareness on the values of biodiversity and the steps they can take to conserve and use it sustainably; achieving reduction of rate of loss of natural habitats and conserving biodiversity and ecosystem services through effectively and equitably managed, ecologically representative and well-connected systems of protected areas. Other targets aim at minimizing anthropogenic pressures on ecosystems and biodiversity to maintain their integrity and functioning; enhancing ecosystem resilience and the contribution of biodiversity to carbon stocks; and contributing to restoring and safeguarding health, livelihoods and wellbeing, taking into account the needs of women and children" (Democratic Republic of Timor-Leste, 2011a).

The NBSAP also examined how national strategies, plans, laws and regulations have integrated aspects of biodiversity conservation, including short-, medium- and long-term goals and objectives (see Annex 2, A2.5 and A2.6, in Democratic Republic of Timor-Leste, 2011a). They still remain valid, although partly they have been replaced or complemented by updated newer legislation that further strengthens conservation and sustainable use of Timor-Leste's biodiversity.

No proper strategic planning has been done when implementing the activities identified in the NBSAP as urgent to ensure that biodiversity conservation and sustainable use is mainstreamed into national policies and programmes. Accordingly, the accomplished actions have been punctual and widely uncoordinated among the different government units and sectors. In addition, the many relevant government units, with mandates that often appear to overlap, normally seem to work in isolation. Under Priority Strategy 1 on "mainstreaming biodiversity into sectoral plans and programmes to address the underlying causes of biodiversity loss" only few of the activities that directly contribute to biodiversity mainstreaming have been implemented. These are in particular sub-action 1.4 on integrating biodiversity and environment modules into school curricula, sub-action 4.3 on enhancing sustainable land use policies through accession to the UNCCD (delivery of the country's required National Action Plan and Sustainable Land Use Management Policy is still pending), as well as sub-actions 5.1 and 5.2 on enhancing and implementing the EIA system through developing a comprehensive EIA framework for Timor-Leste. The latter was done through the project "Strengthening the Regulatory Framework for Environmental Impact Assessment in Timor-Leste" funded by the ADB (approval of the framework is still pending).

The project contained two main components: (i) a legal analysis of the country's legislative system for environment which primarily includes the Decree Law 05/2011 - Environmental Licensing Law (ELL) and the Decree Law 26/2012 - Environmental Basic Law (EBL) together with an assessment of equivalence with ADB's Safeguard Policy Statement (SPS) 2009; and (ii) an assessment of implementation capacity of the National Directorate for the Environment (DNMA) and National Directorate of Roads, Bridges and Flood Control (DNEPCC) project management unit. One of the outcomes of the project is an action plan that identifies areas where the legal and regulatory

framework and implementation capacity for environmental safeguard systems need to be strengthened.

Based on the legal analysis, a number of recommendations for amendments to the EBL and ELL were proposed. These were aimed at improving clarity in the laws and introducing international best practices in environmental assessment and environmental licensing. In addition five regulations were drafted, to be adopted under Article 42 ELL. These were:

- Regulation on the Detailed Requirements for the Terms of Reference, Environmental Impact Statements and Environmental Management Plans for Environmental Assessment
- Regulation on Public Consultation
- Regulation on Impact and Benefit Agreements
- Regulation on Evaluation Committee for Category A Projects
- Regulation on Fees and Charges.

The overall aim of the project was to improve the regulatory framework for environmental assessment and environmental licensing, to enhance the capacity of DNMA staff to understand and implement the environmental legislation and to increase stakeholder awareness about the environmental assessment and environmental licensing process.

## **7.2 Synergies in implementation of related MEAs**

Timor-Leste is still in the process of considering, evaluating and finalizing accession procedures for a number of Multilateral Environmental Agreements (MEAs) that are relevant to the country. One recent example was the symposium and briefing meetings of 26 to 27 November 2014 in Dili with a delegation from CITES and UNEP. Accordingly, the level of coordination and cooperation at this stage is in its infancy. Nevertheless, it is recommended to start planning and implementing the required coordination processes now to achieve beneficial synergies in the near future.





## PART III

# PROGRESS TOWARDS THE 2020 AICHI BIODIVERSITY AND RELATED TARGETS

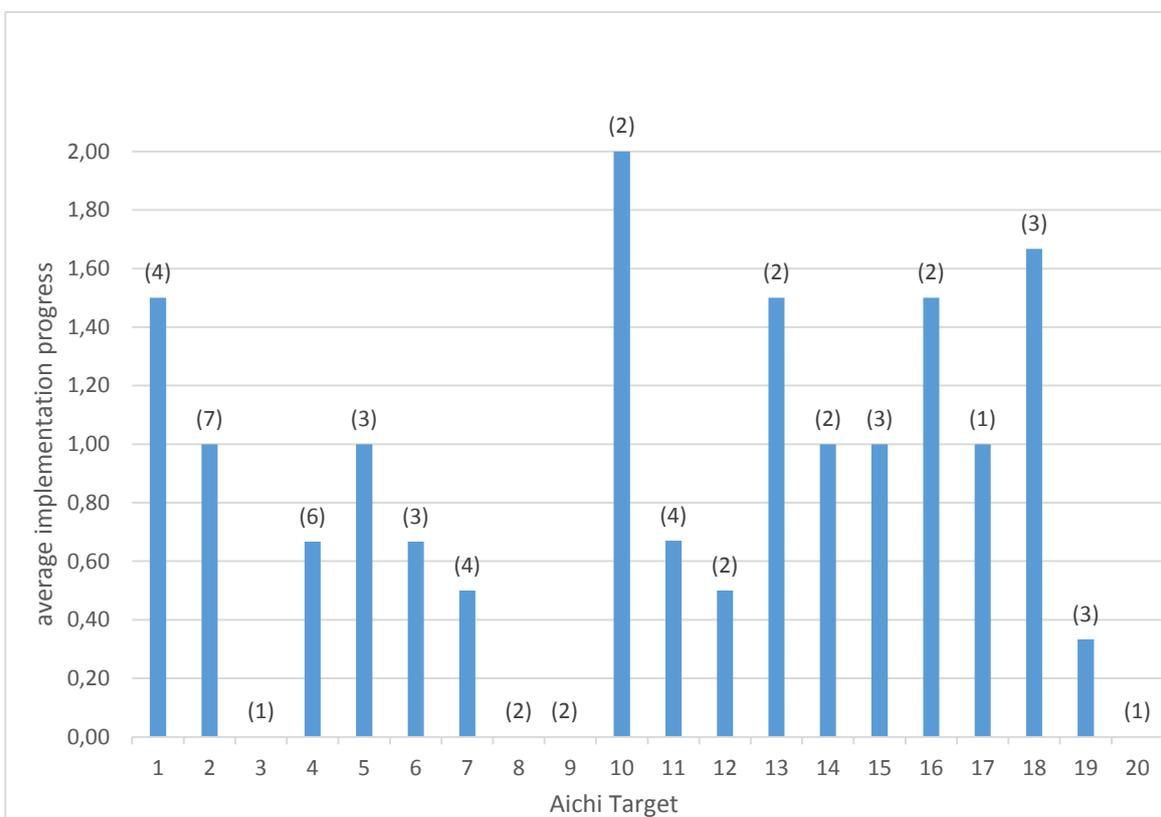
## **8. Progress towards the national biodiversity targets**

Timor-Leste became a party to the UN CBD at an early stage in the nation's history thus its commitments, achievements and challenges in conserving and sustainably using all components of biodiversity are so far rather comprehensively reflected in the CBD tools such as the NBSAP and required national reporting. For the new decree laws on biodiversity, EIA, and protected areas which have not yet been enacted, however, more specific regulations will need to be formulated that will likely include additional aspects, measures, requirements and specifications (e.g., protected species lists, hunting and other restrictions) related to biodiversity conservation. Supporting tasks may include compilation and implementation of a national red list of endangered species that could be complemented on a rolling basis. Such possible elements of a national biodiversity agenda will need to be monitored, evaluated and followed up on at a later stage.

## **9. Progress towards the 2015 and 2020 Aichi Biodiversity Targets**

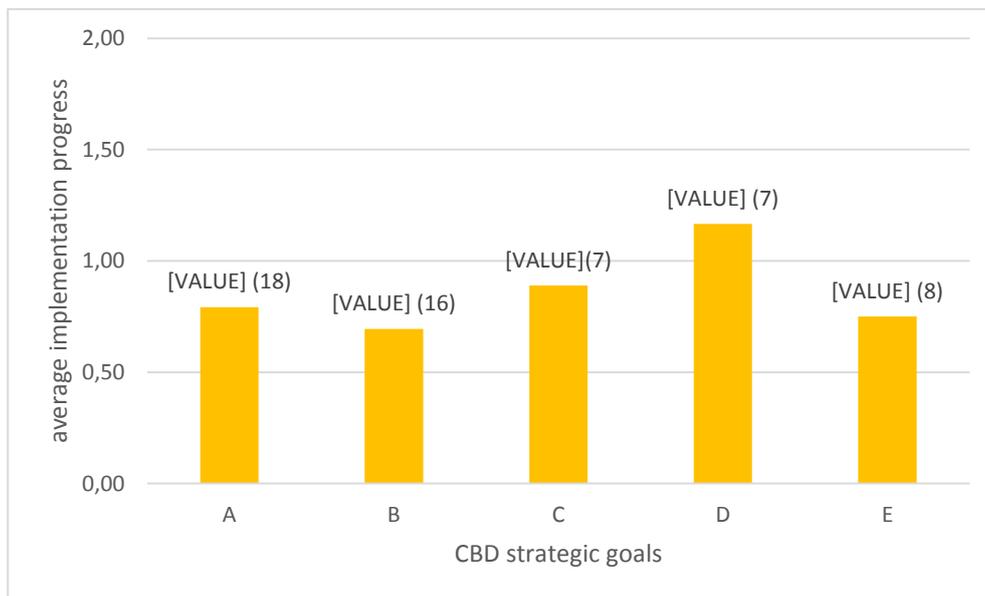
The assessment of progress of NBSAP priority actions and priority strategies presented in chapter 6 can be used as well to get an indication of how well Timor-Leste has contributed to achieving the CBD's Strategic Plan by linking it with the ATs and CBD strategic goals. An analysis of what actions may have contributed to which individual AT and the resulting average progress scores can be found in the table of Appendix III. Progress scores have been calculated averaging the estimated progress made for individual actions using the following valuation system: 0 = little/no, 1 = moderate, 2 = considerable progress (see Appendix III).

Figure 10 visualizes the results for the individual ATs. Sample sizes (given in brackets), however, are rather small and the higher scores have mainly been achieved with regard to one particular area of intervention (e.g., AT 1 with regard to CEPA activities, ATs 10 and 13 with regard to improving subsistence agriculture in rural areas, and AT 16 with regard to the Nagoya Protocol on ABS).



**Figure 16** – Estimation of Timor-Leste’s contribution towards implementation of the CBD’s Aichi Targets (ATs) based on the country’s progress in implementing their NBSAP priority actions (the numbers given in brackets refer to sample sizes, i.e. the numbers of priority activities contributing to each AT; average progress has been calculated based on the estimated progress made for individual actions using the following valuation system: 0 = little/no, 1 = moderate, 2 = considerable progress, see Appendix III; for ease of reference, ATs are listed in Appendix IV)

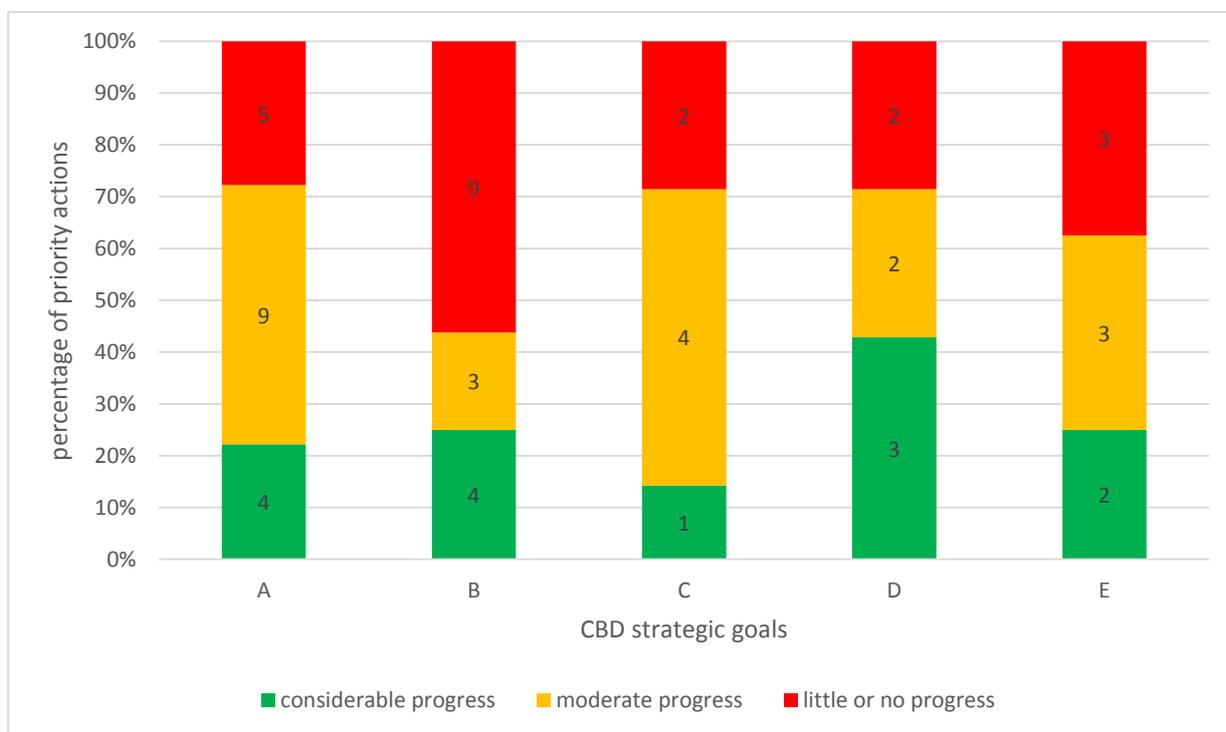
Each of the 20 Aichi Targets belongs to one of the six CBD strategic areas (goals) A to E (see Appendices III and IV for ease of reference). Therefore, by doing the same analysis done above for the Aichi Targets (Figure 16) for the six CBD goals to which Timor-Leste’s strategic priorities 1 to 5 directly correspond to, small sample sizes can be avoided and the average implementation progress can be calculated from already mean values (Figure 17). The diagram shows that based on the country’s progress in implementing their NBSAP priority activities only one CBD strategic goal achieves higher than moderate implementation progress scores. This is strategic goal D on enhancing the benefits to all from biodiversity and ecosystem services.



**Figure 17** – Estimation of Timor-Leste’s contribution towards implementation of the CBD’s strategic goals based on the country’s progress in implementing their NBSAP priority actions (the numbers given in brackets refer to sample sizes, i.e. the numbers of priority activities within each category; average progress has been calculated based on averaging the estimated progress made for individual actions within each category using the following valuation system: 0 = little/no, 1 = moderate, 2 = considerable progress, see Appendix III; CBD goal A: Address the underlying causes of biodiversity loss by mainstreaming diversity across government and society; CBD goal B: Reduce the direct pressures on biodiversity and promote sustainable use; CBD goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity; CBD goal D: Enhance the benefits to all from biodiversity and ecosystem services; CBD goal E: Enhance implementation through participatory planning, knowledge management and capacity building)

As done in Figure 15 for Timor-Leste’s priority strategies, Figure 18 shows the relative implementation progress within each CBD strategic goal. The result can be summarized as follows: based on its progress in implementing the NBSAP priority actions, the country’s contributions towards the CBD strategic goals for over 60% of evaluated actions appear to have achieved moderate or higher progress, with one exception: CBD strategic goal B that is about reducing the direct pressures on biodiversity and promoting sustainable use for over 50% of evaluated actions comes out as having made little or no progress. Together with the finding from Figure 17 that strategic goal D on enhancing the benefits to all from biodiversity and ecosystem services scored best in the analysis, this seems to well capture the overall situation of the country and may be used as a basis for future planning.

Surprisingly, there is an obvious contrast to Figure 15 where priority strategy 4 (corresponding to CBD goal D) scored poorly and priority strategy 2 (corresponding to CBD goal B) did rather well. This discrepancy, however, can be explained by the way the identified priority activities had been attributed to the five priority strategies in the NBSAP and would disappear mostly when regrouping them in an alternative manner.



**Figure 18** – Estimation of Timor-Leste’s contribution towards implementation of the CBD’s strategic goals based on the country’s progress in implementing their NBSAP priority actions: relative implementation progress within CBD strategic goals (“green” indicates considerable, “orange” moderate, and “red” little or no progress; numbers inside columns refer to sample sizes, i.e. the numbers of priority activities within each category; CBD goal A: Address the underlying causes of biodiversity loss by mainstreaming diversity across government and society; CBD goal B: Reduce the direct pressures on biodiversity and promote sustainable use; CBD goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity; CBD goal D: Enhance the benefits to all from biodiversity and ecosystem services; CBD goal E: Enhance implementation through participatory planning, knowledge management and capacity building)

Another potential way of assessing a country’s contributions towards achieving the Aichi Biodiversity Targets that has been considered is to use the set of indicators proposed by the Biodiversity Indicators Partnership (BIP). Meanwhile, one or several such indicators have been elaborated and agreed upon for most of the Aichi Targets. While some of them have been tailored towards the CBD Secretariat to assess implementation progress globally or regionally, others such as the area of forest that is certified to be managed sustainably or the Wild Bird Index for farmland birds (both for AT 7) could be applied at the national level if the data is available. As these are quite sophisticated indicators, this requires an advanced level of development which at this stage does not exist in Timor-Leste. They may, however, become at least partly applicable in the future.

## **10. Progress towards the relevant Millennium Development Goals**

There are eight Millennium Development Goals (MDGs) of which Goal 7 “Ensure environmental sustainability” is relevant to biodiversity conservation and sustainable use. In particular, Target 7.A of the MDGs “Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources” and Target 7.B of the MDGs “Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss”, are of interest. These MDGs refer in first instance to the CBD strategic goals A and B, i.e. “Address the underlying causes of biodiversity loss by mainstreaming diversity across government and society” (goal A); and “Reduce the direct pressures on biodiversity and promote sustainable use” (goal B). As seen in the previous chapter 11, implementation progress of these two CBD goals appear to differ considerably. While Goal A on addressing the underlying causes of biodiversity loss by mainstreaming diversity across government and society fared rather well with over 70% of assessed priority actions having made at least moderate progress, Goal B about reducing the direct pressures on biodiversity and promoting sustainable use for over 50% of evaluated actions comes out as having made little or no progress (see Figure 18).

## **11. National implementation of the CBD programme of work on protected areas**

Timor-Leste commenced its work on protected areas some 15 years ago with initial research work that stemmed from the Regulation 19/2000 UNTAET and declared 15 wild areas. From this foundation the Nino Konis Santana National Park (PNNKS) was declared in 2007 under Government Resolution No. 8/2007. Science and research work on both terrestrial and marine ecosystems followed on from this. Gaining a better understanding of Timor-Leste’s marine environments was supported by the CTSP. Along with this formative research, work was undertaken by the Charles Darwin University (CDU), Darwin, in collaboration with the Government of New South Wales, Australia. On the terrestrial front CI and USAID committed work with NGO Haburas on developing community biodiversity. In the early to mid-2000s, the Darwin Initiative supported IBA research through Birdlife International using the support of the CDU. Information and knowledge of Timor-Leste’s ecology was being amassed.

In 2010, the UN CBD with its Programme of Works on Protected Areas (PoWPA) provided an opportunity for the MAF to gain support for further work on extending Timor-Leste’s protected areas based on the ecological information that had been collected. The Timor-Leste PoWPA work was managed by the DNFGBH within MAF with support from UNDP and UNESCO.

The National Directorate of Fisheries was also a crucial partner being the government host of the Coral Triangle Initiative work in unison with CI.

With funding gained from the GEF and support from UNDP, the MAF commenced implementing PoWPA in January 2010. A National Ecological Gap Assessment (NEGA) was completed by the end of 2010 and the participative report recommended the establishment of 30 protected areas, including two terrestrial areas and one marine area already within the PNNKS. The NEGA reinforced earlier decisions for IUCN Category V to be applied to the national park.

From 2011-2012 the DNFGGBH generated the Strategic Action Plan for PoWPA, Timor-Leste to guide the national planning processes for protected areas. A commensurate Capacity Development Action Plan was also developed to coordinate institutional strengthening and outline the needs for individual capacity building. The intent of the DNFGGBH to commence on-the-ground efforts in the PNNKS led to gaining the interest of UNESCO in Timor-Leste joining the Man and Biosphere Programme (MAB). Assisted by UNESCO, MAF in 2011 sought assistance for the nomination of PNNKS as a Biosphere Reserve. These composite actions supported the outstanding components of Timor-Leste's PoWPA and in late 2014 work was commissioned to complete the Site Conservation Management Plan (SCMP) for the PNNKS.

The SCMP is now complete with final validation and review by the DNFGGBH and the wider MAF. It has combined work on biophysical elements of the terrestrial and marine environments with the production of the socio-economic and existing land use analysis of the Park (*'Mapping of the Existing Conditions in Nino Konis Santana National Park, Timor-Leste, PEKA Foundation for UNESCO Regional Office, Jakarta'*). A participatory land use approach was used in the progress of the SCMP, with proposed biosphere zoning greatly informed by the mapping from the NEGA, the more recent National Forest Conservation Management Plan (JICS and NDF. 2013c), and UNESCO first pass zoning options refined by GIS mapping undertaken by Planning 4 Sustainable Development Pty Ltd. The SCMP advocates zoning of a core area (Zone 1), a buffer area (Zone 2) and transition areas (Zone 3) under the MAB guidelines. The use of IUCN Category V classification with the MAB method of conservation area zoning provides a sound basis upon which the SCMP reconciles social and cultural heritage needs with biodiversity conservation needs to ensure the existing communities have sustainable livelihoods.

## **12. Future priorities**

During preparations for this report and the second consultation meeting held on 28 January 2015, stakeholders were given the opportunity to recommend future priorities. The results, together with their relation to the country's priority strategies and identified NBSAP strategic actions (cf. Appendix II) are shown in Table 4.

Only one out of six of these 30 additional actions considered and recommended as an immediate priority, however, are new actions. The remainder refer to the continuation of ongoing work, already planned activities that have not yet been implemented, or partly new activities (see Table 4).

**Table 4 – Recommended future priorities and their relation to the NBSAP strategic actions**

PS	SA	Recommended future priorities	Relation to NBSAP strategic actions	noted by
1	1	Continuation of previous and other CEPA-related activities;	Continuation of ongoing work	CEPA TWG
1	1	Awareness raising on the importance of ABD for enhancing the rural economy of Timor-Leste;	Continuation of ongoing work	ABD TWG
1	1	Enhance subject of biodiversity in curricula of primary schools up to university level.	Continuation of ongoing work	CEPA TWG
1	1	Production and dissemination of information materials and hand-outs on the fifth National Report and NBSAP revision;	Planned activity	CEPA TWG
1	1	Effective sensitization and education of local people and students on the importance of aquatic resources;	Partly new activity	AB TWG
1	1	Education/training on a more sustainable use of water;	Partly new activity	AB TWG
1	1	Sensitization of public on decree law on livestock (14 May 2014);	New activity	CEPA TWG
1	3	Promotion of Maubisse and Atauro Island as alternative locations for ecotourism;	Partly new activity	CEPA TWG
2	6	Enactment of the new Biodiversity Decree Law;	Planned activity	AB TWG
2	6	Strict implementation of environmental laws and other relevant legislation;	Planned activity	AB TWG
2	8	Integrated, well-coordinated management using mechanical, physical and biological approaches to eradicate and control invasive exotic weeds in Timor-Leste in order to use lands appropriately for stimulating agricultural production, food security, the economy and livelihoods of local farmers, and as a tourist destination, based on a MoU between MAF, SEMA/MCIA and MOT;	Partly new activity	ABD TWG
2	9	Implementation of additional participatory forest management schemes with local communities;	Partly new activity	ABD TWG
2	9	Implementation of comprehensive national programme on community-based forest management;	Partly new activity	FDB TWG
3	10	Preparation and enactment of conservation plans for forest, dryland and grassland ecosystems;	Partly new activity	FDB TWG
3	12	Stronger recognition of and action in agrobiodiversity, upland agriculture and climate-smart agriculture embedded in a national programme;	Continuation of ongoing work	ABD TWG
3	12	Creation of a gene bank for agricultural species and varieties.	Continuation of ongoing work	ABD TWG

3	12	Identification, compilation and close monitoring of threatened agricultural species and varieties (some of which have been identified through the ABD project) by the MAF and National Working Group on ABD;	Partly new activity	ABD TWG
3	12	Creation of an institution/department responsible for the agro-biodiversity programme;	New activity	ABD TWG
4	15	Strengthening water management system (residual and rain water);	Continuation of ongoing work	AB TWG
4	15	Improvement of environmental standards, especially with regard to water quality;	Continuation of ongoing work	AB TWG
4	15	Better use of data on water resources and quality, e.g., to enhance implementation of protected areas;	Partly new activity	AB TWG
5	17	Training for stakeholders on NBSAP implementation;	Planned activity	CEPA TWG
5	17	Training of judges and magistrates on environmental crime and respective penal code;	New activity	AB TWG
5	18	Research on methods to cope with invasive alien weed species, in particular on control methods adapted to the specific conditions of Timor-Leste;	Planned activity	ABD TWG
5	18	Creation of a database and GIS map for species biodiversity throughout the country;	New activity	ABD TWG
5	19	Establishment of the CHM to store and share all available environment and biodiversity related data;	Planned activity	ABD TWG
5	19	Enforcement of CHM	Planned activity	AB TWG
5	21	Provision of financial support to biodiversity-related activities	Continuation of ongoing work	CEPA TWG
5	21	Provision of means for independent research based on partnerships of universities with research agencies/institutes or individual researchers (e.g., Terrestrial Rapid Assessment Programme (RAP), Aqua RAP, Marine RAP; cf. Erdmann and Mohan, 2013);	Continuation of ongoing work	AB TWG
5	21	Use of human development fund for technical trainings on issues related to aquatic biodiversity;	New activity	AB TWG

(AB = aquatic biodiversity; ABD = agricultural biodiversity; CEPA = communication, education and public awareness; FDB = forest and drylands biodiversity; NBSAP = National Biodiversity Strategy and Action Plan; PS = priority strategy; SA = strategic action; cf. Appendix II)

### **13. Information concerning the reporting Party and preparation of the fifth national report**

Since 2007 Timor-Leste is a party to the UN CBD. In October 2011, it presented a first official report on the status of biodiversity in Timor-Leste to the UN CBD (termed the “4<sup>th</sup> National Report”) which was prepared by the National Biodiversity Working Group coordinated by the Ministry of Economy and Development (MED) with support from the United Nations Development Programme (UNDP) and the GEF. The report gives an overview of the status of the country’s biodiversity and serves as a baseline at the moment it joined the UN Convention, however, it was also felt that the process of gathering this initial information and writing the report had not been fully participatory. The report at hand, therefore, was designed to address this issue and make sure that the knowledge that is required to compile such information is generated within Timorese professionals thereby assuring their ownership of the process. This led to the establishment of four TWGs as described earlier in this report. More effort and time than anticipated, however, was needed to support these working groups in delivering data in the required format and quality, and for two of them the project team had to resort to complementary search and collection of data, including interviews with relevant Directors and senior staff members, to make sure that the available information is duly included in the report. Moreover, all of the groups delivered the data that could be used very late, i.e. in December 2014 and January 2015, despite the constant support, reminders and encouragement by the project team.

Some of the information included in this report, in particular on the state of the country’s forests (cf. JICS and NDF, 2013a/b/c), date from work done in 2010 and 2011, or earlier, but have not been reported in the 4<sup>th</sup> National Report because the results were not available at that time. The 4<sup>th</sup> National Report further includes a few misleading figures and statements that were corrected in this report based on the more reliable and accurate data that is meanwhile available.

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# Appendices

**Appendix I** – Progress matrix on Timor-Leste’s implementation of the priority actions identified in the country’s NBSAP

(CEPA = Communication, Education and Public Awareness; NBSAP = National Biodiversity Strategy and Action Plan; TWG = Thematic Working Group)

Priority Strategy 1	Mainstreaming biodiversity into sectoral plans and programmes to address the underlying causes of biodiversity loss				
Target	By 2015, public awareness on biodiversity has increased and participation in conservation activities (through sustainable tourism and sustainable agriculture) by private sector, media, and local communities, including women and youth, has been enhanced.				
NBSAP recommended activity/sub-action (#)	Actions reported by agricultural biodiversity TWG	Actions reported by forest/drylands biodiversity TWG	Actions reported by aquatic biodiversity TWG	Actions reported by CEPA TWG	Overall progress
1.1 Conduct communication, education and public awareness activities through forum, seminars and public dialogues on environment and biodiversity conservation, especially on various topics such as sustainable management of ecosystems; endangered species and prohibition of collection and sale; pollution and garbage; wildlife management and conservation; sound management of land, forest and water resources; and other related topics.	<ul style="list-style-type: none"> <li>Annual celebration of World Food Day (16 October) together with Konsantil.</li> <li>Sensitization of ABD concept in 26 pilot sucos / 5 districts (Bobonaro, Manatuto, Baucau, Viqueque, Lautem).</li> <li>Various presentations at national level (Biodiversity Day 2013, World Food Days 2013 and 2014).</li> <li>Seed fairs (5 Districts as above – 700 farmers, Lautem 2013, rest Oct to Dec 2014).</li> <li>26 farmers groups (550 families) trained in ABD-conservation activities.</li> </ul>	<ul style="list-style-type: none"> <li>MAF (i.e. DNFBGH, DNCN) and SEMA conducted public awareness raising activities on forest biodiversity and its importance in Oecussi, Viqueque, Aileu, Lospalos, Baucau, and Manatuto.</li> <li>Information boards placed around protected areas by MAF (e.g., Tasi Tolu, Cristo Rei).</li> <li>Media: Radio and TV (RTTL) broadcastings on forest protection by MAF.</li> <li>Annual tree planting events in different locations with small budget support to community groups, NGOs.</li> </ul>	<ul style="list-style-type: none"> <li>Awareness raising on values of marine biodiversity.</li> <li>Conservation International (CI) provided country and site specific marine biodiversity information from community-based work during the USAID funded Coral Triangle Support Partnership (CTSP). This included the development of information, communication and education campaign products (brochures, radio and TV spots, posters).</li> <li>Several community-led conservation activities have been conducted in PNNKS, including partnerships with local business owners.</li> <li>Development partners have helped developing awareness raising campaigns.</li> </ul>	<ul style="list-style-type: none"> <li>Annual celebrations of World Biodiversity Day (22 May), World Environment Day (5 June) and the Coral Triangle Day (9 June) with distinct public events in Dili and elsewhere organized and conducted by SEMA, MAF and NGOs, e.g., fairs, exhibits, on relevant environmental topics; children’s drawing competitions and quizzes; public speeches of national key politicians or members of parliament.</li> <li>Information and awareness raising workshops/events conducted by: <ul style="list-style-type: none"> <li>SEMA: 4 ABS workshops (22-24 Jan 2013, 28 June 2013, 29-31 July 2013, 14 Nov 2013); workshops in all districts on new Decree Laws on Biodiversity &amp; EIA (2013-14); 1<sup>st</sup> Conference on Climate Change Adaptation (5-7 Nov 2014); stakeholder consultation on preparation of 5<sup>th</sup> Biodiversity National Report</li> </ul> </li> </ul>	<p>Overall progress</p>
1.2 Produce and distribute CEPA publications such as brochures, pamphlets, newsletters and other printed materials, and participate in exhibits in village and school activities.	<ul style="list-style-type: none"> <li>MAF staff at district and suco level trained and involved in ABD conservation activities.</li> <li>LinkedIn group “Promotion of ABD in Timor-Leste”.</li> <li>Inclusion of ABD aspects in food security policy.</li> <li>Inclusion of ABD aspects in national rice, beans and vegetable campaigns.</li> <li>Media (Radio, film, TV, print products): 3x community radio (VQQ, Lautem 2013);</li> </ul>				<p>Overall progress</p>

	<p>3x national radio (Radio Timor-Leste, Nov 2014); 1 film on seed banks; ABD database; 3x national TV; 1 ABD brochure; 2 ABD posters; ABD thematic maps.</p> <ul style="list-style-type: none"> <li>• Agricultural training given to twelve farmers from twelve municipalities (districts) in 2013 by Hasatil.</li> <li>• One day workshop on local seed saving techniques and their promotion for 12 Hasatil members from 12 districts in Nov 2014 in Dili.</li> <li>• March to commemorate Human Rights Day with the theme of Food Sovereignty and Agrarian Reform (Rede Hasatil, R. ba rai, UNAER, FONGTL).</li> <li>• Local cuisine competition in 2014 (Rede Hasatil).</li> <li>• Promotion of cooking (“five dishes, five colours”) in 2013 by HIAM Health in Manufahi.</li> <li>• Establishment of shops that sell local products by Hasatil in 2014.</li> <li>• Workshop conducted by MCIA on “one sub-district, one product” in 2014.</li> </ul>			<p>(19 Aug 2014); CITES briefing (27 Nov 2014);</p> <ul style="list-style-type: none"> <li>○ MAF: Promotion of PNNKS for nomination as a Biosphere Reserve under the UNESCO MAB programme: national workshops (June 2011, Sep 2012); district workshops in Lautem (Oct 2013, Sep 2014);</li> <li>○ other awareness raising activities were conducted by the Ministry of Tourism and NGOs, e.g., Haburas, Hasatil, Permatil, Halarae, Fraterna, Prospek.</li> <li>• Production and dissemination of brochures, posters: <ul style="list-style-type: none"> <li>○ SEMA: e.g., on marine turtles and tortoises, endangered plants and trees, plantations, and climate change;</li> <li>○ MAF: e.g., on protected areas and endemic, rare and vulnerable bird species.</li> </ul> </li> <li>• Participation in exhibitions: <ul style="list-style-type: none"> <li>○ SEMA: see first bullet point; participation in awareness raising events of other Ministries and organizations;</li> <li>○ MAF: fairs on forest and bird conservation, wood and forest products.</li> </ul> </li> <li>• Environmental education: <ul style="list-style-type: none"> <li>○ presentation of specific environmental informa-</li> </ul> </li> </ul>	
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				<p>tion for school children in the form of quizzes;</p> <ul style="list-style-type: none"> <li>○ beach and underwater clean-up with schools;</li> <li>○ environmental education seminars at junior high schools organized by SEMA and supported by JICA (from June 2014; ongoing), e.g., littering, organic and inorganic wastes, functions of forests, ozone issue;</li> <li>○ “Tempu Labarik Aprende” with RTTL (Sept and Oct 2014);</li> <li>○ participation in drawing contests in Japan about environmental issues supported by JICA (Sept and Oct 2014);</li> <li>○ environmental education lecture on internalizing environmental costs at UNTL with H3R, a local NGO (Sept 2014);</li> <li>○ preparation and use of comics to explain ozone issues to children supported by UNDP (Jan 2015);</li> <li>○ ashtray production to reduce littering by cigarette butts in Lautem with Verde, a local NGO (Jan 2015; ongoing).</li> </ul>	
1.3 Establish a Communication and Education and Information Centre and Library.	Establishment of an integrated agriculture centre (KSI, 2014-2015).			<ul style="list-style-type: none"> <li>● A Centre for Climate Change and Biodiversity has been established and inaugurated</li> </ul>	

				<p>on 22 May 2014.</p> <ul style="list-style-type: none"> <li>• Small library established at SEMA but not continued.</li> </ul>	
<p>1.4 Develop modules on environment and biodiversity conservation for integration in the elementary and high school curriculum.</p>	<ul style="list-style-type: none"> <li>• Development of primary school curriculum on nature /biodiversity conservation.</li> <li>• Development of curriculum on natural resource conservation (UNPAZ, 2013).</li> <li>• Development of primary school curriculum on school gardening by Ministry of Education in 2014.</li> <li>• Creation and implementation of forest programme for children (KSI, 2014).</li> <li>• ABD "Training of Trainers" manual under preparation.</li> </ul>			<p>School curriculum developed by Ministry of Education. The same Ministry, with support from SEMA, UNICEF and CARE International, also produced the Lafaek magazine as one teaching material.</p>	
<p>2.1 Develop policies and programmes to integrate biodiversity into agriculture programmes and promote agro-biodiversity.</p>	<ul style="list-style-type: none"> <li>• National working group on agro-biodiversity established in 2014 to advocate for and promote knowledge base of ABD.</li> <li>• National policies on seeds and food security and sovereignty (draft) developed by MAF.</li> <li>• ABD implementation guide currently is in progress.</li> </ul>				
<p>2.2 Introduce and promote appropriate and environmentally-compatible improved farming practices to increase production in agricultural lands, e.g. alley cropping, crop rotation, terracing, high-yield seeds.</p>	<ul style="list-style-type: none"> <li>• Application of biodiversity friendly farm practices (erosion control, water harvesting, mulching, terracing, compost preparation, IPM, organic farming, etc.) with community groups on 26 pilot sites of 5 districts, 2013 onwards.</li> </ul>	<p>MAF conducted soil and water conservation activities for agricultural purposes and developed a traditional dam and infiltration wells in Matadoru.</p>	<p>There has been an increase in the use of living fences in FAO conservation agriculture sites.</p>	<p>Provision of organic fertilizer by MAF, NGOs</p>	

3.1 Review and develop national and local laws and policies on tourism and ecotourism.			A tourism policy framework has been approved in 2014.	Activities for promoting ecotourism have been conducted in Pantai Walu, Tutuala, Com, Maubara, etc. by the Ministry of Tourism, SEPFOPE and the NGO Haburas (this does not directly address activity 3.1.)	
3.2 Establish and develop key tourism destinations and ecotourism centers with upgraded infrastructures and promotional materials that integrate biodiversity.		Surveys on ecotourism (nature, culture, history) conducted by MAF in PNNKS and in protected area of lake Modomahud in Fatuberliu sub-district of Manufahi.	<ul style="list-style-type: none"> <li>• ILO (2013) explored the potential for cultural tourism.</li> <li>• First economic valuation studies on the contributions of ecotourism (more specifically SCUBA diving tourism) in Timor-Leste showed the importance of conserving marine biodiversity and highlighted pressures witnessed in common dive destinations (Pinto, 2014c).</li> </ul>	Information boards have been installed by the Ministry of Tourism and SEPFOPE in potential ecotourism areas of the entire territory of Timor-Leste.	
4.1 Socialize and implement sustainable land management and land use policy.				Registration for land ownership has been conducted under the Ministry of Justice and DNTP (but this does not directly address activity 4.1.)	
4.2 Monitor impacts of sustainable land management and land use policy.					
4.3 Enhance sustainable land management and land use policy.		MAF programme on controlling forest fires (sensitization, radio and TV broadcasts).	Timor-Leste signed and ratified the United Nations Convention to Combat Desertification (UNCCD) and received funds by the GEF to prepare its National Action Plan and Sustainable Land Use Management Policies (pending).	Regulations put in place (Diploma Ministerial No. 2, 19 Feb 2014) by Ministry of Petroleum and Mineral Resources to limit gravel and sand extraction by private companies.	
5.1 Enhance implementation of the EIA system (National Decree No. 5/Feb 2011) for				EIA Decree Law No. 5/Feb 2011 has been produced under SEMA.	

specific development projects					
5.2 Implement appropriate EIA system and evaluate impacts of development projects (industry, oil and mining, infrastructure, energy, transport, etc.)			Timor-Leste with support of the Asian Development Bank developed a comprehensive framework for Environmental Impact Assessment (EIA) in Timor-Leste (still pending approval by the Ministry of Commerce, Industry and Environment).		
<b>Priority Strategy 2</b>	<b>Protecting biodiversity and promoting sustainable use</b>				
<b>Target</b>	<b>By 2015, rehabilitation activities in critical watershed and degraded lands have been undertaken and at least one million trees have been planted per year; and sustainable livelihoods have been provided to local communities through ecosystem restoration activities.</b>				
<b>NBSAP recommended activity (#)</b>	<b>Actions reported by agricultural biodiversity TWG</b>	<b>Actions reported by forest/drylands biodiversity TWG</b>	<b>Actions reported by aquatic biodiversity TWG</b>	<b>Actions reported by CEPA TWG</b>	<b>Overall progress</b>
6.1 Conduct inclusive stakeholder consultation/socialization of the national Biodiversity Law/Decree and Wildlife Conservation Law.		Finalization of the Biodiversity Law			
6.2 Facilitate enactment and implementation of the National Biodiversity Law, including wildlife conservation policies and benefits sharing.		Facilitating the supervision and implementation of the Biodiversity Law	Timor-Leste has finalized its Biodiversity Decree Law (still pending approval from the government).		
6.3 Strictly implement environmental decrees, regulations and policies at national and district levels, including traditional laws (Tara Bandu).		<ul style="list-style-type: none"> <li>• Implementation of environmental decree laws together with traditional Tara Bandu law;</li> <li>• Joint operations of MAF and PNTL to control illegal felling of trees in various districts.</li> </ul>			

<p>7.1 Establish community-based nurseries especially for high-value timber trees and involve local communities in reforestation/planting activities.</p>	<p>Camoes, MAF and GIZ supported in twelve districts the establishment of 313 community-based nurseries for high value tree species such as mahogany, teak and sandalwood, as well as 182 nurseries for coffee.</p>	<p>MAF supported communities to develop/plant seedlings in cooperation with Mercy Corps in villages of 8 districts.</p>			
<p>7.2 Conduct massive tree planting activities by targeting one million trees nationwide every year, and reforest degraded mangrove areas.</p>		<ul style="list-style-type: none"> <li>• MAF supported provision of seedlings and reforestation activities.</li> <li>• 6000 trees planted in Atauro Island by MAF to protect the water source.</li> <li>• Maloa River protected by MAF through planting trees.</li> <li>• Mangrove seedlings planted by MAF in Tibar together with local community and mangrove trees in Ulmera village, Liquiça.</li> </ul>			
<p>7.3 Assess and identify areas suitable for planting (e.g., degraded mountain slopes and watersheds) and identify appropriate rehabilitation approaches and suitable species for planting (e.g., suitable tree species include trees for domestic and commercial use and for environmental rehabilitation).</p>	<ul style="list-style-type: none"> <li>• 26 ABD pilot groups planted 5000 local fruit tree seedlings in 2014 and 2015.</li> <li>• 64,000 Marungi seeds (local vegetable) have been disseminated for planting in school gardens in 2014 by MAF, NCBA.</li> </ul>	<ul style="list-style-type: none"> <li>• MAF supported studies/research to find the right areas for certain tree species.</li> <li>• Industrial forest border demarcation by MAF in Zulo village, Zumalai, Covalima and Aidabaleten village, Atabae, Maliana.</li> <li>• MAF and JICA conducted activities to manage waterways/watersheds in the Comoro (Dili) and Lacro (Manatuto) river basins.</li> </ul>	<ul style="list-style-type: none"> <li>• Few to little efforts other than donor funded programmes (JICA) have been done to restore degraded catchments in Timor-Leste.</li> <li>• Government is yet to create national guidelines for site and species selection for different restoration activities.</li> </ul>		

7.4 Develop and implement a monitoring and evaluation system for rehabilitation activities (to monitor growth and survival and replanting needs).			Government still needs to generate a monitoring and evaluation system for rehabilitation activities in Timor-Leste together with national guidelines for the rehabilitation of degraded catchments.		
8.1 Identify invasive species and pathways in critical sites and assess their impacts on ecosystems and biodiversity.					
8.2 Identify and implement prevention, control or eradication measures on invasive species.			Little to no work has been done to control invasive species that use waterways such as the Asian Black-spined Toad ( <i>Duttaphrynus melanostictus</i> ) as well as Bellyache Bush ( <i>Jatropha gossypifolia</i> ) which has invaded significant coastal areas in Timor-Leste's north coast.		
9.1 Organize and mobilize communities to protect and manage forests and other ecosystems.	<p>Project: "Promotion of sustainable use of agrobiodiversity" – main pillars:</p> <ul style="list-style-type: none"> <li>• ABD-assessment of 26 sucos in all 26 pilot sucos, 2013 and 2014.</li> <li>• Establishment of an ABD database (hosted by UNTL) with 500 varieties, 2013 and 2014.</li> <li>• ABD-Monitoring System</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of seedlings and reforestation activities supported by MAF.</li> <li>• SEMA supported integration of Tara Bandu traditional jurisdiction to protect forests and other ecosystems from degradation.</li> </ul>	The Ministry of Agriculture and Fisheries (MAF) initiated the process to register and provide support to community-based groups interested in engaging in restoration and reforestation. Unprecedented funds have been allocated to this project from the State budget showcasing the government's commitment to this cause.		

<p>9.2 Sensitize communities and let them understand the importance and values and functioning of ecosystems and biodiversity resources therein.</p>	<p>in place and used, 27 % increase of ABD on average after one year (starting 2014, every six months).</p>	<ul style="list-style-type: none"> <li>• SEMA and DNMA conducted public awareness raising activities on forest biodiversity and its importance in 13 districts.</li> <li>• Campaigns on forest education and awareness raising conducted by MAF for communities in PAs of Tasi Tolu and Aitana (suco: Lalini), as well as in Oecusse, Aileu, Lospalos, Viqueue, Baucau and Manatuto.</li> </ul>			
<p>9.3 Develop pilot sites to mobilize communities to protect and manage forests.</p>		<p>JICA, Mercy Corps, MAF, and SEMA piloted watershed protection projects in Los Palos and Aileu districts (ongoing).</p>			

<p>9.4 Enhance existing and develop new sustainable livelihood options for local communities.</p>	<ul style="list-style-type: none"> <li>Starting implementation of value chain on native species, e.g. Tua metan (sugar palm) through processing palm sap to syrup, maintaining/conserving forest ecosystem and ecosystem services, while obtaining monetary benefits (1 forest edge living community)</li> <li>Supporting economic development of farmer groups through forest edge based value chains (chilly peppers).</li> <li>Supporting farmers to produce and market ABD crops such as black and red rice.</li> <li>Starting March 2014 in Viqueque, Lautem and Baucau</li> </ul>	<p>Mercy Corps, together with SEMA, supported sustainable rural livelihoods through the introduction of cooking stoves made from soil and mud.</p>	<p>Different partners have worked with the government on sustainable livelihood issues, however, this data is extremely scattered.</p>	<p>Promotion of natural stoves (made from red soil), solar stoves, and biogas in Aileu, Viqueque, Dili and Ermera (2012-2014).</p>	
<p><b>Priority Strategy 3</b></p>	<p><b>Building climate-resilient ecosystems through effectively managing protected areas and reducing threats to biodiversity</b></p>				
<p><b>Target</b></p>	<p><b>By 2020, the status of biodiversity has improved by safeguarding ecosystems, species and genetic diversity in the 30 identified protected areas.</b></p>				
<p><b>NBSAP recommended activity (#)</b></p>	<p><b>Actions reported by agricultural biodiversity TWG</b></p>	<p><b>Actions reported by forest/drylands biodiversity TWG</b></p>	<p><b>Actions reported by aquatic biodiversity TWG</b></p>	<p><b>Actions reported by CEPA TWG</b></p>	<p><b>Overall progress</b></p>
<p>10.1 Delineate and map protected areas and identified conservation areas including lands occupied by local people</p>		<p>MAF (i.e. DNFGBH, DNCN) established preliminary boundaries for Nino Konis Santana National Park (PNNKS).</p>	<p>Timor-Leste has developed a proposed protected area network. Freshwater ecosystems, however, are not represented in it.</p>		

<p>10.2 Assess flora and fauna and identify endangered and threatened species, together with the direct and indirect causes of threat.</p>		<ul style="list-style-type: none"> <li>• MAF conducted surveys of flora and fauna in PNNKS and the protected area of Makfahek in Manatuto, sub-district Bariki.</li> </ul>	<ul style="list-style-type: none"> <li>• The lack of biodiversity assessments makes it difficult to establish baselines for important catchment areas.</li> <li>• The government of Timor-Leste and development partners have done little to document Timor-Leste's unique freshwater biodiversity.</li> </ul>		
<p>10.3 Identify and develop protection programmes for endangered species in all ecosystems (forests, mountains, inland wetlands, coastal and marine areas, agricultural lands, etc.), including commercially and culturally valuable species.</p>	<p>AKAHANA ("academy loves nature") group (UNTL-based) conducted conservation activities to protect endangered tree species in 2014.</p>	<p>DNPRB and MAF (DNFGBH, DNCN) prepared and installed announcement boards to ban the hunting and capture of endangered species (e.g., cockatoo, parrots, native sparrow).</p>			
<p>10.4 Prepare and implement a management plan for each protected area integrating climate change, connectivity, promotion of equity and benefit-sharing, as well as standards for the preparation and approval, and establish effective management systems for the terrestrial and marine protected area network.</p>		<ul style="list-style-type: none"> <li>• Forest Directorate of the MAF created and is managing PNNKS based on government resolution no. 9/2007 (ongoing).</li> <li>• Preparations for PA management system were initiated, including a draft forest conservation plan based on the work done by JICS.</li> <li>• The number of protected areas has been increased from 30 to 52 under the guidance of MAF (DNFGBH, DNCN); the additional 22 PAs that have been identified and listed are not yet confirmed and enacted.</li> </ul>		<p>Promotion of PNNKS for nomination as a Biosphere Reserve under the UNESCO MAB Programme by MAF: workshop on mapping of initial conditions and zonation (Dili, 26 Nov 2014); preparation of UNESCO Biosphere Reserve Nomination Dossier, incl. consultations in 6 sucos (Oct-Dec 2014)</p>	

10.5 Establish multi-stakeholder Protected Area Management authorities for each of the 52 identified sites, composed of government, district authorities and local community representatives.		Establishment of a committee for the management of PNNKS, involving 6 sucos, and a management board for national parks (so far only PNNKS).			
10.6 Establish in-situ and ex-situ conservation approaches/pilot sites/facilities to conserve specific endangered plant or animal species.	<ul style="list-style-type: none"> <li>• Conservation activities of local species and varieties by project “promotion of sustainable use of ABD” is taking place in 6 sucos in protected areas and PNNKS through in-situ cultivation in pilot sites for e.g. black rice, red rice, black soy bean, millet, black mung bean, jobs tears, diverse varieties of beans, medicinal plants, root crops</li> <li>• Monitoring of local species in the same 8 sucos (and 18 others) every 6 months</li> <li>• Monitoring results after one year of support show increase of ABD by 15 % on average</li> <li>• Activities in PNNKS (Tutuala, Muapitine, Com) as well as in PAs including Ossu Rua, Ossu de Cima, Saburai, 2013 and 2014 – ongoing</li> </ul>	<ul style="list-style-type: none"> <li>• In-situ conservation activities in PNNKS began in 2007 under the Forest Directorate of the MAF (ongoing).</li> <li>• So far, there were no ex-situ conservation activities.</li> </ul>	Given the lack of data on plant species occurring in freshwater systems of Timor-Leste and riparian vegetation, and their changes through the altitudinal gradient, nothing has been done to maintain the genetic diversity of freshwater plants and riparian vegetation.		
10.7 Establish wildlife rescue and refuge centers.		On Jaco Island (PNNKS), drinking water has been provided to deer.	SEMA is collaborating with the owner of a local company in Loes to adapt and rebuild an existing enclosure for temporarily keeping Saltwater Crocodile problem animals.		

<p>11.1 Develop a comprehensive and integrated marine and coastal policy and fisheries management system.</p>			<ul style="list-style-type: none"> <li>• SEMA conducted 3 meetings on crocodile management (5 Nov 2013, 6-8 June 2014, 5 Dec 2014) and established a Crocodile Management Task Force (Jestaun Lafaek).</li> <li>• Timor-Leste currently has an Oceans Policy in draft and is in the process of reviewing its entire Fisheries legal framework.</li> </ul>		
<p>11.2 Establish and implement Integrated Coastal Management (ICM) programmes focusing on sustainable livelihood development, including sustainable fishery management.</p>			<p>Timor-Leste has taken significant steps in its pursuit of Integrated Coastal Zone Management (ICZM) through its participation in the Partnership in Environmental Management for the Seas of East Asia (PEMSEA) project, as well as Ecosystem Approach to Fisheries Management (EAFM) through the country's engagement in the Coral Triangle Initiative for Coral Reefs, Fisheries and Food Security (CTI-CFF).</p>		
<p>11.3 Enhance fishery production quality and improve distribution of fisheries production, including developing fisheries production quality standards.</p>					
<p>11.4 Support the creation of financial institutions for fishermen and fish farming communities.</p>					
<p>11.5 Develop fish processing technology and establish fish processing plants.</p>					

<p>12.1 Diversify types of products and develop alternatives to subsistence agriculture through the Seeds of Life (SoL) Programme.</p>	<ul style="list-style-type: none"> <li>• Seed fairs for local seed exchange to maintain genetic diversity</li> <li>• Terracing of existing farm land to safeguard ecosystem services</li> <li>• Using local seeds as a means of adapting to climate change through: <ul style="list-style-type: none"> <li>○ genetic basis for plant breeding</li> <li>○ genes for drought, flood resistance, etc. often in traditional seeds</li> <li>○ local seeds adapt to changing climate conditions over decades and hundreds of years</li> <li>○ using diverse crops in order to minimize the risk/effect of extreme climate conditions</li> </ul> </li> <li>• Activities in PNNKS (Tutuala, Muapitine, Com) as well as in PAs including Ossu Rua, Ossu de Cima, Saburai, 2013 and 2014 – ongoing</li> </ul>	<p>Seeds of Life (SoL) supports the MAF in maintaining the originality of crop seeds.</p>			
<p>12.2 Employ techniques such as the Integrated Pest Management (IPM); Integrated Crop Management (ICM); and System of Rice Identification (SRI).</p>		<p>Supported by the SoL programme</p>			
<p>12.3 Establish gene banks to ensure sustainable supply of seeds.</p>	<p>Conservation of genetic resources of 200 corn species and types by MAF.</p>				

12.4 Establish an animal laboratory and medical center.		Once in a while, the MAF organizes health check-up sessions for cattle of local farmers by mobile clinic throughout Timor-Leste.				
13.1 Conduct public awareness campaign on waste management.		Rubbish management campaign conducted by DNSAS.			Promotion of healthy sucos in the municipalities of Same, Viqueque and Suai.	
13.2 Mobilize communities to conduct waste management activities.						
13.3 Establish waste management centers for composting, recycling and re-using of domestic, commercial and other wastes.						
13.4 Establish livelihood options for local communities using waste products.						
<b>Priority Strategy 4</b>	<b>Enhancing biodiversity and ecosystems services to ensure benefits for all</b>					
<b>Target</b>	<b>By 2020, ecosystems services have been enhanced through promoting economic values of biodiversity/ecosystems and promoting benefits sharing.</b>					
<b>NBSAP recommended activity (#)</b>	<b>Actions reported by agricultural biodiversity TWG</b>	<b>Actions reported by forest/drylands biodiversity TWG</b>	<b>Actions reported by aquatic biodiversity TWG</b>	<b>Actions reported by CEPA TWG</b>	<b>Overall progress</b>	
14.1 Promote public awareness on the economic values of ecosystems and biodiversity and the goods, services and ecological functioning these provide.		Establishment of public parks in Dili by the Ministry of Tourism (e.g., 5 de Maio Park, Balai Prajurit Park)	Hardly any economic valuation studies for direct and indirect goods and services of biodiversity have been conducted to date.			
14.2 Identify and develop a system of economic instruments such as incentives and penalties.						

15.1 Develop and implement an Integrated Water Management Plan, involving key concerned sectors (forestry, infrastructure, water management authorities) to address pollution and sedimentation.					
15.2 Monitor pollution/water quality, sedimentation of rivers, soil erosion and implement restoration activities to prevent siltation.		MAF developed bamboo plantation to stop landslides and erosion in Manatuto.	There are no wastewater treatment plants in Timor-Leste, most of the water runoff goes straight into the sea.		
15.3 Develop water quality standards and establish a water quality laboratory.		DNSAS, MPW, conducts bio-engineering and water quality management activities.			
15.4 Develop and implement payment for ecosystem services (PES) schemes for water resources.		Water fee by DNSAS			
16.1 Conduct awareness-raising among policymakers, government and non-government stakeholders, including private sector and communities to understand the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS).		Four workshops delivered to raise awareness on and build capacity for implementing the Nagoya Protocol on ABS (22-24 Jan 2013, 28 June 2013, 29-31 July 2013, 14 Nov 2013)			
16.2 Conduct national and local consultations in developing national policies on ABS.		Consultancy analyzed and identified existing legislation of the country relevant to ABS			
<b>Priority Strategy 5</b>	<b>Enhancing implementation of the NBSAP through participatory planning, knowledge management and capacity building, including at the district and sub-district and community levels</b>				
<b>Target</b>	<b>By 2015, a national biodiversity monitoring and reporting system has been established using the clearing house mechanism as an operational tool.</b>				
<b>NBSAP recommended activity (#)</b>	<b>Actions reported by agricultural biodiversity TWG</b>	<b>Actions reported by forest/drylands biodiversity TWG</b>	<b>Actions reported by aquatic biodiversity TWG</b>	<b>Actions reported by CEPA TWG</b>	<b>Overall progress</b>

<p>17 Enhance technical and managerial capacity of officials and staff on biodiversity conservation and management as laid out in the Strategic Action Plan (SAP) and the Capacity Building Plan on Protected Areas under the PoWPA Project of the MAF (cf. also NBSAP Capacity-building Plan Chapter).</p>	<ul style="list-style-type: none"> <li>• Enhance capacity of government officials regarding biodiversity conservation through ABD ToT trainings (5 in 5 districts, 2013 and 2014).</li> <li>• Knowledge management on ABD through national ABD working group and LinkedIn group on promotion of agro-biodiversity in Timor-Leste (Oct 2014 – ongoing).</li> <li>• Monitoring system for agro-biodiversity established and in use in 26 pilot sucos.</li> <li>• 26 participatory plans for two years (2013-2015) on ABD at farmer group levels shared with suco officials and MAF at district level.</li> </ul>	<p>Capacity building of local authorities and community forest guards for protecting the PNNKS under the MAF and SEMA.</p>		<p>Establishment of the DNPRB as a third independent directorate in SEMA in 2013.</p>	
<p>18.1 Identify and implement research needs and priorities of the different sectors on biodiversity and ecosystems services.</p>	<ul style="list-style-type: none"> <li>• MAF conducted study in 2014 on food species such as cassava, potato, maize, and dryland rice paddies.</li> <li>• Research by SOL and MAF to identify wild plants (e.g., fruits, roots, berries) that can be consumed (2014).</li> <li>• Research initiated in 2015 on local crops in Baguia and Baucau by Verdade and UNTL Tourism Faculty.</li> </ul>		<p>The government is yet to identify research needs and priorities for the different sectors which use and impact biodiversity and ecosystem services nationwide.</p>		
<p>18.2 Identify and develop capacities for academic centers of excellence on taxonomy, for inventory of species.</p>					

18.3 Establish botanical gardens, herbariums and zoos to showcase the indigenous flora and fauna of the country and to serve as center for taxonomic and conservation biology research.					
19.1 Maintain and enhance the CHM server and further develop the information system database.			The Clearing House Mechanism (CHM) requires support to enable it to become the platform for knowledge sharing and networking it was originally conceived to be.		
19.2 Update information and data on biodiversity through inter-agency collaboration (Timor-Leste CHM Network)			While there is some geo-referenced data at the National Directorate for Water and Sanitation (DNSAS), such information is not available through the Timor-Leste Clearing House Mechanism, which has not been updated since its inception.		
20.1 Document and analyze traditional knowledge as to its relevance to biodiversity conservation (e.g. Tara Bandu).			Much work has been devoted to promoting Traditional Ecological Knowledge (TEK) and local knowledge (see 20.2), however very little has been done in documenting and analyzing local conservation practices.		

<p>20.2 Promote traditional knowledge and practices relevant to biodiversity conservation.</p>	<ul style="list-style-type: none"> <li>• Promotion of traditional knowledge and practices: <ul style="list-style-type: none"> <li>○ promoting local, native vegetables in support of agriculture conservation programme (FAO, MAF, 2013/2014);</li> <li>○ promoting local species used for traditional ceremonies and the traditional knowledge aligned to the local varieties;</li> <li>○ promoting traditional practices/ceremonies to protect water, soil, and forests, etc.;</li> <li>○ two meetings conducted in 2014 by ALVA on “slow food” emphasizing and promoting food prepared and eaten in Timor-Leste during the resistance period.</li> </ul> </li> </ul>	<p>Implementation of Tara Bandu traditional jurisdiction together with new environmental decree laws.</p>	<p>See 20.1</p>		
<p>21.1 Develop joint programmes with relevant sectors for funding by bilateral and multi-lateral partners (e.g., GEF, UNDP, UNEP, FAO and bilateral partners).</p>			<ul style="list-style-type: none"> <li>• Different funding proposals have been prepared to different funding agencies (European Union, GEF), however there were few priorities in the NBSAP that have been funded through the GEF and/or other development partners.</li> <li>• Timor-Leste has initiated discussions on accession to the Nagoya Protocol with support from UNEP and funds from the GEF.</li> </ul>		

<p>21.2 Establish and/or enhance partnerships and linkages with regional organizations and programmes such as Coral Triangle Initiative (CTI), Partnership for Environmental Management for Seas of East Asia (PEMSEA), Arafura-Timor-Leste-Seas Forum (ATSEA), South Pacific Regional Environment Programme (SPREP), and ASEAN Centre for Biodiversity (ACB).</p>		<p>Various cooperation with UN agencies and the mentioned NGOs (ongoing).</p>	<p>Some work has been done through the Coral Triangle Initiative with new bilateral and multilateral donors showing some interest to invest in programmes with components in Timor-Leste.</p>		
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**Appendix II – NBSAP Annex 3 revised:** NBSAP strategic actions identified for Timor-Leste

(PS = priority strategy – highlighted in bold blue; strategic actions of Timor-Leste are divided between priority actions and further actions; priority actions are earmarked by black bold fonts, for further actions normal black fonts are used; integral numbers and text in blue italics refer to strategic action groups; decimal numbers refer to sub-actions under the strategic action groups)

#	Strategic actions and sub-actions	Timelines	
		2012-2015	2016-2020
	<b>PS 1 - Mainstreaming biodiversity into sectoral plans and programmes to address the underlying causes of biodiversity loss</b>		
1	<i>Raise awareness on the values of biodiversity and engage various sectors including the media, business sector, youth and women groups and local communities in conservation activities:</i>		
1.1	<b>Conduct communication, education and public awareness activities through forum, seminars and public dialogues on environment and biodiversity conservation especially on various topics such as sustainable management of ecosystems; endangered species and prohibition of collection and sale; pollution and garbage; wildlife management and conservation; sound management of land, forest and water resources; and other related topics.</b>	■	■
1.2	<b>Produce and distribute CEPA publications such as brochures, pamphlets, newsletters and other printed materials, and participate in exhibits in village and school activities.</b>	■	■
1.3	<b>Establish a Communication and Education and Information Centre and Library.</b>	■	
1.4	<b>Develop modules on environment and biodiversity conservation for integration in the elementary and high school curriculum.</b>	■	■
1.5	Design and implement education modules for specific grade levels in the elementary and high school, on coastal ecosystems and their management, focusing on habitat-building species such as mangroves, coral reefs and sea grasses. This will be implemented in cooperation with the education agency and the schools/universities.		■
1.6	Mobilize environmental education for environment and biodiversity conservation at the community level through community-level environmental education campaigns, regular dialogues and involvement of local communities in conservation and income-generating activities. This should include coordination with local elders so that the conservation agenda is included in the traditional Tara Bandu.	■	■
1.7	Integrate the principles of sustainable land management at all levels of formal education.		■
1.8	Develop and implement a technical and vocational education and training plan for Timorese especially the out-of-school youth through development of national curricula for identified/registered training courses.	■	■
1.9	Establish a marine research and development and demonstration center.		■
1.10	Promote improved and sustained conservation of threatened species through public awareness.	■	■
1.11	Develop an information and wise use campaign directed at educating stakeholders on best practices in sewage and solid waste management, forest fire prevention and other environmental issues; encourage composting, plastic, glass and paper recycling.	■	■
1.12	Launch information campaign on climate change mitigation and adaptation especially for local communities.	■	■
1.13	Conduct information campaign in communities and schools on the restoration and safeguarding of our ecosystems.	■	■
1.14	Involve the local constituency in environmental/conservation planning and management through public consultation.	■	■

2	<i>Mainstream sectoral plans, policies, and national planning</i>		
2.1	<b>Develop policies and programmes to integrate biodiversity into agriculture programmes and promote agro-biodiversity.</b>	■	■
2.2	<b>Introduce and promote appropriate and environmentally-compatible improved farming practices to increase production in agricultural lands, e.g. alley cropping, crop rotation, terracing, high-yield seeds.</b>	■	■
2.3	Integrate urban planning strategies, land use and protected area plans into the national planning systems.	■	
2.4	Integrate tourism and ecotourism in the Forestry and Protected Area Management Plan.		■
2.5	Integrate environmental considerations in policies and legislations in the industrial, tourism, agriculture, forestry and fisheries sectors.		■
2.6	Mainstream conservation and maximize benefits for natural habitats in infrastructure projects.		■
3	<i>Promote nature-based and community-based sustainable tourism and ecotourism:</i>		
3.1	<b>Review and develop national and local laws and policies on tourism and ecotourism.</b>	■	
3.2	<b>Establish and develop key tourism destinations and ecotourism centers with upgraded infrastructures and promotional materials that integrate biodiversity.</b>		■
3.3	Determine potentials for ecotourism as an incentive to forest and biodiversity and involve the local communities in the development of a tourism/ecotourism plan and implementation of tourism activities, especially for the sites that are sacred to them.		■
3.4	Conduct inventory of tourism/ecotourism attractions in Timor-Leste: eco- and marine tourism; historic and cultural tourism; adventure and sports tourism; religious pilgrimage; and conference and convention tourism.	■	
3.5	Support the development of environment-friendly tourism or ecotourism.	■	
3.6	Develop tourism promotion marketing strategies.	■	
3.7	Join forces with private sector for the development of tourism infrastructures.	■	
3.8	Develop comprehensive tourism packages.	■	
3.9	Establish Tourist Information Centers.	■	
3.10	Involve community groups in tourism/ecotourism services: taxis, restaurants, guesthouses, and IT services (internet, cell phones, etc.).	■	■
3.11	Create a multi-sectoral tourism board to facilitate the planning and management of the ecotourism industry in protected areas.		■
4	<i>Develop and enforce a sustainable land management and land use policy:</i>		
4.1	<b>Socialize and implement sustainable land management and land use policy.</b>	■	
4.2	<b>Monitor impacts of sustainable land management and land use policy.</b>	■	
4.3	<b>Enhance sustainable land management and land use policy.</b>		■
4.4	Improve legislative framework and policies for sustainable land management.	■	
4.5	Ensure an improved land-use classification and delineation.	■	
4.6	Establish systems of formal land administration and regulatory arrangements for proper land use and management.		■
5	<i>Ensure impact assessment of development projects through the Environmental Impact Assessment (EIA) system:</i>		
5.1	<b>Enhance implementation of the EIA system (National Decree No. 5/Feb 2011) for specific development projects</b>	■	■
5.2	<b>Implement appropriate EIA system and evaluate impacts of development projects (industry, oil and mining, infrastructure, energy, transport, etc.)</b>	■	■
5.3	Investigate and determine possible impacts of exploration and other development projects to ensure that proper mitigation methods are employed.		■
5.4	Develop policies regarding responsible assessment of the environmental impacts and implementation of investment projects.	■	■

	<b>PS 2 - Protecting biodiversity and promoting sustainable use</b>		
6	<i>Enhance and develop a national biodiversity law and relevant environmental policies on nature conservation, pollution and other related concerns, including traditional laws:</i>		
6.1	<b>Conduct inclusive stakeholder consultation/socialization of the national Biodiversity Law/Decree and Wildlife Conservation Law.</b>	■	
6.2	<b>Facilitate enactment and implementation of the National Biodiversity Law, including wildlife conservation policies and benefits sharing.</b>	■	
6.3	<b>Strictly implement environmental decrees, regulations and policies at national and district levels, including traditional laws (Tara Bandu).</b>	■	■
6.4	Review existing laws, policies and regulations on environmental protection and natural resources conservation, evaluate their effectiveness, amend and/or develop appropriate laws and regulations, and support the conservation of forests and other ecosystems using both the national legislation and the traditional law enforcement systems (Tara Bandu).	■	
6.5	Review, revise and enhance existing and/or formulate new and appropriate forestry laws and regulations to ensure effective management of forests.	■	■
6.6	Enforce and implement forestry, environmental and biodiversity laws and regulations.	■	■
6.7	Improve and/or formulate appropriate laws and regulations regarding waste management and control of air, water, soil, and noise pollution and emissions from vehicles; and penalties/fines for polluters for the damage caused by their action.		■
6.8	Ratify and have access to international treaties on environment such as the Ramsar Convention on Wetlands, CITES Convention and other conventions. In addition to the benefits accruing from the policy side of these conventions, countries that are parties to the conventions have access to several international funding sources.	■	■
6.9	Advocate for and promote the development of locally relevant natural resource management policies; provide assistance in developing transparent, appropriate, practical and understandable laws, regulations and procedures.	■	■
6.10	Monitor and evaluate implemented laws and regulations. Results will serve as basis for enhancement or revision.	■	■
6.11	Document and share best practices and lessons learned related to the implementation of laws and regulations.	■	■
7	<i>Rehabilitate damaged and critical habitats and ecosystems and degraded watersheds through massive tree planting including mangrove reforestation:</i>		
7.1	<b>Establish community-based nurseries especially for high-value timber trees and involve local communities in reforestation/planting activities.</b>	■	■
7.2	<b>Conduct massive tree planting activities by targeting one million trees nationwide every year, and reforest degraded mangrove areas.</b>	■	■
7.3	<b>Assess and identify areas suitable for planting (e.g., degraded mountain slopes and watersheds) and identify appropriate rehabilitation approaches and suitable species for planting (e.g., suitable tree species include trees for domestic and commercial use and for environmental rehabilitation).</b>	■	■
7.4	<b>Develop and implement a monitoring and evaluation system for rehabilitation activities (to monitor growth and survival and replanting needs).</b>	■	■
7.5	Plant trees along riverbanks, roadsides, steep slopes and lake margins to prevent soil erosion.	■	■
7.6	Plant native tree species in favour of introduced species to restore natural habitats of associated insects and other organisms.	■	■
7.7	Conserve mother trees for seed production.	■	■
7.8	Develop and implement a Forestry Management Plan, integrating tourism in it.	■	■
7.9	Restore/rehabilitate degraded landscapes and habitats using native species and diverse planting.	■	■

7.10	Encourage communities to spearhead tree planting activities in forests and protected areas.	■	■
7.11	Conduct enrichment planting in sparse forests and upland farms, to help increase carbon stocks.	■	■
8	<i>Assess impacts of invasive species and prevent and control their spread:</i>		
8.1	<b>Identify invasive species and pathways in critical sites and assess their impacts on ecosystems and biodiversity.</b>	■	■
8.2	<b>Identify and implement prevention, control or eradication measures on invasive species.</b>	■	■
8.3	Document and disseminate available best practices for the proper management of invasive species.	■	■
9	<i>Implement sustainable livelihood activities for local communities, promote traditional conservation knowledge and practices, and enhance the role of women and youth in biodiversity conservation:</i>		
9.1	<b>Organize and mobilize communities to protect and manage forests and other ecosystems.</b>	■	
9.2	<b>Sensitize communities and let them understand the importance and values and functioning of ecosystems and biodiversity resources therein.</b>	■	
9.3	<b>Develop pilot sites to mobilize communities to protect and manage forests.</b>		■
9.4	<b>Enhance existing and develop new sustainable livelihood options for local communities.</b>	■	
9.5	Identify and develop livelihood opportunities: a. Production of seedlings of high-value forest species; fruit trees and other agricultural crops for sale; b. Handicraft using dried branches and twigs; c. Manufacture of household products such as brooms, baskets and cooking implements d. Household industries like carpentry and furniture making	■	■
9.6	Support community-based tree and forest product enterprises that provide local communities some benefits from forest resources.		■
	<b>PS 3 - Building climate resilient ecosystems through effectively managing protected areas and reducing threats to biodiversity</b>		
10	<i>Effectively manage representative samples of biodiversity in the 52 identified protected areas and create natural conservation zones to protect specific biodiversity and ecosystems:</i>		
10.1	<b>Delineate and map protected areas and identified conservation areas including lands occupied by local people.</b>	■	
10.2	<b>Assess flora and fauna and identify endangered and threatened species, together with the direct and indirect causes of threat.</b>	■	
10.3	<b>Identify and develop protection programmes for endangered species in all ecosystems (forests, mountains, inland wetlands, coastal and marine areas, agricultural lands, etc.), including commercially and culturally valuable species.</b>	■	
10.4	<b>Prepare and implement a management plan for each protected area integrating climate change, connectivity, promotion of equity and benefit-sharing, as well as standards for the preparation and approval, and establish effective management systems for the terrestrial and marine protected area network.</b>	■	
10.5	<b>Establish multi-stakeholder Protected Area Management authorities for each of the 52 identified sites, composed of government, district authorities and local community representatives.</b>		■
10.6	<b>Establish in-situ and ex-situ conservation approaches/pilot sites/facilities to conserve specific endangered plant or animal species.</b>		■
10.7	<b>Establish wildlife rescue and refuge centers.</b>		■
10.8	Identify and conduct a survey and detailed mapping of biodiversity-rich areas.	■	
10.9	Designate and conserve areas with unique value, natural beauty and cultural significance.		■

10.10	Review, revise and enhance existing and/or formulate new protected area laws and regulations, including traditional laws, to ensure the effective management of protected and other conservation areas.	■	■
10.11	Encourage community support to the conservation and management of protected areas and conservation areas through socialization (community-level environmental education campaigns) coupled with environment-appropriate income-generating livelihoods especially for those living within and around the area.	■	■
10.12	Promote effective management of protected areas through public awareness, the development and dissemination of comprehensive field guides and best practices, and attendance at regional and international convention meetings.	■	■
10.13	Review protected area categories and integrated management and identify opportunities to strengthen the protected area system by developing transfrontier collaboration.		■
10.14	Implement the CBD Programme of Work on Protected Areas (POWPA) as the global standard for the comprehensive and effective management of protected areas.		■
10.15	Maintain connectivity across landscapes by reducing fragmentation, recovering lost habitats, expanding protected area networks and establishing ecological corridors.		■
10.16	Establish routine monitoring of biodiversity impacts and management effectiveness in protected areas as well as socio-economic conditions of local communities by developing a harmonized reporting system and meeting international reporting obligations to CBD and other international conventions.	■	■
10.17	Establish databases for protected areas and for a network of experts in the country.	■	■
10.18	Recover/re-introduce rare and endangered species.	■	■
10.19	Prioritize conservation of forests of high biodiversity and large areas of primary intact forests.	■	■
10.20	Develop pilot demonstration and/or plantation areas for threatened tree species.		■
10.21	Conserve diversity of forest types.	■	■
10.22	Develop guidelines and apply best practices for sustainable forest management.		■
11	<i>Develop and implement a comprehensive and integrated coastal and marine and fisheries management programme and promote responsible and sustainable coastal and marine resources use:</i>		
11.1	<b>Develop a comprehensive and integrated marine and coastal policy and fisheries management system.</b>		■
11.2	<b>Establish and implement Integrated Coastal Management (ICM) programmes focusing on sustainable livelihood development, including sustainable fishery management.</b>		■
11.3	<b>Enhance fishery production quality and improve distribution of fisheries production, including developing fisheries production quality standards.</b>		■
11.4	<b>Support the creation of financial institutions for fishermen and fish farming communities.</b>		■
11.5	<b>Develop fish processing technology and establish fish processing plants.</b>		■
11.6	Make an inventory and assessment of sites for commercial fishing.	■	■
11.7	Protect water resources and conserve aquatic biodiversity.	■	■
11.8	Increase conservation and protection of habitat, sea grass and breeding grounds, especially those areas with the highest marine biodiversity and with high number of endemic species per unit area and those areas with moderate biodiversity values but with substantial natural habitats under threats.	■	■
11.9	Conduct reforestation activities/projects in selected mangrove sites as prioritized and guided by appropriate technologies (species selection, species-soil compatibility).	■	■

11.10	Design and implement a community-based mangrove management (reforestation and conservation) strategy, including policy support.	■	■
11.11	Conduct clean-up activities such as clean-up of coastal areas and wetlands.	■	■
11.12	Regulate and monitor expansion and/or intensification activities in aquaculture to minimize if not prevent destruction of mangrove and pollution of coastal areas in many parts of the country.	■	■
11.13	Identify species and distribution of coral reefs.	■	■
11.14	Determine status and extent of damage to coral reefs, if any.	■	■
11.15	Identify and implement approaches to rehabilitate and/or enhance coral reefs.	■	■
12	<i>Develop and implement a comprehensive and integrated agricultural management programme aimed at maintaining plant genetic diversity:</i>		
12.1	<b>Diversify types of products and develop alternatives to subsistence agriculture through the Seeds of Life Programme.</b>	■	
12.2	<b>Employ techniques such as the Integrated Pest Management (IPM); Integrated Crop Management (ICM); and System of Rice Identification (SRI).</b>	■	
12.3	<b>Establish gene banks to ensure sustainable supply of seeds.</b>		■
12.4	<b>Establish an animal laboratory and medical center.</b>		■
12.5	Identify agricultural zones suitable for specific crop production.	■	
12.6	Establish farm grain storage and improve post-harvest facilities and technologies and the use of resistant varieties to cope with post harvest rot and to stop the spread of fungi; establish demonstration plot for fodder and livestock waste processing for organic fertilizer.	■	■
12.7	Rehabilitate and extend irrigation systems and improve water quality and storage; promote farm modernization for water security.	■	■
12.8	Establish on-farm agro-biodiversity conservation centers.		■
12.9	Promote agroforestry activities and techniques, e.g. in coffee plantations, to increase tree cover, provide income, improve food security, and control erosion.	■	■
12.10	Invest in and support research, development and extension programmes for agriculture, including market research.	■	■
12.11	Promote organic farming.		
12.12	Use appropriate seeds, fertilizers and pesticides.	■	■
12.13	Introduce and adopt quality standard grades for important agricultural crops like coffee and coconut.		■
12.14	Encourage kitchen gardens (compost) and backyard production of high-value agricultural crops and integrate farm activities with household enterprises. Example: production and use of organic fertilizer.	■	■
12.15	Use agroforestry techniques like integrating woody perennials in shifting cultivation areas to enhance carbon storage capacity.	■	■
12.16	Introduce and promote appropriate/relevant farming technologies to local people to prevent them from moving or being nomadic.	■	■
13	<i>Develop and implement a waste management programme on composting, recycling, and re-using of domestic, commercial and other wastes:</i>		
13.1	<b>Conduct public awareness campaign on waste management.</b>	■	
13.2	<b>Mobilize communities to conduct waste management activities.</b>	■	■
13.3	<b>Establish waste management centers for composting, recycling and re-using of domestic, commercial and other wastes.</b>		■
13.4	<b>Establish livelihood options for local communities using waste products.</b>		■
13.5	Develop a national sewage and solid waste management strategy in cooperation with districts and sub-districts, including development of waste management guidelines especially in urban areas.	■	■
13.6	Establish an environmental laboratory to conduct tests and carry out environmental auditing, monitoring and evaluation of pollution-related activities.		■
	<b>PS 4 - Enhancing biodiversity and ecosystem services to ensure benefits to all</b>		

14	<i>Conduct a valuation and accounting of direct and indirect goods and services of biodiversity resources and ecosystems:</i>		
14.1	<b>Promote public awareness on the economic values of ecosystems and biodiversity and the goods, services and ecological functioning these provide.</b>	■	
14.2	<b>Identify and develop a system of economic instruments such as incentives and penalties.</b>		■
14.3	Partner with business and other relevant sectors in sustainable production and consumption of biodiversity.	■	■
15	<i>Safeguard and maintain ecosystem services through promoting the Integrated Water Resource Management Plan:</i>		
15.1	<b>Develop and implement an Integrated Water Management Plan, involving key concerned sectors (forestry, infrastructure, water management authorities) to address pollution and sedimentation.</b>		■
15.2	<b>Monitor pollution/water quality, sedimentation of rivers, soil erosion and implement restoration activities to prevent siltation.</b>	■	■
15.3	<b>Develop water quality standards and establish a water quality laboratory.</b>		■
15.4	<b>Develop and implement payment for ecosystem services (PES) schemes for water resources.</b>		■
16	<i>Develop and promote understanding of national policies on access and benefit-sharing arising from utilization of genetic resources, including biosafety measures:</i>		
16.1	<b>Conduct awareness-raising among policymakers, government and non-government stakeholders, including private sectors and communities to understand the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS).</b>	■	
16.2	<b>Conduct national and local consultations in developing national policies on ABS.</b>	■	■
16.3	Document and monitor genetic resources codes of conduct and best practices in the country.		■
16.4	Develop protocol on access to genetic resources and the fair and equitable sharing of benefits from the use of biodiversity resources.		■
16.5	Respect intellectual property rights regarding traditional knowledge.	■	
	<b>PS 5 - Enhancing implementation of the NBSAP through participatory planning, knowledge management and capacity building, including district and sub-district and community levels</b>		
17	<i>Enhance technical and managerial capacity of officials and staff on biodiversity conservation and management as laid out in the Strategic Action Plan and the Capacity Building Plan on Protected Areas under the PoWPA Project of the MAF (cf. also NBSAP Capacity-building Plan Chapter).</i>		
17.1	Enhance capacity of government officials and staff to develop, implement and enforce environment and biodiversity legislations.	■	■
17.2	Implement individual, institutional and systematic capacity building programmes to ensure effective management of programmes toward sustainable agriculture and forestry.		■
17.3	Develop packages and conduct trainings on intensive farming and permanent farming; intensification of soil and water conservation; drought mitigation measures; genetic conservation and germ plasma collection; biological control of coconut pests; species domestication and breeding for production, and other agriculture related issues, especially for rural communities.	■	■
17.4	Improve the capacity of protected area officials and staff in the establishment, management and conservation of protected and conservation areas and monitoring of key threats to them by developing training modules for the officials and staff; conducting training for trainers; and supplementing formal training with in-service training for the staff.	■	■
17.5	Enhance the capacity-building skills of protected area staff on tourism/eco-tourism with focus on education and vocational training.	■	

17.6	Establish a Forestry Training Center to ensure effective capacity-building and institutional governance of organizations from the national to the local levels; include training in carpentry and furniture-making.		■
18	<i>Develop an integrated research programme for Timor-Leste and intensify research efforts on the different aspects of forestry, protected areas, agriculture and other ecosystems, such as population studies, ecological studies, water quality assessment, and impact of alien invasive species:</i>		
18.1	<b>Identify and implement research needs and priorities of the different sectors on biodiversity and ecosystems services.</b>	■	■
18.2	<b>Identify and develop capacities for academic centers of excellence on taxonomy, for inventory of species.</b>		■
18.3	<b>Establish botanical gardens, herbariums and zoos to showcase the indigenous flora and fauna of the country and to serve as center for taxonomic and conservation biology research.</b>		■
18.4	Conduct ecological and population studies of various ecosystems; and biology and conservation of endemic and rare species.	■	■
18.5	Conduct basic and applied research in protected areas, taking into consideration the biophysical, economic and social factors of the ecosystem.	■	■
18.6	Conduct research on the taxonomy and potential utilization of commercially and culturally valuable species, species domestication and breeding for production.		■
18.7	Conduct research and development projects to determine sources, extent and impacts of pollutants.		■
18.8	Conduct research and development projects on the relationship of weeds and other invasive alien species with land management practices.		■
18.9	Develop appropriate tools and new facilities for climate change mitigation and adaptation.		■
18.10	Increase support for population studies, ecological studies and studies regarding re-introduction of important but not invasive alien species.		
18.11	Identify carbon rich areas in forest, agro-ecological and other ecosystems and determine carbon stocks and sequestration rates.		■
19	<i>Maintain and put into operation the Clearing House Mechanism (CHM) as the platform for knowledge sharing and networking:</i>		
19.1	<b>Maintain and enhance the CHM server and further develop the information system database.</b>	■	■
19.2	<b>Update information and data on biodiversity through inter-agency collaboration (Timor-Leste CHM Network)</b>	■	■
20	<i>Document and promote indigenous and traditional knowledge, techniques and practices for biodiversity conservation and environmental protection:</i>		
20.1	<b>Document and analyze traditional knowledge as to its relevance to biodiversity conservation (e.g. Tara Bandu).</b>	■	■
20.2	<b>Promote traditional knowledge and practices relevant to biodiversity conservation.</b>	■	■
20.3	Review traditional laws regarding natural resources management and harmonize these with government legislations and regulations. Existing customary laws like Tara Bandu should be considered to contribute to sound environmental management.	■	■
20.4	Document and share indigenous and local knowledge in mitigating the effects of drought and combating land degradation.		■
21	<i>Coordinate with donor partners, the United Nations and regional organizations and explore ways to substantially increase levels of funding and develop joint programmes:</i>		
21.1	<b>Develop joint programmes with relevant sectors for funding by bilateral and multi-lateral partners (e.g., GEF, UNDP, UNEP, FAO and bilateral partners).</b>	■	■

21.2	<b>Establish and/or enhance partnerships and linkages with regional organizations and programmes such as Coral Triangle Initiative (CTI), Partnership for Environmental Management for Seas of East Asia (PEMSEA), Arafura-Timor-Leste-Seas Forum (ATSEA), South Pacific Regional Environment Programme (SPREP), and ASEAN Centre for Biodiversity (ACB).</b>	■	■
21.3	Identify and coordinate with partners who can assist in the implementation of the different capacity-building activities. These include experts/individuals, government and non-government organizations and international donors. Assistance can be technical and/or financial.	■	■
21.4	Promote public-private partnerships in identifying and addressing knowledge gaps and disseminating effective approaches and techniques especially to farmers and other local communities.	■	■
21.5	Encourage and engage major sources of funding support such as the government (oil and gas fund sources) and the private sector to invest in infrastructure such as transportation and ecotourism facilities.	■	■
21.6	Establish a sustainable financing mechanism for ecosystem and environmental research.	■	■
21.7	Consider nature conservation tax.	■	■
21.8	Consider payments for ecosystem/ecological services (e.g., water user tax).	■	■

**Appendix III** – Estimation of Timor-Leste’s contribution towards implementation of the CBD’s Aichi Targets and strategic goals based on the country’s progress in implementing their NBSAP priority activities (AT = Aichi Target; ABD = agricultural biodiversity; CBD = Convention on Biological Diversity; EIA = environmental impact assessment; JICA = Japan International Cooperation Agency; NBSAP = National Biodiversity Strategy & Action Plan; TL = Timor-Leste; for the specific meaning of individual priority actions refer to Appendices I and II, for Aichi Targets to Appendix IV; a few TL actions are not directly reflected in the priority actions but have contributed to CBD Aichi Targets and goals: they are listed as “other TL actions contributing to ATs” and have been added to the total number of actions)

<b>CBD goal</b>	<b>CBD Aichi Target</b>	<b>TL priority strategy</b>	<b>TL priority actions</b>	<b>other TL actions contributing to ATs</b>	<b>total # actions</b>	<b>considerable progress (2 pt.)</b>	<b>moderate progress (1 pt.)</b>	<b>Little/no progress (0 pt.)</b>	<b>average progress</b>
A	1	1	1.1, 1.2, 1.3, 1.4		4	1.1, 1.3	1.2, 1.4		1.50
A	2	1	2.1, 3.1, 4.3, 11.1, 15.1, 16.2	EIA framework	6+1	EIA framework	2.1, 3.1, 4.3, 11.1, 16.2	15.1	1.00
A	3	1	14.2		1			14.2	0.00
A	4	1	4.1, 4.2, 9.4, 11.2, 12.3	ABD project	5+1	ABD project	9.4, 11.2	4.1, 4.2, 12.3	0.67
B	5	2	7.3, 7.4, 9.1		3	9.1	7.3	7.4	1.00
B	6	2	11.1, 11.2, 11.3		3		11.1, 11.2	11.3	0.67
B	7	2	4.1, 4.2, 12.3	ABD project	3+1	ABD project		4.1, 4.2, 12.3	0.50
B	8	2	15.1, 15.2		2			15.1, 15.2	0.00
B	9	2	8.1, 8.2		2			8.1, 8.2	0.00
B	10	2	9.1, 12.1		2	9.1, 12.1			2.00
C	11	3	10.1, 10.4, 10.5		3		10.1, 10.4	10.5	0.67
C	12	3	10.3, 10.6		2		10.6	10.3	0.50
C	13	3	10.6, 12.1		2	12.1	10.6		1.50
D	14	4	9.1, 15.4		2	9.1		15.4	1.00
D	15	4	9.1, 15.2	JICA forest restoration	2+1	9.1	JICA forest restoration	15.2	1.00
D	16	4	16.1, 16.2		2	16.1	16.2		1.50
E	17	5		NBSAP revision	0+1		NBSAP revision		1.00

E	18	5	9.1, 20.1, 20.2		3	9.1, 20.2	20.1		1.67
E	19	5	17, 19.1, 19.2		3		17	19.1, 19.2	0.33
E	20	5	11.4		1			11.4	0.00

## Appendix IV – The Aichi Targets of the CBD Strategic Plan (2011-2010)

No.	Aichi Targets of the CBD Strategic Plan (2011-2020)
1	By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.
2	By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.
3	By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio-economic conditions.
4	By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.
5	By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.
6	By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that over-fishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.
7	By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.
8	By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.
9	By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.
10	By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.
11	By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.
12	By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.
13	By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.
14	By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.
15	By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.
16	By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of

	Benefits Arising from their Utilization is in force and operational, consistent with national legislation.
<b>17</b>	By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.
<b>18</b>	By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.
<b>19</b>	By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.
<b>20</b>	By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011–2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.

# NOTES

