

**FAA 118 / 119 REPORT**

**CONSERVATION OF TROPICAL FORESTS**

**AND**

**BIOLOGICAL DIVERSITY**

**IN EAST TIMOR**

**JUNE 2004**

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## A. INTRODUCTION

East Timor is located on Timor Island in the Lesser Sunda Islands chain. Its residents voted for independence from Indonesia in a referendum held in 1999. Immediately following the referendum, large-scale violence by the Indonesian Army and militia erupted that included massacres and wide-scale destruction of property. Sixty to eighty percent of public and private property was destroyed including schools and health clinics. There was a displacement of people into mountainous areas (UNHRC, 2000). Such violence destroyed the socio-economic base for the country's development. The United Nations has helped to support the development of this new sovereign state and in May 2002, East Timor became independent.

The total population of East Timor is currently estimated at approximately 876,000 individuals. Most recent estimates indicate a total fertility rate of 7.4, which is among the highest in the world (UNICEF, 2002). Mortality rates for infants are 8 to 9 of every 100 born and for young children under five years of age, 3 to 4 of every 100 children die (UNICEF, 2002). The population growth rate is estimated to be between 2.4-2.6% per year, with a doubling time of approximately 28 years (Pederson and Arneberg, 1999).

Population density is approximately 55 individuals per square kilometer or approximately 1.8 ha per individual. In actuality, a rural family holds on average about 1.2 ha of land. About 85% of the population is primarily agrarian (Valdivieso, 2001). The rural population is poorer than urban populations (Ministry of Agriculture, *et al*, 2003). Farmers grow rice, corn, tubers and have some livestock. Food shortages of rice and corn are experienced between December and April. Forty-six percent of the population lives below the poverty line (World Fact Book, 2003) making East Timor among the poorest countries in the world.

Deforestation and soil erosion are major problems in East Timor (Westerberg, 2000). Forest cover in East Timor has decreased by almost 30% over the period of 1972 to 1999, (Sandlund *et al.*, 2001) and only 1 to 6% of the remaining cover is believed to be primary forest. Valuable timber species have been nearly logged out due to cutting during the colonial and occupation periods. Fifty percent of the land is degraded. This degradation is due, in part, to unsustainable agricultural practices. Subsistence farmers practice swidden agriculture by clearing forests for new fields in a cyclical manner. At low human population densities and long fallow periods, swidden systems can be sustainable. Population movements, sometimes forced, and lack of agricultural assistance under Indonesian rule affected the sustainability of agriculture. Despite relatively low population density in East Timor, the amount of suitable agricultural land available per person is insufficient. Farmers regularly cultivate areas with slopes of more than 40 degrees. Almost half of the land of East Timor is this steep or more (Democratic Republic of Timor-Leste, 2003). Landslides and flash floods are common. Despite such difficulties, agroforestry practices do exist, for example, shade coffee and have the potential to rehabilitate degraded lands.

The Government of East Timor's review of the natural resources and environment sector describes well the economic impacts of environmental degradation as follows:

“Natural resource degradation-for example, lack of water and productive land- is already limiting economic opportunities in many areas. It is also leading to significant direct economic costs, for example, by damaging infrastructure, increasing floods and contributing to health problems. Finally, there are localized threats to Timor-Leste air, coasts and remaining biodiversity.” (Democratic Republic of Timor-Leste, 2003, p. v.).

## **B. LEGISLATIVE AND INSTITUTIONAL STRUCTURES AFFECTING BIOLOGICAL RESOURCES**

### **Legislation**

In the period between the 1999 referendum and official independence (May 20, 2002), The United Nations Transitional Administration in East Timor (UNTAET) was given overall responsibility for the administration of East Timor. The East Timor Transitional Authority worked with the UN to develop a new constitution, as well as a legal and political framework.

As the Government of East Timor develops its own laws, the existing UNTAET laws on protected areas and protected species are in effect; however the challenge is their implementation and enforcement. These laws taken from the Indonesian governments laws, at times, do not fit in with the governmental jurisdictions that exist in East Timor and presents difficulties of enforcement.

Laws in East Timor are currently based primarily on Indonesian laws and regulation. These include:

#### **Laws**

- Law No. 5. 1967 on Basic Stipulations on Forestry.
- Law No. 4, 1982 on Basic Stipulations on Environmental Management.
- Law No.9, 1985 concerning Conservation of Natural Resources and the Ecosystem.
- Law No. 5, 1990 on Conservation of Biological Resources and Their Ecosystems.
- Law No. 5, 1994 Concerning Biodiversity.
- Law No. 23, 1997 Concerning Environmental Management.

#### **Government Regulations**

- Government Regulation No. 28, 1985 on Forest Protection.
- Governmental Regulation No.29, 1986 concerning Environmental Impact Analysis (AMDAL).
- Government Regulation No. 51, 1993 on Environmental Impact Analysis (AMDAL).
- Government Regulation No. 20, 1990 requiring water pollution controls.
- Governmental Regulation No.18, 1994 concerning Natural Resources Tourism in the Use Zone of National Parks, Community Forest Parks and Natural Resources Parks.

These laws and regulations were modified by the transitional government. UNTAET instituted additional or replacement laws as necessary. UNTAET Regulation No. 2000/17 prohibits logging and the export of wood products. UNTAET Regulation No. 2000/19 protects 15 of the remaining primary forest areas, primarily mountain summits. Coral reefs, mangroves, and wetland habitats are also protected under this regulation. These protected habitats allow traditional use by local communities.

The designation of protected areas under this regulation is not based on a systematic country conservation strategy or plan. This protected area system may not be representative of East Timor's existing biodiversity, nor is it likely to include sufficient areas to conserve endangered species. Some survey work has been conducted by the Forestry Unit, but it has been limited by available resources. Some fauna groups are also protected under UNTAET Regulation No. 2000/19. These include all species listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendices I and II, including sea turtles, marine mammals, wallabies, and crocodiles. Appendix I species are those threatened with extinction. Appendix II species are not threatened with

extinction; however, their trade should be regulated in order to avoid exploitation that would affect their survival.

During UNTAET, responsibility for biological diversity and tropical forest issues was placed with the Forestry Unit, the Environmental Protection Unit, and with the UN civil police (CIVPOL) (enforcement only). The police have a community service division in charge of crime prevention at the community level. Their aim is to deter the cutting of logs, hunting and the burning of vegetation in the summer. The Environmental Protection Unit has now become the Directorate for the Environment under the Ministry of Development and Environment. CIVPOL also no longer exists as the National Police (PNTL) force has been created.

The Constitution of the Democratic Republic of East Timor contains a section (#61) on the environment that states:

1. Everyone has the right to a humane, healthy, and ecologically balanced environment and the duty to protect it and improve it for the benefit of the future generations.
2. The State shall recognise the need to preserve and rationalise natural resources.
3. The State should promote actions aimed at protecting the environment and safeguarding the sustainable development of the economy.

### **Government Institutions**

Below is a list of Ministries with responsibilities for some aspect of environmental management (from Democratic Republic of Timor-Leste, 2003)

- Ministry of Development and Environment (MDE)
  - Environmental Impact Assessment
  - Air and Water Pollution Control
  - Minerals management
  - Biodiversity conservation
  - Environmental Awareness and Education
- Ministry of Agriculture, Forestry and Fisheries (MAFF)
  - Forests, fisheries and minerals management
  - Biodiversity conservation
  - Agriculture
- Ministry of Transport, Communications and Public Works (MTCPW)
  - Collection and Management of Solid Waste
  - Pollution Control of Solid Waste
  - Hazardous Waste
- Ministry of Education, Culture Youth and Sports (MEYC)
  - Environmental Awareness and Education

Given the cross-cutting nature of these sectors, an inter-ministerial working group has been established to coordinate environmental issues. The Ministry of Transport, Communications and Public Works (MTCPW), the Ministry of Agriculture, Forestry and Fisheries (MAFF) and the Ministry of Development and Environment (MDE), each have some degree of responsibility for water resource

management. MDE is leading a coordination group with MAFF and MTCPW in the implementation of the ADB's Integrated Water Resources Management Policy Project. There are also proposals to develop a catchment policy by MDE and catchment management by MAFF (Democratic Republic of Timor-Leste, 2003). To date **drafts** of the following have been produced:

- Water Resources Decree by MTCPW on controlling water quality and quantity for household consumption
- Law on Environmental Impact Assessment by MDE that takes into account pollution control and discharge licenses
- Law on Pollution Control by MDE

Other laws in draft that have relevance or could impact tropical forest and biodiversity conservation are:

- Draft of a Sustainable Mining Law
- Draft of a National Forestry Policy, Strategy and Legislation

Pending are National Policies for Agricultural Use of Land, Natural Resources and Agrarian Reform.

MAFF has drafted a forest policy and management strategy with funding from the World Bank and DfID for watershed rehabilitation.

There are also traditional regulations and customs which in some areas have been successful in conserving natural resources such as forests and crops. This system of communal protection is known as *tara bandu*. Villagers designated as *cab-leha/tobe* are responsible for seeing that village laws are followed (Sandlund, *et al*, 2001). Also, there were designated village foresters. *Tara bandu* includes temporary prohibitions on resource extraction, such as tree cutting including mangroves and the designation of specific areas as sacred; for example, Jaco Island and its surrounding reef are considered sacred by the local community. *Tara bandu* prescribes fines for violations and also provides for mediation of land disputes. East Timor's Constitution states in Section 2 line 4 "The State shall recognize and value the norms and customs of Timor-Leste that are not contrary to the Constitution and to any legislation dealing specifically with customary law."

In planning for the country's budget, the Government of East Timor has commissioned draft sector expenditure programs for agriculture and livestock (Ministry of Agriculture, Forestry and Fisheries, *et al.*, 2003) and for forestry and fisheries (Ministry of Agriculture, Forestry and Fisheries and Ministry of Development and Environment, 2003). Priorities for investment in natural resources and the environment have also been proposed (Democratic Republic of Timor-Leste, 2003). A proposed investment of \$10 million would provide funding for forestry and fisheries including the building environmental management capacity and assessing the country's water resources and watersheds (Democratic Republic Timor-Leste, 2003).

In August 2003, East Timor became a party to the UN Convention to Combat Desertification. The UN Framework Convention on Climate Change and the Convention on Biodiversity Conservation are being considered (Democratic Republic of Timor-Leste, 2003).

## **Donors and International Organizations**

During the transition period to the present, there has not much support for the environment from donors or the UN. USAID's current program is focused on sustainable economic growth and democracy and good governance. The ongoing economic growth programs support the diversification and sustainability of agricultural systems including improvements in coffee and vanilla production in agroforestry systems. In this way, USAID has been reducing agricultural pressure on forests and their biodiversity. Peace Corps Volunteers in East Timor are assisting in community-level projects related to small-scale agriculture and forestry. The volunteers are also working on environmental education based on customary laws of *tara bandu*. Other donors are currently focusing their programs on urban environmental issues, democracy and governance, agriculture, and economic growth.

UNDP has identified environmental governance and biodiversity management as priorities. Environmental governance consists of legislation, capacity and environmental information systems. They are just developing the framework for biodiversity management that includes an assessment of the country's biodiversity, legislation and community-based biodiversity management. Although there are plans, these activities are not fully funded. The UNDP has partial funding for a preliminary analysis of firewood consumption through household surveys. In the first phase, the UNDP is planning to improve cook stoves and to introduce alternative cooking fuels such as coffee (husks, wastes, shells, hulls).

UNDP's Ainaro and Manatutu Community Activation Project (AMCAP) has agroforestry initiatives including the reforestation of catchments and road bank protection. The project is developing nurseries for seedlings to be planted on communal, state and private lands. This project will continue up to 2007 and is working with NGOs. The World Bank Trust-fund administered Agriculture Rehabilitation Project II (ARPII) worked with communities on reforestation.

MAFF also has funding from the World Bank and DfID for reforestation in watersheds. The World Bank has a team for a study on Rural Energy development. Other donors with activities linked to environmental issues include the GTZ assistance in linking candlenuts to markets. The Canadian International Development Agency is working in rural communities to improve agriculture, sanitation and access to water.

There are indications that the lack of early attention to the environment by the UN and donors has resulted in some of today's environmental degradation. For example, without a subsidy for kerosene, there has been widespread tree felling for firewood. Also, the high population concentration around Dili, in part due to the international presence, has resulted in significant deforestation for firewood. The rebuilding of infrastructure has led to increased pressures on the forest estate for raw materials.

## **Non-governmental Organizations Active in East Timor**

East Timor currently has numerous NGOs providing assistance, but few are playing a direct role in the conservation of biological diversity and tropical forests. The Haburas Foundation and To Make Green (TMG) are new local environmental NGOs. Haburas works on environmental education, management and advocacy as well as networks for popular education and sustainable agriculture. Demetrio do Amaral de Carvalho, director of Haburas was the recipient in 2004 of a Goldman Environmental Prize for his leadership in sustainable development. The international conservation NGO, BirdLife International has been working with the Ministry of Development and Environment on bird inventories and the identification of protected areas (see reference BirdLife-International-Asia Programme, 2003).

As economic opportunities are few and people greatly depend on natural resources, many types of assistance such as humanitarian aid, capacity-building, and technical assistance indirectly reduce subsistence pressures on tropical forest and biodiversity. Over 100 international NGOs have conducted activities, including CARE, Habitat for Humanity International (HHI), International Committee of the Red Cross (ICRC), OXFAM (OXFI), The Asia Foundation (TAF), and World Vision (WLDV). There are approximately 25 local NGOs; several of these are working on urban environmental issues that can have an impact on biodiversity and tropical forest conservation. A list of these NGOs is included in Appendix 2 of this report.

## **C. BIOPHYSICAL AND ECOSYSTEM CHARACTERISTICS**

### **Climate and Topography**

East Timor is located in the Lesser Sunda Islands (part of the Australian continental plate), and includes the eastern end of the island of Timor, the Oecussi enclave in West Timor, and the islands of Atauro and Jaco. The total area encompassed is approximately 1,460,937 ha or 14,874 km<sup>2</sup> (Sandlund *et al.*, 2001). The total length is approximately 265 km, with a maximum width of 97 km.

The bedrock is primarily sedimentary calcareous rock, with fossil coral reefs found at high altitudes (up to 2000 m) (Monk *et al.*, 1997). Soils are generally thin, with poor water holding capacity (Carson, 1989). The topography is quite dramatic, with mountain peaks reaching as high as 2964 m. Steep slopes (incline over 40%) characterize as much as 44% of the total area (Monk *et al.*, 1997). Lakes are relatively few and small, apart from the Iralalaru lake basin. Few of the approximately one hundred rivers flow regularly throughout the year. The largest river system (80 km in length) is the Lois River, on the north side of the mountains.

Climate varies greatly across East Timor. The South coast is “permanently moist” with more than 2000 mm of rain for 9 to 12 months per year. The northern part is “permanently dry” with rainfall of 500 to 1000 mm or more occurring in only four months or less. Hard torrential rain is common, with maximum daily rainfall recorded as high as 398 mm. This causes a high degree of surface runoff and increased soil erosion. The mean annual temperature at sea level is 27.5 °C and 19.8 °C at 1432 m above sea level (Keefer, 2000).

### **Natural Ecosystems**

East Timor contains six major ecosystem types (adapted from Sandlund *et al.*, 2001). These are the:

- Marine and coastal zone
- Arid lowland areas
- Moist lowland areas
- Mountainous areas
- Highland plains
- Wetlands and lakes

## **Marine and coastal zone**

*Description* – includes the mangrove and other specialized coastal vegetation, the shallow seas adjacent to land, coral reefs, and seagrass beds.

*Conservation status* – mangroves and coral reefs are protected by the UNTAET regulation 2000/19. Some mangroves, but not all, are also protected under traditional practices (*tara bandu*). The marine and coastal areas have maintained their environmental quality for the most part. A recent trend towards the use of destructive fishing techniques (bombing coral reefs, and cyanide fishing) could have significant negative impacts on biodiversity and endangered species if it continues.

*Ecosystem functions* – mangrove and coastal vegetation protect the coastline from erosion, and the coral reefs from sedimentation. Productivity in mangroves and coral reefs is extremely high; these areas are the primary breeding grounds for many fish and shellfish species. Seagrass beds also protect coral reefs from erosion and provide feeding grounds for the endangered dugong.

*Importance* – in 1997, fisheries contributed approximately US\$ 481,000, less than 1% of all revenues generated. Few East Timorese fish as their primary livelihood, although those located in coastal areas may fish for partial subsistence. Mangrove trees are used for fuel wood. The area is extremely important in the conservation of marine biodiversity and endangered marine species, such as turtles, dugong, and dolphins.

## **Arid lowland areas**

*Description* – located along the northern coast at altitudes of 0 to 600m, with temperatures above 24° C, and a five month dry season. Deciduous forest was the original vegetation; this has largely been converted to cultivated land, grasslands, or secondary forests.

*Conservation status* – no information.

*Ecosystem functions* – contributes to primary and secondary productivity.

*Importance* – contributes to the agricultural sector of the economy. The area contributes to biodiversity, particularly insect, bird, and small mammal communities.

## **Moist lowland areas**

*Description* – located at altitudes between 0 and 600 m, with temperatures generally above 24° C, along the southern coast. The original vegetation is moist deciduous forest, semi-evergreen forest, or lowland rainforest. Almost all of this area has been converted for agriculture, plantations, or degraded to secondary vegetation and grasslands.

*Conservation status* - some sites are protected by UNTAET regulation 2000/19.

*Ecosystem functions* – vegetation cover prevents erosion into rivers and the ocean, thus protecting coastal marine areas, and helps maintain water flow and quality. It also contributes to primary and secondary productivity.

*Importance* – lowland areas typically have the highest degree of biodiversity in tropical areas. Most of the forest cover has been degraded or eliminated through human activities; the small remaining amount of forest probably harbors significant remaining biodiversity. The area contributes to the agriculture sector of the local economy.

## **Mountainous areas**

*Description* – these areas are characterized by steep terrain, with altitudes 600 m and above. The original vegetation is semi-evergreen forest, moist deciduous forest, or non-deciduous forest. Landslides are frequent during the rainy season, partly due to the conversion of steep slopes for agriculture.

*Conservation status* – several sites are protected by UNTAET regulation 2000/19.

*Ecosystem functions* (erosion, water flow, productivity) – the area plays an important role in water flow. Vegetation cover on steep slopes helps prevent landslides, flooding, erosion, and droughts. The area contributes to primary and secondary productivity.

*Importance* (economic, ecological, socio-cultural) – montane areas are noted for their high levels of endemism; several of East Timor's endemic species are montane forest species.

The remaining primary forest in East Timor is mostly located in this area. This area is also used for agricultural purposes.

### **Highland plains**

*Description* – located between 300 and 700 masl, with clay soils and large fluctuations in water level. This area is currently dominated by agricultural land, particularly irrigated rice production. Basically all original forest cover has been converted for agriculture.

*Conservation status* – no information

*Ecosystem functions* (erosion, water flow, productivity) – agricultural productivity is high in this area. Ground water levels are low, and the water retention attributes of the soil types contribute to flooding during the rainy season.

*Importance* – this area is of high economic importance, contributing approximately 21% or US \$14,925,000 in ground and tree crops in 1997. It is the most important agricultural area.

### **Wetlands, freshwater rivers and lakes**

*Description* - there is one large lake, Iralalaru Lake. Based on previous aerial photographs from 1972 (Sandlund *et al.*, 2001), this area appears to have been a wetland previously. Several dead standing trees are visible in the lake. The Iralalaru lake basin is surrounded by forest. There are few other lakes, and these are quite small in comparison. Rivers are ephemeral, often drying up completely during the dry season.

*Conservation status* – wetlands are protected by UNTAET regulation 2000/19. Efforts are underway to declare the Iralalaru lake basin area a Man and Biosphere (MAB) reserve.

*Ecosystem functions* – essential to water quality and abundance, contribute to nutrient cycling, and primary and secondary productivity.

*Importance* – the areas are essential to maintaining human quality of life and agricultural (irrigation). The areas are essential for migratory bird species, endangered bird species, and endemic fish species.

## **D. CURRENT STATUS OF TROPICAL FORESTS AND BIODIVERSITY**

### **Tropical Forest Status and Management**

Forest cover in East Timor has decreased by almost 30% over the period of 1972 to 1999, based on analysis of satellite images (Sandlund *et al.*, 2001) (Figure 1, green areas include both agriculture and forest cover). Approximately 35% (453,850 ha) of the land area (excluding approximately 22 km<sup>2</sup> of water bodies) has some type of forest cover (Figures 2 and 3). Remaining primary forest vegetation is minimal. Estimates range from 1 to 6% of the territory. East Timor does not have sufficient timber for rebuilding and firewood. Ebony, sandalwood, and teak trees have been almost completely eliminated (Westerberg, 2000), yet illegal logging of these species continues and is smuggled across the border into West Timor. During the Indonesian occupation of East Timor, not only was timber harvested for sale, but the Indonesian military frequently burned the forest. One reason given was to remove any cover that could protect guerrillas. Furthermore, during the Indonesian occupation, many people were displaced to the hills and cleared forests for agriculture.

Figure 1. Landsat 7 satellite image provided by ACRES September 1999

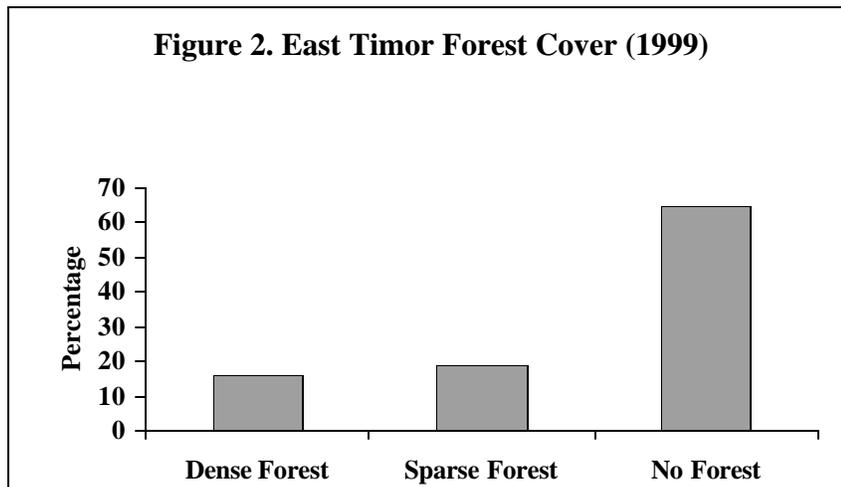
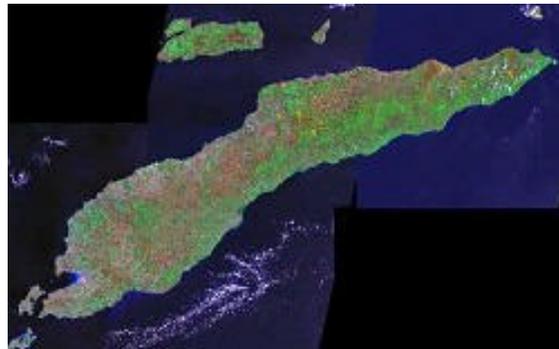
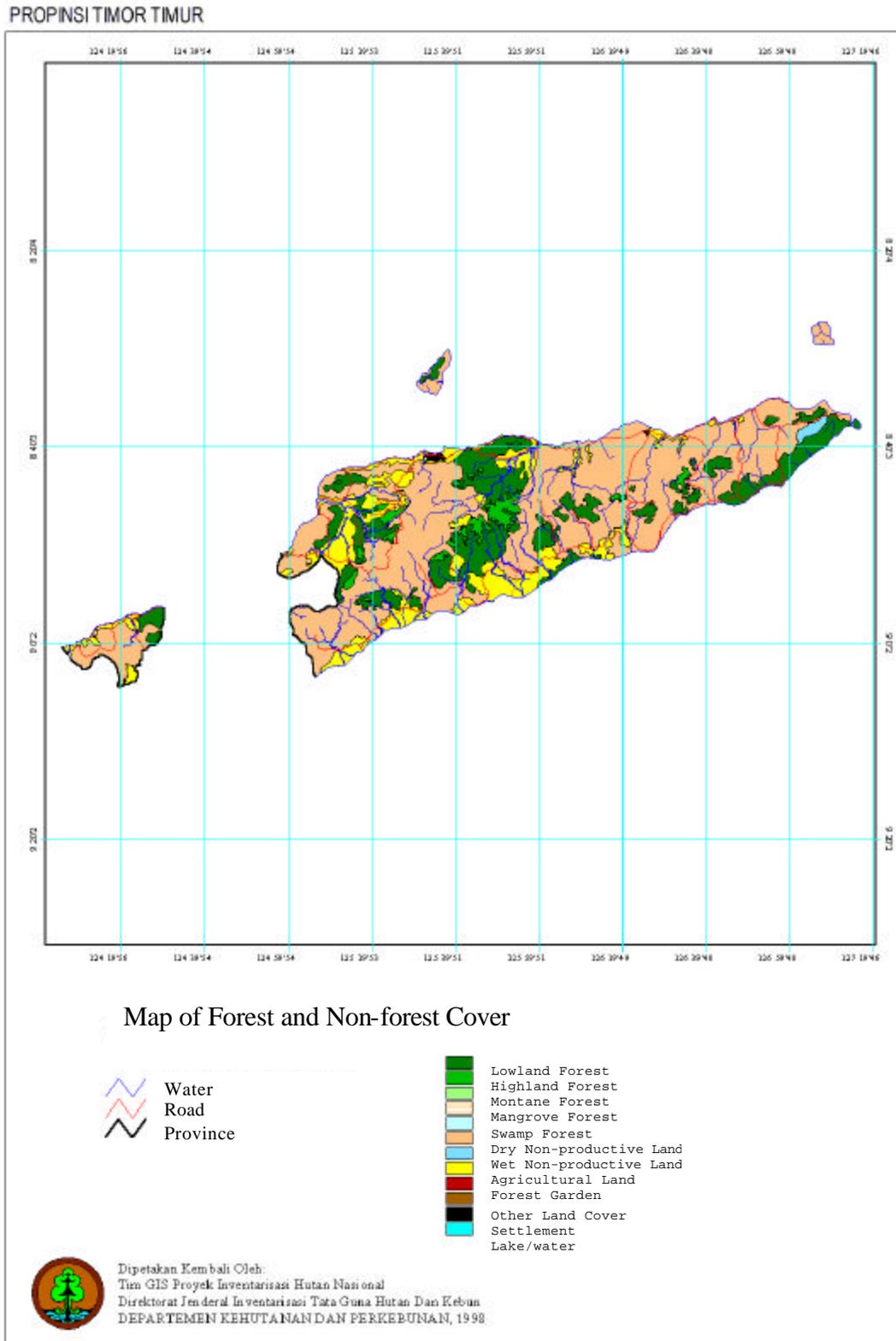
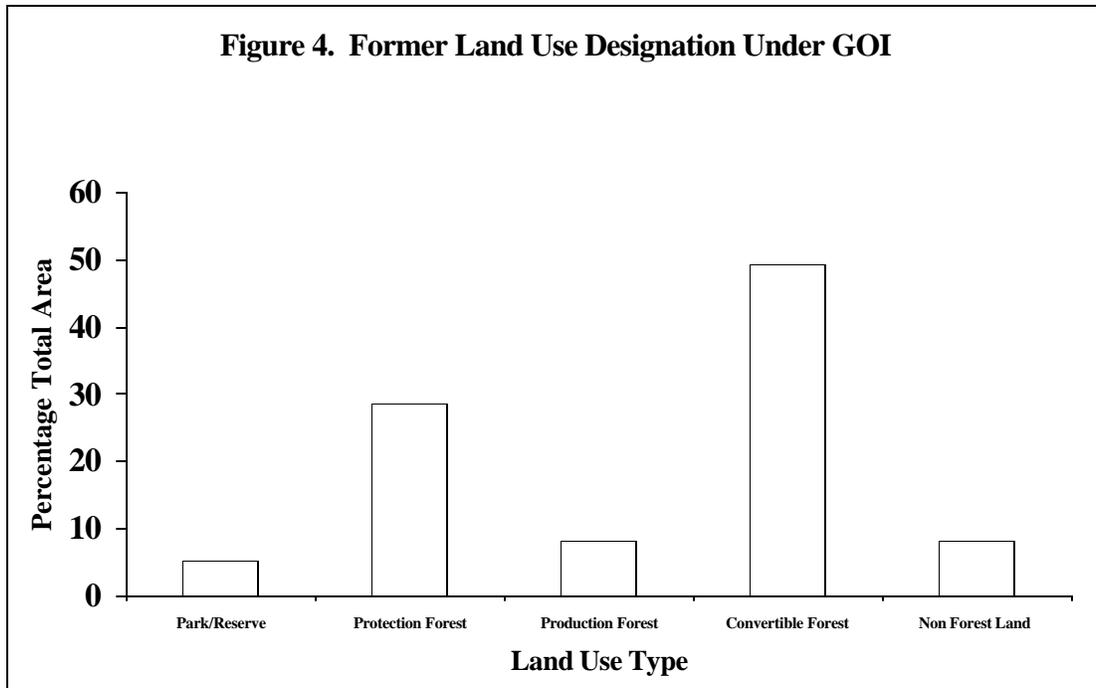


Figure 3. Government of Indonesia map of Forest Cover in East Timor



New land use plans and spatial zonation have not been completed. Land use designation prior to 1999 included five major categories: parks/reserves, watershed protection forest, production forest, convertible forest, and non-forest land (Figure 4). The majority of this land was designated as convertible forest, in other words, the forest cover could be removed and replaced by crops or plantations.



There are significant gaps in information concerning actual forest status. Management of the forest estate is currently under the National Direction of Forestry and Water Resources (NDFWR) of MAFF. Under NDFWR are the directorates of Reforestation and Rehabilitation; Protection and Utilization of Forest Products; and Services, for example for community forests and mangroves. The Forestry staff have few resources available. For example, there are 30 staff in NDFWR, five of whom are forest guards. There are hopes of hiring 21 more guards (National Direction of Forestry and Water Resources, 2003). MAFF has done a limited inventory of trees from the Consolidated Fund for East Timor (CFET) administered by UNTAET. Reforestation projects are also being planned.

## **Biodiversity Status and Management**

### **Protected Areas Status**

The Directorate of the Environment within the Ministry of Development and Environment is the lead for the management of protected areas. Fifteen specific protected areas have been designated under UNTAET regulation 2000/19. These are:

1. The total land area of Jaco Island together with surrounding rocks, reefs, and other surface and sub-surface features;
2. Tutuala Beach together with forest adjacent to the beach;
3. Cristo Rei Beach and the hinterland;

4. The summit of Tata Mailau Mountain, all elevations on Tata Mailau Mountain above 2000 meters and the surrounding forest;
5. The summit of Sadoria Mountain, all elevations on Sadoria Mountain above 2000 meters and the surrounding forest;
6. The summit of Malobu Mountain, all elevations on Malobu Mountain above 2000 meters and the surrounding forest;
7. The summit of Mount Diatuto and the surrounding forests;
8. The summit of Mount Fantumasin and the surrounding forests;
9. The Riverlet Clere Sanctuary;
10. The Tilomar Reserve;
11. The Lore Reserve;
12. The Monte Mundo Perdido and the surrounding forest;
13. The summit of Monte Matebian and all elevations on Monte Matebian above 2000 meters and the surrounding forest;
14. The Monte Cablaque and the surrounding forest; and
15. The Manucoco Reserve.

The protected areas designated contain the majority of the remaining primary forest cover in East Timor. The majority of the areas designated are montane. These areas are likely to have high endemism. Lowland forest areas, typically higher in biodiversity and with greater numbers of threatened species, are not as well represented. The protected area system designated is provisional, and is not based on an analysis of East Timor's biodiversity and forest conservation needs. It is likely that the critical habitat necessary for the survival of some endangered and endemic species is not included in the current design. Jaco Island and Lake Iralalaru area have had surveys performed by BirdLife International and the Directorate of Environment and are among the first to be proposed as protected areas. Management plans, including management of tourism, have not been developed yet for these protected areas.

There were fewer than 500 foreign visitors in 1998 to East Timor. There has been a significant influx of foreign visitors since 1999, composed primarily of UN and other international aid staff on temporary assignment. The lack of tourist management practices has put pressure on some protected areas, and is contributing to increasing levels of degradation and conflict with local communities. Jaco Island is one such site. The island is considered sacred and local customs prohibit use; however, it has become a popular destination for foreign visitors. There is some disagreement among communities about this tourism.

### **Species information**

Collections of biological materials from East Timor are located primarily in Indonesia, Australia, the Netherlands, Portugal, and the United States.

BirdLife International and the Directorate of the Environment have done recent inventories of threatened birds and internationally significant sites (BirdLife International-Asia Programme, 2003) in Maubara, Los Palos and the three lakes of Tacitolu where the government is planning a peace park. This inventory identified nine important Bird Areas: Tilomar, Tata Mailau, Fatumasin, Atauro Island, Sungai Clere, Lore, Monte Paitchau, Jaco Island and Mount Diatuto. East Timor has numerous endemic and globally threatened bird species such as Timor Green Pigeon *Treron psittacea* (endangered); Timor Imperial Pigeon, *Ducula cineracea* (endangered), Timor Black Pigeon *Turacoena modesta* (vulnerable), Wetar Ground-dove *Gallucolumba hoedti* (endangered), Yellow-crested Cockatoo *Cacatua sulphurea* (critically endangered) and Timor Sparrow *Padda fuscata* (Vulnerable).

**Table 1. The Status of East Timor's Birds and Their Dependence on Closed Canopy Tropical Forest.<sup>1</sup>**

English name	Species	Status	RR	Forest Fidelity
<b>Christmas Island Frigatebird</b>	<i>Fregata andrewsi</i>	<b>CR</b>		None
<b>Timor Green Pigeon</b>	<i>Treron psittacea</i>	<b>EN</b>	RR	<b>HIGH</b>
Pink-headed Imperial Pigeon	<i>Ducula rosacea</i>	nt	RR	<b>MOD</b>
<b>Timor Imperial Pigeon</b>	<i>Ducula cineracea</i>	<b>EN</b>	RR	<b>MOD</b>
<b>Timor Black Pigeon</b>	<i>Turacoena modesta</i>	<b>VU</b>	RR	<b>MOD</b>
Barred-necked Cuckoo-dove	<i>Macropygia magna</i>		RR	<b>MOD</b>
<b>Wetar Ground Dove</b>	<i>Gallicolumba hoedtii</i>	<b>EN</b>	RR	<b>HIGH</b>
Olive-headed Lorikeet	<i>Trichoglossus euteles</i>		RR	<b>MOD</b>
Iris Lorikeet	<i>Psitteuteles iris</i>	nt	RR	<b>MOD</b>
<b>Yellow-crested Cockatoo</b>	<i>Cacatua sulphurea</i>	<b>CR</b>		<b>MOD</b>
Olive-shouldered Parrot	<i>Aprosmictus jonquillaceus</i>	nt	RR	<b>MOD</b>
Cinnamon-banded Kingfisher	<i>Halcyon australasia</i>	nt	RR	<b>MOD</b>
White-bellied Chat	<i>Saxicola gutturalis</i>		RR	Low
Chestnut-backed Thrush	<i>Zoothera dohertyi</i>	nt	RR	<b>HIGH</b>
Orange-sided Thrush	<i>Zoothera peronii</i>	nt	RR	<b>MOD</b>
Timor Stubtail	<i>Urosphena subulata</i>		RR	Low
Buff-banded Bush-bird	<i>Buettikoferella bivittata</i>		RR	Low
Timor Leaf warbler	<i>Phylloscopus presbytes</i>		RR	Low
Black-banded Flycatcher	<i>Ficedula timorensis</i>	nt	RR	<b>HIGH</b>
Timor Blue Flycatcher	<i>Cyornis hyacinthinus</i>		RR	<b>MOD</b>
Plain Fairy Warbler	<i>Gerygone inornata</i>		RR	Low
Fawn-breasted Whistler	<i>Pachycephala orpheus</i>		RR	Low
Red-chested Flowerpecker	<i>Dicaeum mauei</i>		RR	Low
Flame-breasted Sunbird	<i>Nectarinia solaris</i>		RR	Low
Spot-breasted Dark-eye	<i>Heleia muelleri</i>	nt	RR	<b>MOD</b>
Yellow-eared Honeyeater	<i>Lichmera flavicans</i>		RR	Low
Black-chested Honeyeater	<i>Myzomela vulnerata</i>		RR	Low
Streak-breasted Honeyeater	<i>Meliphaga reticulata</i>		RR	Low
Timor Friarbird	<i>Philemon inornatus</i>		RR	Low
Tricolored parrot-finch	<i>Erythrura tricolor</i>		RR	Low
<b>Timor (Finch) Sparrow</b>	<i>Padda fuscata</i>	<b>VU</b>	RR	Low
Olive-brown Oriole	<i>Oriolus melanotis</i>		RR	<b>MOD</b>
Timor Figbird	<i>Sphecotheres viridis</i>		RR	<b>MOD</b>
Oriental Darter	<i>Anhinga melanogaster</i>	Nt		None
Great-billed Egret	<i>Ardea sumatrana</i>	Nt		None
Malaysian Plover	<i>Charadrius peronii</i>	Nt		None
Eastern Curlew	<i>Numenius madagascariensis</i>	Nt		None
Beach Curlew	<i>Esacus magnirostris</i>	Nt		None

Red List categories for endangered species: CR – critically endangered, EN – endangered, VU – vulnerable, LR – lower risk (nt – near threatened, cd – conservation dependent), DD-data deficient. Restricted-range (RR): natural global distribution is less than 50,000 km<sup>2</sup> (less than twice the area of Timor island).

<sup>1</sup> This table is copied in its entirety from Appendix 1 of BirdLife International-Asia Programme. (2003). Status of globally threatened birds and internationally significant sites in Timor-Leste (East Timor) based on rapid participatory biodiversity assessments with particular reference to the proposed 'Nino Conis Santana National Park (NCSNP)'. The legend of Appendix 1 explains states: "Approximate fidelity of globally threatened, near threatened and restricted-range birds to Closed Canopy Tropical Forest types in East Timor, based on this study and previous reviews (Noske and Saleh 1996, BirdLife International 2001, Mauro 2003). Forest fidelity ranges from "none" (no dependence on closed canopy tropical forest) to "high" (highly dependent on closed canopy tropical forest)."

## Terrestrial Species

Tropical forests are in poor condition, and continue to be degraded and converted, putting several species, particularly frugivorous birds and mammals, at risk. Coastal habitats are largely in good condition. This is probably due in part to traditional prohibitions against destruction of mangrove. Wetland areas are limited and ephemeral, generally drying up during the dry season. Ten endangered mammals and three endangered reptiles are found in East Timor (Table 2). The majority of the mammals and the python are all forest dwellers, and the remaining two lizards inhabit wetlands.

<b>Taxonomic Name</b>	<b>English Name</b>	<b>IUCN/CITES</b>
<i>Paradoxurus hermaphroditus</i>	Mentawai Palm Civet	VU
<i>Macaca fascicularis</i>	Long-tailed macaque	LR/nt, CITES
<i>Phalanger orientalis</i>	Northern common cuscus	CITES
<i>Hipposideros crumeniferus</i>	Timor leaf-nosed bat	DD
<i>Nyctophilus timoriensis</i>	Greater long-eared bat	VU
<i>Rhinolophus philippinensis</i>	Philippine horseshoe bat	LR/nt
<i>Rhinolophus simplex</i>	Lombok horseshoe bat	EN
<i>Pipistrellus papuanus</i>	Papuan pipistrelle bat	LR/nt
<i>Miniopterus schreibersii</i>	Schreibers' bent-winged bat	LR/nt
<i>Crocidura tenuis</i>	Timor shrew	VU
<i>Varanus timorensis</i>	Timor monitor lizard	CITES
<i>Crocodylus porosus</i>	Estuarine crocodile	CITES
<i>Python timoriensis</i>	Timor python	CITES

Red List categories for endangered species: CR – critically endangered, EN – endangered, VU – vulnerable, LR – lower risk (nt – near threatened, cd – conservation dependent), DD-data deficient

## Marine Species

Threatened and endangered marine species include turtles, dugong, whales, dolphins, sharks, crabs, and clams. Marine habitat degradation, from destructive fishing practices and pollutants, is beginning to occur, and could have serious implications for these species in the near future. Coral is also harvested as a building material. Illegal fishing occurs which is depleting fish stocks. The Naval component of East Timor's Defense Force caught an Indonesian boat catching young sharks for the Chinese market.

<b>Taxonomic Name</b>	<b>English Name</b>	<b>IUCN/ CITES</b>
<i>Chelonia mydas</i>	Green turtle	EN, CITES
<i>Eretmochelys Imbricata</i>	Hawksbill turtle	CR
<i>Dermochelys Coriacea</i>	Leatherback turtle	CR
<i>Caretta caretta</i>	Loggerhead turtle	EN
<i>Lepidochelys Olivacea</i>	Olive turtle	EN, CITES
<i>Dugong dugon</i>	Dugong	VU
<i>Physeter catodon</i>	Sperm whale	VU
<i>Orcinus orca</i>	Killer whale	LR/cd, CITES
<i>Stenella longirostris</i>	Spinner dolphin	LR/cd, CITES
<i>Tursiops truncatus</i>	Bottlenose dolphin	DD
<i>Rhincodon typus</i>	Basking shark	VU
<i>Tridacna derasa</i>	Southern Giant Clam	VU
<i>Tridacna gigas</i>	Giant Clam	VU
<i>Tridacna maxima</i>	Small Giant Clam	LR/cd
<i>Tridacna squamosa</i>	Fluted Giant Clam	LR/cd
<i>Hippopus hippopus</i>	Bear Paw Clam	LR/cd
<i>Hippopus porcellanus</i>	China clam	LR/cd
<i>Birgwa latro</i>	Giant coconut crab	DD

Red List categories for endangered species: CR – critically endangered, EN – endangered, VU – vulnerable, LR – lower risk (nt – near threatened, cd – conservation dependent), DD-data deficient

Aquatic (both marine and freshwater) biodiversity are affected by environmental degradation from a number of causes. Sand extraction can affect the flow of the rivers. Informal settlements along river and stream banks dispose waste directly into the water. There is no water sanitation available and waste enters the coastal areas. Villagers are also concerned about fertilizers and pesticides polluting the rivers.

### **Vegetation**

Two tree species are endangered in East Timor (Table 4). Sandalwood was formerly abundant, but has been severely over-harvested.

<b>Taxonomic Name</b>	<b>English Name</b>	<b>IUCN/CITES</b>
<i>Santalum album</i>	Sandalwood	VU
<i>Mangifera timorensis</i>		EN

Red List categories for endangered species: CR – critically endangered, EN – endangered, VU – vulnerable, LR – lower risk (nt – near threatened, cd – conservation dependent), DD-data deficient

East Timor, prior to the 1999 referendum, was in the process of developing a local system of seed multiplication for several crops. Two Central Seed Centers were set up in Balai Benih Induk, Maliana, Bobonaro district (rice) and in Loes, Liquica district (corn, soybean, peanuts and mung beans) (East Timor Joint Assessment Mission, 1999). The transitional government and the international donor community have undertaken efforts to conserve and support the sustained production of commercially important plant species through restoration and additional development of local seed resources and seed production stations. USAID is supporting efforts to maintain locally-adapted coffee plants.

## **E. ASSESSMENT OF THREATS TO TROPICAL FORESTS AND BIODIVERSITY**

A lack of economic alternatives drives deforestation, coral reef destruction and over-exploitation of wildlife in East Timor. Deforestation is the single most pressing problem in East Timor. The majority of East Timor's endangered species, and much of its biodiversity are found in its remaining forests. Pressures on forests are driven primarily by the need for firewood, clearing for agriculture and escaped fires during land clearing or hunting. Illegal logging is also a threat. From March 2002 to November 2003, the police confiscated over 572,000 tons of sandalwood (National Direction of Forestry and Water Resources, 2003). Hunting for meat or sale for the pet trade appears to be common, but there are few concrete data. Destructive fishing practices are contributing to the degradation of coral reefs. During the UN transition period, corals were also used for construction material.

Demand for firewood around the Dili area has increased as the population of Dili has tripled in 3 years. Moreover, there is increased use of firewood because there is no longer the Indonesian subsidy for kerosene, the distribution networks for kerosene no longer exist and many people lost their kerosene stoves during the violence of 1999. The price of kerosene during the Indonesian occupation was 10 cents per liter and in January 2004 was 50 cents per liter. In the urban areas of Dili and Baucau, 86% percent of households use firewood. In other parts of the country, 99% of households rely on firewood (UNICEF, 2002).

Habitat degradation also occurs through the conversion of forests to agriculture. Given the low amount of appropriate agricultural land, and a growing human population engaged primarily in subsistence agriculture, the pressure on forest resources will continue unabated, unless steps are taken in the immediate future.

Given East Timor's sloping terrain and the rainfall pattern of short, intense rains, soil erosion from farming and deforestation have negative impacts on both terrestrial and aquatic biodiversity. Conservation impacts of high erosion include loss of forest habitat through landslides and degradation of river and coastal habitats through sedimentation. Stream sedimentation is very high from upland soil erosion. Livestock grazing also contributes to erosion and the appearance of weeds that are difficult to eradicate.

Poaching is also a major problem for endangered species. Endangered species are hunted for food, medicine, and ornaments, and collected live for the pet trade. Conservation efforts in East Timor are nascent. A start at protecting endangered species has been made by the formulation of UNTAET regulation 2000/19, but enforcement has been lacking. A number of illegal wildlife products have been observed openly for sale in the capital, Dili. These products have included marine turtle eggs and Hawksbill turtle shell ornaments (Sandlund *et al.*, 2001). Unemployment and demand from foreigners fuels the trade in rare birds and turtles. Now there is a display in the airport of the wildlife products that

are not allowed to be taken. Some checking of bags at the airport is also occurring. The Directorate of Environment is planning joint patrols with the National Police force to improve enforcement. They have also created information cards on endangered species.

Pollution from a variety of sources has potential for negative impacts particularly upon aquatic biodiversity. For example, upstream pollution of rivers from agricultural inputs and human wastes is not only contaminating rivers and streams, but also, makes its way out to the coasts and coral reefs. It is estimated that about 45% of households have access to toilet facilities and of those who do, half are unsafe (UNICEF, 2002). Wastes is a large issue; for example, Dili dumps its waste into the river. Ships also release their wastes along the coast. The UN had contracted with a company for the disposal of waste oil; however, the contract ended and there are currently 200,000 liters of waste oil stored by the Comoro River. It was reported that some of the drums are leaking oil posing a threat to aquatic biodiversity.

Threats to biodiversity may arise due to outside investments. For example, hydroelectric, oil palm and sugar cane plantations. Oil palm and sugar cane plantations are planned in Los Palos. The Norwegian Water Resources and Energy Directorate (NVE) is formally cooperating with the Ministry of Transport, Communication and Public Works to develop hydropower including transmission lines. NVE has invited tenders for feasibility studies. Norplan and Norconsult were awarded the contract by NVE. They have identified potential for a mini-hydropower plant of 150-300 kW in Baucau and dams of 30-60 m in gorges on the river Lacro. Another possibility identified hydroelectric energy generation is the redirection of water underground from the Lake Iralalaru. The water from this lake flows downstream through the Ira Siquiro River into a sinkhole and underground veins. According to Norplan's Newsletter, "The engineering challenges lie with design of the intake to catch the water and design of the waterway in this kind of poor rock with low ability to withstand pressurized water" (Norplan, 2004). Transmission lines to Dili would be built to produce 190 GWh/year of electricity. Further tenders for implementation will be invited upon the completion of feasibility studies. The development of the plantations and hydroelectric energy generation are just outside of the proposed park border in Lore. The area around the proposed hydroelectric site is the only pristine area of forests that remains in East Timor and has been described as "best tropical closed forest on the island" (Birdlife International-Asia Programme, 2003). The lake is a stabilizer for the region including for wetlands and rivers to the South coast. The wetlands are important for crocodiles and large resident water bird populations. The NGO Haburas is collecting information on how the livelihoods of the people are dependent on the environment and how the generation of hydroelectricity could affect them.

In East Timor, there is an overall lack of information on the environment and biodiversity such as extent of forest cover, hydrology, water catchment and wetland areas. The lack of knowledge hinders conservation. New legislation is being drafted and information to the public on these laws will need to be disseminated.

## **F. USAID'S CURRENT ACTIVITIES**

Most of USAID's current activities in East Timor are focused on supporting the development of organically certified coffee grown in an environmentally-sustainable manner. The "Timor Economic Rehabilitation and Development Project" is also known as the Coffee Project. The project focuses on improving production of existing coffee plants and is not promoting clearing of forests for production. The project works with about half of the coffee farmers (100,000) in East Timor. There are plans to expand the project to provide assistance to an additional 75,000 farmers but this will not require clearing

land to plant additional coffee. The coffee plantations involved in this project were planted during the time when East Timor was a Portuguese colony. The coffee produced is a very strong tasting coffee and is a genetic mix of Robusta and Arabic strains developed over the years. The coffee is hardy, resistant to disease (leaf rust), and is able to grow at practically all elevations.

Given this coffee's local adaptation and pest resistance, inputs such as inorganic fertilizers or pesticides are not utilized. The coffee project has taken advantage of these conditions and has achieved organic certification for smallholder-produced coffee. The coffee that is sold to organic markets in the U.S. and Europe is required to be tested yearly by internationally-recognized inspectors. As a result of the success of this project USAID's technical assistance personnel working on the project have introduced a plan for an East Timor National Organic Policy that will control the use of pesticides and fertilizer to protect coffee and other organic agricultural production including vanilla throughout the country. In addition, the coffee is sold under the "Fair Trade Label". The Fair Trade label certifies fair labor practices and also provides a premium price to farmers.

The coffee in East Timor is also shade-grown and the project has developed a shade tree seedling production program to replace old or diseased trees. Currently the project is testing the feasibility of a *Leucaena* hybrid (PG 79) to replace diseased shade trees. Recently, a great number of *Albizia* spp have become infected with the fungus *Uromykladium tepperianum* known as gall rust. According to a study by a task force established by the Department of Agriculture and Forestry (2001), gall rust was found in 67% of the total coffee plantations across all eight districts where coffee is grown. In 2000, approximately 6,000 seedlings of the *Albizia* spp<sup>2</sup> and *Casuarina* spp<sub>2</sub> tree varieties were distributed and planted by the coffee farmers with help of project extension agents. Demand for the trees has been exceptionally high. This tree seedling program will have the important added benefit of stabilizing soil on these steep hillsides and reducing soil erosion in areas known to suffer serious negative environmental impacts from erosion. The project also will be examining the value of improved varieties of *Leuceana* (*Leucaena*) spp. for reforestation and fodder.

USAID's democracy and governance activities under the Land Law project have been focusing on land titling in urban areas. Given that no clear authority has been designated for spatial planning, an advisor will be brought in to analyze the role of current government bodies in land use decisions as first steps in planning. The project will be working on a Title Restitution Act that recognizes rights including forests.

USAID's small grants program is assisting in sustainable agricultural practices such as the use of organic fertilizer. They are also assisting in the distribution of improved varieties of seeds and seedlings. Assistance to the children's magazine Lafaek which has provided information on the environment to schoolchildren across the country. It is also supporting a traveling expo that is raising environmental awareness among communities throughout the country.

USAID's other activities do not have direct biodiversity or forest impacts, but are crucial to the development of an enabling environment for the conservation of biodiversity and forests. In particular, the development of good governance, participatory processes, and a transparent judicial system, will contribute to the protection of endangered species, biodiversity conservation, and the retention of forest cover, as these issues slowly gain greater attention.

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<sup>2</sup> Please note that the *Albizia* genus has been renamed to *Paraserianthes*. A common shade tree for the coffee is *Paraserianthes falcataria*.

## **G. ACTIONS NECESSARY TO CONSERVE BIOLOGICAL DIVERSITY AND TROPICAL FORESTS**

### **Watershed Management through Sustainable Agriculture and Reforestation**

Watershed management including sustainable agriculture and reforestation would address the two primary threats to East Timor's forests and biodiversity. These threats are unsustainable, low-yielding agricultural practices and deforestation for firewood collection.

Improving agricultural production on existing cleared lands would reduce the need of farm families to clear forests for new fields. More support needs to be provided that will help East Timor diversify the types of products grown and develop economic alternatives to subsistence agriculture, thus reducing pressure for forest conversion. Agriculture sector development should also focus on decreasing erosion and maintaining soil quality. Practices such as bank stabilization and terracing can decrease the risk of landslides.

Agroforestry systems such as coffee with shade trees are a valuable example of a practice beneficial to the environment. The benefits of planting of multi-purpose species in gardens, agroforestry systems and large-scale reforestation would be an increase in tree cover, income generation, improved food security, erosion control, firewood supply and improvements in water quality and quantity.

Enabling conditions to ensure the success of such environmental rehabilitation would be the institutional capacity of East Timor's Ministry of Agriculture, Forests and Fisheries to provide assistance and continuation of such programs, along with clarification of the rights, roles and responsibilities of government, NGOs, communities and the private sector. Tenure rights to land and forests will be of primary importance for clarification (see also D'Andrea, *et al.*, 2003).

### **Water Quality and Quantity**

Humans along with terrestrial, aquatic, coastal and marine wildlife are dependent upon a steady water supply of good quality. Fresh water is needed for irrigation and high value crops. Water scarcity is a major challenge because of the relatively low levels and sporadic rainfall in some parts of East Timor combined with deforestation and the sedimentation of rivers. Such water scarcity can become a flashpoint for conflict.

Overall, there is very little information of the hydrology of the country and the impacts that the wide-scale deforestation may have or had on groundwater supply. An analysis is needed to determine options for water conservation and rehabilitation of key watersheds. Existing water supplies are also threatened by wide-scale erosion and siltation of rivers. Run-off affects the marine environment and its biodiversity. Additionally, many rivers are contaminated with human and livestock waste. There is no sewage treatment and the waste flow from Dili is released along the coast. Recommendations related to watershed management would also benefit the quality and quantity of East Timor's water supply.

### **Firewood and Energy**

Most informants in East Timor identified deforestation for firewood collection as the major threat to forests. Furthermore, the development of hydroelectric power adjacent to East Timor's most pristine remaining forest has raised concerns for the forest and its biodiversity. Also, energy for small and large-

scale industries is needed to attract investment and economic growth to provide alternatives to subsistence agriculture, which also threatens forests and biodiversity.

Energy generation from diesel fuel supplies electricity mainly to people in the urban centers of Dili and Baucau where approximately 92% have some degree of service. In other urban areas about 47% of households are serviced. In rural areas only 14% have electricity for lighting. The majority use oil lamps (UNICEF, 2002). Furthermore, most people rely on firewood for their cooking needs. East Timor's oil and natural gas reserves are coming on line, but more slowly than expected and there will be a \$20 million shortfall of government budget revenues until 2006. In the meantime, there is not a reliable supply of energy in Dili or the rest of the country. Renewables may have potential for electricity generation in remote areas. An analysis of what forms of energy are cost-effective in which locations is important along with an analysis of the potential of renewables or natural gas for domestic supply. In the short-term, specifically related to firewood, an analysis of the sector is needed to determine what local household energy needs are, what the existing firewood use is and its market chain. This information would contribute to the identification of opportunities for reforestation and income generation using fast-growing firewood species as well as alternatives to firewood for cooking fuel.

The analysis should also consider the potential that the production of renewable energy resources has to create jobs in rural areas while providing the necessary energy for the establishment of other industries. Renewable energy will be a sound foundation for the sustainable development of East Timor as gas and oil reserves will be depleted eventually. They may also provide an opportunity for developing public-private sector partnerships.

### **Policies and Planning for Forest and Biodiversity Management**

There is a sense among civil society groups that UNTAET developed regulations without appropriate dialog and participation of the citizens. Some of the UNTAET regulations were also derived from Indonesian laws. A participatory process tailored to the priorities of East Timor will assist in the development and eventual enforcement of laws and regulations related to forest and biodiversity conservation. East Timor is just developing its legal infrastructure, and the regulations and procedures necessary to conserve its resources. Assistance in developing transparent, equitable, and sustainable systems is paramount to conserving its biodiversity and remaining tropical forests. Capacity building of government staff to develop, implement and enforce environmental legislation is also necessary. An interview with the police suggested that to enforce laws, the laws should be practical and understandable. Given the roles of the MAFF, MDE and PNTL in enforcement, it was suggested that a coordination mechanism among the three would be needed. Enforcement would also require good field communications and transport for mobility.

Existing customary laws under *tara bandu* provide grassroots examples of the types of policies that could contribute to sound environmental management. The drafting of new national policies presents an excellent opportunity to reinforce these existing forms of community-level resource management. Communities thereby can be recognized within policies as a key partner for conservation. NGOs could use assistance to enhance their skills in analysis and advocacy for specific environmental policies and their implementation.

### **Biodiversity Conservation**

Given that there are difficulties in the enforcement of UNTAET determinations of protected areas and that they may not reflect the current state of terrestrial, aquatic, coastal and marine biodiversity, rapid

assessment of biodiversity is needed to delineate protected areas of terrestrial and coastal biodiversity. BirdLife International along with the Directorate of Environment in MDE, have begun inventories of endangered birds and have identified key areas of biodiversity conservation. A National Conservation Strategy and Action Plan should be developed, incorporating the survey results, and areas should be added to the protected areas network based on these documents. Management plans should be developed for protected areas, including buffer zone development with community participation and active management. These activities that promote participatory planning of East Timor's natural resources are important methods to build local governance and human capacity for biodiversity conservation and management.

Both government and non-governmental organizations require a building of capacity to sustainably manage East Timor's forests and conserve their biodiversity. Training in basic principles of ecology and conservation, ecological restoration, sustainable management of fisheries and forests, habitat requirements of endangered species, and eco-tourism management are some of the most pressing training needs.

Capacity building of existing environment staff in forming national level conservation policies will enable East Timor to become a party in conservation-related UN Conventions such as the Convention on Biodiversity Conservation, the Convention on the International Trade in Endangered Species and the Convention to Combat Desertification. East Timor became a party to the UN Convention to Combat Desertification in August 2003. It will be important to assist East Timor in gaining conservation funding from the Global Environment Facility (GEF). The implementing agencies of the GEF are UNEP, UNDP and the World Bank. Such a fund is particularly important for East Timor because of the overall lack of conservation funding from donors.

### **Environmental Education and Awareness**

There is a lack of information in East Timor on the state of the environment, including endangered species and sustainable agricultural and other environmental management practices. Existing legislation and policies are unclear to the Timorese public and international community. Environmental education and awareness can contribute to an informed citizenry and promote good governance of natural resources. Specific recommendations can be found in the next Section H, "Meeting Conservation Needs: Current and Recommended Actions".

### **Ecotourism**

The World Tourism Organization is developing a master plan for tourism development. Currently there are sites of natural beauty that can attract tourists. These are, for example, Iralalaru Lake, Tutuala Beach and dive sites off the coast. Jaco Island is also suggested; however, this is a sacred site for some inhabitants and respect for their culture should be taken into account if any eco-tourism plans are to be developed. The potential for eco-tourism as an incentive to forest and biodiversity conservation exists. For example, diving may be a source of revenue for conservation and the diving industry would be a likely partner for conservation. Tourism could provide jobs and income to local communities. As tourism is at the very beginning stages in East Timor, the country has a unique opportunity to work directly with communities in the design and the equitable sharing of benefits. It will be important to conserve and manage these existing sites while the opportunities for tourism develop over the coming years. Furthermore, any development projects, such as hydroelectric generation, that are proposed in or near these sites, should consider the potential value of tourism in the cost-benefit analysis of the project.

## **Environmental Impact Analysis**

Upon passing of the law on Environmental Impact Analysis, investigation would be needed of possible impacts of exploration of the country's petroleum resources. Assistance will also be needed ensuring that mitigation methods are in place.

## **H. MEETING CONSERVATION NEEDS: CURRENT AND RECOMMENDED ACTIONS**

### **Current Actions**

Current USAID actions under the coffee project and University of Hawaii CRSP are meeting needs for the maintenance of forest cover, reforestation and sustainable agriculture that will slow the degradation of the environment. By improving and diversifying existing agricultural and agroforestry systems, these activities prevent the further cutting of forests and loss of their biodiversity.

The coffee project, implemented by the National Cooperative Business Association (NCBA), provides an excellent example of how to reconcile the need to generate income for the rural poor while protecting the environment. The project's assistance to existing shade coffee production systems maintains critical forest cover. The project is adding aspects of diversification; for example, the cultivation of vanilla that requires shade and the maintenance of tree cover. Appropriate sustainable agricultural practices are being explored to reduce wide-scale erosion causing the degradation of terrestrial as well as river and coastal habitats. East Timor, however, is facing the demise of the trees shading coffee by the fungal infection known as gall rust. The project has been investigating ways to protect the tree cover and is promoting the planting of seedlings to replace diseased trees. The project is currently testing *Leucaena* hybrid ('PG 79') for evaluation to replace infected shade trees. Given the tremendous need to generate income for farmers and to reduce environmental degradation, USAID's coffee project provides a key foundation future activities that improve farmer incomes without cutting the remaining forests.

The University of Hawaii project is working with subsistence farmers to understand their specific constraints to food production and income generation and resource management. Information gathered through participatory rural appraisals should contribute to improving farming systems including preventing soil erosion based directly on farmers' priorities and needs. Again the aims are to improve farm income on existing lands to prevent further cutting of forests and loss of biodiversity. Additionally, USAID's small grants program supports NGOs to provide quality seeds to farmers.

### **Recommended Actions**

Recommended actions can be implemented within the two Strategic Objectives and one Special Objective proposed in the new strategy for economic growth; good governance and health, respectively. The small grants program provides a flexible and timely mechanism by which to implement conservation activities. Consideration of the environment within the existing SOs will help to strengthen them because the majority of East Timor's population depends on natural resources for food and income. Furthermore, the sound management of these resources will be an indication and mechanism for good governance. The below are proposed short to long-term actions to conserve forests and biodiversity for the new USAID strategy in East Timor. They are a range of options for consideration within the new strategy; it is not suggested that all recommendations be carried out.

Cross-cutting among all the recommendations below is the need to build capacity among Timorese counterparts (including government and NGOs) in the design and implementation of conservation and sustainable production activities. Furthermore, Peace Corps volunteers are a valuable resource who can facilitate grass roots participation in sustainable agriculture, reforestation, environmental awareness and protected areas management.

### **Recommended Short-Term Actions:**

#### ***Environmental Awareness and Education***

An immediate target of opportunity to reduce pressure on endangered wildlife is providing informational materials to expatriates, at a minimum, and the Timorese on endangered species and the prohibition of their sale and export. Some of this work is beginning with exhibits at the airport; however more could be done for example, through expatriate publications such as the local newspaper and introductory material that might be given to expatriates upon their arrival to Dili. The Directorate of Environment in MDE is working with the police on enforcement and would be a partner in such an information campaign.

Further informational materials, perhaps addressed to higher levels of leadership within the UN, diplomatic and donor communities, could explain the pollution challenges faced by East Timor through the disposal of waste oil from vehicles and diesel generators, plastic bottles and toxic components of car parts. Recommendations should be presented on how to prevent the contamination of East Timor's fragile environment and scarce water resources. Otherwise, such pollution will become an obstacle to development. A mechanism for implementation of actions supporting environmental education could be the small grants program.

Some environmental education has already begun in schools through *Lafaek* children's magazine. This magazine is in color. It is produced in Tetum and teaches children about their rights, health, civic responsibilities, environment, history and culture. The magazine comes with a teacher's guide and there is a weekly radio program. This publication is distributed to all schools, even those in remote areas. Such informational materials could be expanded to include not only information on wildlife and biodiversity but also on the sound management of land, forest and water resources. Given that over 80% of the population is currently rural, facilitating education on sound resource management will contribute to the long-term sustainable development of East Timor.

Potential partners to raise environmental awareness could be the Hironnelle Foundation and health practitioners. The Hironnelle Foundation provides support to the Public Broadcast Service (PBS), including national radio coverage and Dili's TV station. PBS develops educational programs and informational spots. Given the contacts that health clinics and practitioners have with communities, they could assist with distributing information on the environment. A direct link between environment and health is clean drinking water, yet there might be opportunities to discuss conservation as well.

Coastal environmental education programs would serve to inform industry and local citizens of the impact of their actions on the coastal and marine environment. Such programs include the identification and execution of proper sewage treatment. Proper maintenance of sea-going vessels, waste disposal, and responsible fishing practices are also important focal points and could be a part of a comprehensive education program. Parallel to education, activities such as beach cleanups conducted by citizens would reveal trends in marine debris and solid waste as well as identify sources. Participation also promotes community awareness, increased morale and community involvement.

## *Firewood*

Given that firewood collection is a major cause of deforestation, USAID could collaborate with UNDP on their firewood survey that is only partially funded. An understanding of the dynamics of firewood collection including who is collecting, what species and the market itself will be a necessary first step before any recommendations can be made on where priority areas for replanting should be or which types of species. Once this information is known, planting of trees for firewood could be added as a component of USAID's existing agricultural activities. Farmers could in turn sell the firewood. A component of any analysis should also identify potential alternatives to trees for cooking fuel such as coffee husks or coconut shells. It is also worth noting that the burning of firewood has been reported to cause respiratory discomfort in women and illness in children.

## *Energy*

A stable energy supply at the local and national level is critical for the economic growth of East Timor. The World Bank is embarking on a study of the rural energy sector. USAID could follow its progress to see what opportunities there are in a larger context of energy generation and job creation. This effort would assist biodiversity conservation because one threat to biodiversity is the lack of economic alternatives to exploitation of forests and wildlife. On the one hand, oil and natural gas from the East Timor Sea will be coming on line. How much of this will contribute to national energy generation versus foreign exchange earnings might be analyzed in the context of East Timor's ability to generate other renewable energy resources; such as solar.

Biomass energy generation is another option where in some countries, rural communities earn income by growing trees as biomass fuel. An advantage to this type of planting is that the trees themselves can remain standing and continue to grow while only branches are cut as a fuel source. A further advantage is that biomass gassifiers can be located on a small-scale in rural areas for localized energy generation without dependence on a grid and would not require the installation of transmission lines that might otherwise, cut through forests. A sustainable energy supply in rural areas is particularly important for the development of processing industries for agricultural products. Efforts addressing sustainable energy supplies in rural areas that generate jobs and income will reduce the current pressure on forests for subsistence agriculture. It could also reduce some of the pressure of hunting and poaching of wild animals by those who have no other alternative for earning cash.

Birdlife International has identified the Lake Iralalaru area as having the most pristine tropical forest in East Timor. This area also contains a variety of habitats and wildlife. Hydroelectric generation is proposed for the area. Environmentalists consider that this development will severely harm the forests, its biodiversity and local livelihoods. It is reported that there has been some analysis by the company proposing the project; however, it's not clear what has been made available to the public. A short-term action which USAID could take is, similar, to the above paragraph on energy, provide an independent cost-benefit analysis of hydroelectric generation at the site versus other forms of energy generation, such as renewable energy options. This proposed development project appears to be the most immediate and significant threat to East Timor's best area of terrestrial biodiversity; therefore, is of some urgency to consider. Moreover, from an economic point of view, one would want to consider if such remote generation of power makes sense and is the best option for the national development of East Timor. This area, if maintained in a natural state, could possibly provide significant future revenues from eco-tourism and savings in national accounts due to environmental services provided (e.g. water supply).

## **Recommended Medium- to Long-Term Actions**

### *Economic Growth through watershed management and reforestation*

Improvements in biodiversity conservation and agricultural productivity can be accomplished through sustainable natural resource management interventions in fragile land areas such as watersheds. Such interventions can include slope stabilization, reforestation and agricultural diversification. The government of East Timor and donors recognize the importance of watershed and water resources management. USAID's identification of a critical watershed for rehabilitation and conservation could act as demonstration for the government of East Timor. Working at a watershed level not only will conserve biodiversity and rehabilitate degraded lands, but also will improve water quality and quantity.

Steps in the design of such a program include: identification of a critical watershed; analysis of farmer's priorities and needs; incentives such as tenure security and micro-credit for reforestation and slope stabilization; extension services to farmers; access to good supplies of seed and livestock and links to markets. Vetiver grass is renowned for slope stabilization. Reforestation could utilize firewood species and others that have qualities for slope stabilization and water retention. Active protection of seedlings and trees from fires will be a critical component of any reforestation activity.

Such an approach would build upon existing and past USAID investments in East Timor that are already identifying farmer priorities, sustainable agricultural practices and product diversification for local and export markets. Under the existing program, a series of participatory appraisals have been conducted in the field. The results of these appraisals should be a basis for identifying the priorities and needs of farmers in implementing sound agricultural practices including reforestation and exploring agricultural and forest products with domestic and international market potential. Vanilla is an example of a high-value product that is already being promoted for income generation. Such promotion of these and an exploration of other products are recommended to continue in the new strategy.

Further environmental degradation in East Timor will exacerbate poverty as the land becomes less productive for food, water becomes scarce and contaminated and landslides destroy homes. The severity of the challenge in East Timor warrants immediate action that mobilizes people for planting and erosion control through an employment generation program. Such an approach could be developed as a part of an environmental rehabilitation work program for sustainable development. In the short-term, this will create employment. In the long-term if environmental stewardship is institutionalized and continues with incentives for conservation, there will be available a variety of tree and agricultural products for domestic and export markets. With careful market analysis, these products could also provide raw materials for the development of local industries. An additional consideration is that there are different types of lands that need to be rehabilitated; for example, those under government, private or communal control. The approach to their rehabilitation will be dependent upon the type.

Although USAID might begin such an employment program, a long-term investment will be needed for watershed rehabilitation. One option is working to raise the rehabilitation of East Timor's environment as a priority for government funding. Another option is to consider private sector investment in valuable tree species and their products for development. Care must be taken with proposals for crops such as oil palm as usually these investors search for existing forests to clear rather than the higher-cost option of rehabilitating degraded lands.

At the community and household-farm level incentives for conservation and rehabilitation could include: official recognition of customary rights and resource management; secure resource tenure; the

availability of good seeds, seedlings and livestock; and access to credit and markets. Land and resource tenure are fundamental to environmental conservation and management. More on this aspect will be discussed below under democracy and governance. Reforestation could occur with trees that could be pruned for firewood or that provide fodder for livestock. Other commercially-valuable trees should also be considered for planting and income generation. For example, MAFF is trying to produce sandalwood in agroforestry systems. Some communities will already be managing forests. An analysis should be performed of the potential products of these forests that could generate revenue. Regarding livestock as a part of sustainable agricultural systems, the coffee project is already introducing livestock in some communities. These farm animals provide not only an income but also manure for fertilizer. Pressure on forested lands for firewood collection could be reduced through the development of alternative cooking fuel sources such as coffee husks and coconut shells. Another incentive to communities for conserving watersheds could be community block grants from the small grants program.

A fairly new idea in international development and environmental conservation is the payment to communities for sound management of the environment. Such management for example, in the case of watersheds provides benefits of a steady water supply to downstream users such as urban populations and farmers who irrigate their fields. The initiation of such a payment program would depend upon whether there are any downstream users of water who would be able to provide some form of payment. In other countries, such downstream users of water are urban water authorities and irrigators. The payment is not necessarily a direct cash transfer to families, but can also take the form of communal funds managed for education or other community needs. It would be worth exploring whether there would be opportunities for payment to communities to manage the watershed that maintains water supplies to Dili residents.

Additional considerations in promoting watershed management are capacity building of government staff and NGOs to provide extension services to farmers. If it is decided to work at a watershed level, then there is the potential for conflicts regarding land uses between neighboring *sucos*. Provisions to resolve such conflicts would need to be made.

Water pollution in East Timor threatens human health and aquatic biodiversity. Pollution prevention monitoring requires periodic testing of watersheds to gauge presence/appearance of certain pollutants. Test kits contain simple, straightforward instructions for measuring basic water quality parameters (e.g. salinity, pH, etc.) that prove useful in identifying potentially destructive conditions (e.g. eutrophication, algal blooms, coral reef destruction) that threaten biodiversity. Testing can also help to identify point and non-point sources of chemical and biological contaminants (e.g. pesticides and bacteria, respectively) which cause said destruction and threaten human health. Testing is also an invaluable educational tool that can be incorporated into teacher lesson plans and provide students with an awareness of the consequences of human actions on the overall health of their particular watershed.

### ***Economic Growth through Fisheries Management and Coastal Tourism***

The extent of East Timor's fishery resources is not known. Some fishing occurs for local markets and vessels from other countries have been fishing off-shore. An inventory of aquatic and marine species and their abundance is needed to determine which species might be threatened and in need of protection. Such an inventory would also serve to identify what species may have market value and if their levels of abundance would allow commercial fishing and at what levels for sustainability.

Coastal tourism that emphasizes biodiversity conservation has the potential to generate employment and income for the Timorese while protecting coastal resources. Examples include walking and shallow-

water snorkeling tours that would educate tourists on local flora and fauna. SCUBA diving is another sub-sector that would, if properly managed, be highly successful given the diversity of coral that currently exists in the shallow waters off of East Timor. Limitations on tour group size and frequencies would need to be exercised. Small, unobtrusive campsites could be designated and plots rented to tourists. In the development of tourism, opportunities for direct community involvement and benefit-sharing should be explored.

### ***Promoting good governance through public participation in environmental policy and natural resource management***

The transition process has left some uncertainty about legislation regarding land tenure and natural resource management such as protected area management. Laws do exist from three sources: Indonesia, UNTAET and recently passed laws. In cases where new laws have not yet been passed by the new government, Indonesian or UNTAET laws are to be followed. However, it is said that the Timorese do not see these Indonesian and UNTAET laws and policies as acceptable or enforceable.

The uncertainty regarding land and property extends into forest lands and natural resources. The lack of clarity of rights and responsibilities has implications for sound environmental management. As mentioned previously, security of tenure to agricultural and forest lands can be an incentive for community conservation of these resources. Such rights and enforcement of sound management can be strengthened through the official recognition of customary law for natural resource management and conservation, *tara bandu*.

USAID/Dili has begun work on property rights in the urban area of Dili through the Land Law Program. Considering that over 80% of the population is rural and dependent upon land and forest resources for their livelihoods, it is recommended that work continue on clarifying land and property rights in rural areas with specific attention to agricultural and forested lands. The clarification of rights will also be important to avoid conflicts over land and forest resources (D'Andrea, *et al.*, 2003). Another approach, if the focus were to be on strict biodiversity conservation, would be to work with government officials and communities, in a participatory manner on the identification and delineation of protected areas.

Regarding environmental policy in general, advisors could be provided to improve capacity for policy formulation with public participation. Such a policy program could be developed to strengthen biodiversity conservation, watershed management, and sustainable agricultural practices. An overall participatory process in the development of policies related to resource tenure and environmental management such as protected area delineation is a concrete manner to demonstrate the implementation of good governance.

### ***Environment and health***

Environment and health are closely linked with respect to foods and nutrition; clean water supplies and firewood and respiratory illnesses. As the health special objective is defined, some of these links might be appropriate for integration. For example, the production of education materials on these links might be an opportunity to improve both the health and environment of communities. The promotion of sustainable agriculture and reforestation with useful products such as fruits will improve the food security and nutrition of families. Clean water supplies will depend upon reforestation, the stabilization of slopes as well as the implementation of some form of water sanitation. Finding alternatives to the use of firewood for cooking, or making cooking with firewood more efficient could reduce the incidence of respiratory illness among families.

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