

# **Assessing Environmental Needs and Priorities in East Timor: Issues and Priorities**

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## **Preface**

The project "Assessing Environmental Needs and Priorities in East Timor" is described in the Terms of Reference (Annex 1) and Contract no. PS1000419 between UNOPS and NINA-NIKU, dated 23 October 2000. This report constitutes the Issues and Priorities paper as defined in the Contract. The report is based on two periods of field work in East Timor, from 14 November to 18 December 2000, and from 19 January to 10 February 2001.

This version of the report is without photographic illustrations. A revised version of the report including relevant photos will be included in the final report from the project. The photographic and video documentation obtained during field work will be deposited at EPU and UNDP in Dili. The final report will also include the results of the ongoing analysis of satellite images of East Timor (according to Addendum B of the Contract).

I would like to thank all persons we have met in East Timor for their friendliness and support, and for all the interesting discussions we've had in villages, towns, and in the national institutions in Dili. In particular, thanks are due to the Environmental Protection Unit for their support and assistance at all times, and for all the good discussions, and to UNDP Dili for their supportive attitude and good collaboration. The members of the Advisory group are also thanked for constructive input to the project. Peter Johan Schei provided text regarding institutional set up and policies in the environmental sector, and very useful discussions, and Bjørn Kaltenborn and Jørn Thomassen provided assistance during the planning and first phase of the project.

Trondheim, February 2001

Odd Terje Sandlund  
Team leader

## **Executive summary**

### Background

East Timor is emerging as an independent state after five hundred years of colonialism and foreign occupation, when natural resources were exploited for short term profits and management practices included forced transmigration and other unsustainable policies. In addition, the post-referendum troubles in 1999 left the country with seriously damaged infrastructure and very little economic activity. It has been estimated that it will take sustained growth rates for 5-6 years before the pre-crisis income levels in East Timor are regained. In this situation, first priority has been given to reconstruction and establishment of viable political institutions. In a short-term perspective, it is important that the environmental impacts of the reconstruction activities are taken into consideration. In a longer perspective it is important that East Timor develops environmental policies to ensure sustainable management and utilisation of natural resources. To assist in the latter process, this report outlines the major environmental issues facing East Timor today, and identifies the main priorities that may need to be addressed by the East Timorese authorities, civil society, and supported by the donor community.

The report is based in information gathered during interviews, meetings, and field surveys during two periods of field work (November - December 2000, and January – February 2001), and by reviewing secondary sources.

East Timor (14,874 km<sup>2</sup>), or Timor Lorosa'e ("Timor of the rising sun"), includes the eastern end of the island of Timor, the enclave of Oecussi (2500 km<sup>2</sup>), and the islands of Atauro (144 km<sup>2</sup>) and Jaco (8 km<sup>2</sup>). The country has a quite dramatic topography, dominated by the central mountain range of Ramelau. As much as 44% of East Timor's area may have a slope of more than 40%. For the purpose of this analysis, the area of East Timor may be split into six ecosystem types: Marine and coastal zone, Arid lowland areas (the northern coast), Moist lowland areas (the southern coast), Mountainous areas, Highland plains, and Urban areas

The first Portuguese trading post in East Timor was established in 1562. Before that, however, Timor had been within the area known and visited by Chinese traders. The most attractive product from Timor for both Chinese and European trade was sandalwood (*Santalum album*). Other goods were honey and beeswax. The overexploitation of sandalwood in East Timor brought this species close to extinction by the beginning of the 1900s. The remaining stands were ransacked by the Indonesian occupants during 1975-1999. Other valuable timber species have also been seriously overexploited.

The present population is approx. 800,000 people, including the refugees still in West Timor. East Timor is an ethnically and linguistically complex society. The events after the independence referendum in 1999 caused great changes in population, settlement patterns, agricultural production, and all other economic activities. For example, approximately 70% of all houses and most infrastructure were destroyed, 75% of the entire population was displaced, and many people were killed. These circumstances have a strong bearing on environmental conditions and management issues.

Until the mid-1990s, more than 90% of the population lived in rural areas. This has been changing rapidly over the last few years, and it is believed that approx. 200,000 people now live in the capital Dili. The rural population are mainly

subsistence farmers. In spite of the long coastline, there are relatively few fishermen in East Timor. The gross domestic product (GDP) per capita was estimated at USD 304 in 1999. It is assumed that more than 50% of the population live below the poverty line of an income of USD 1 per day. It should be noted, however, that poverty in a rural-dominated, subsistence-oriented economy may not be properly understood in terms of monetary income per capita.

Based on the information gathered during this project, the following issues appear important in the future development in the environmental sector in East Timor. Although many of the issues indicated by our informants in local communities are not environmental issues in a strict sense (e.g. drinking water, access to markets), most economic or social issues in East Timor are related to environmental management issues.

#### Institutions

The institutional framework that has to be developed for handling environmental issues in East Timor, has to be closely matched to the existing challenges, cultural and socio-economic preconditions, and priorities of the people. Regardless of the institutional set up for environmental issues in government and administration, there is a need to integrate environmental consideration into all sectors and aspects of national policies. The involvement of district and local authorities and the private sector in environmental work is also essential for creating the necessary ownership to the emerging problems and solutions.

#### Environmental policies

East Timor will need to develop a national environmental policy, in order to conserve their natural resources and to obtain a pattern of development that secures improved livelihoods for all groups of the population. A national environmental policy should outline the principles which subsequently will form the basis for the national environmental legislation. A policy for sustainable development will need to include integration of environmental considerations into all economic activities, and into the policies of all ministries and departments.

In the rural areas of East Timor, the traditional socio-political structure (clan – aldeia - suco) is still quite strong, and in many areas traditional rules for management of natural resources (tara bandu) are still in active use. Traditional knowledge about local biodiversity, as exemplified through the use of e.g. traditional medicine plants, is still very strong in many areas. Policies for sustainable management need to involve local communities, and to enlist the support of these communities in the implementation of policies and enforcement of laws. This also includes respect for traditional knowledge and intellectual property rights. On the other hand, local communities are asking for national legislation to back up their efforts in enforcing responsible practices based on traditional law.

East Timor faces two types of development pressures. One stems from the immediate need for reconstruction. The other from the fact that East Timor is only now being opened up to foreign investment in sectors with great economic potential such as tourism and oil exploration. This gives high priority to development of policies regarding responsible assessment of the environmental impacts of investment projects. At the same time, policies and modern legislation regarding economic sectors such as industry, tourism, agriculture, forestry, and fisheries must integrate environmental considerations.

### Legislation

Appropriate legislation is the basis for a democratic society where the rights of citizens are respected. The human rights, gender equity, religious and political freedom, etc., has to be embedded in a country's constitution, which will also form the basis for environmental legislation.

The proximate aim of environmental legislation is to protect the environment and secure sustainable use of natural resources. The ultimate aim of these measures is to secure the livelihood, living conditions, and health of the human population of today, as well as for future generations. It is well known that if the environment is allowed to deteriorate, the poorer segments of the population are the ones to suffer. The rural poor have to cultivate the marginal or degraded lands, and the urban poor end up in the most polluted or derelict urban environments.

Legislation to protect natural habitats contributes to protect important resources for local communities. Functioning natural habitats allow local communities to harvest biomass for food (fish, fruit, berries, etc.), fuelwood, building materials, etc. In East Timor medicines and other non-timber forest products are also very important benefits from natural habitats. The socio-economic value of this is particularly important in subsistence economies. The knowledge behind this varied use is normally an integrated part of religious and cultural systems and beliefs, and forms part of people's cultural identity. Thus, environmental legislation, and in particular, legislation to protect biological diversity, protects the basis for local socio-cultural systems.

### Watershed management

The information we have obtained indicates that deforestation is a serious environmental problem in most parts of East Timor. Deforestation is one central aspect of a wider environmental problem that may be included in the term poor watershed management. Watershed management includes whole watersheds, involving many local communities from the mountains to the coast. In the steep watersheds of East Timor, improved management of the hillsides is crucial to reduce the negative environmental impacts on local communities and population groups in the steep upland areas, in the flat lowland rice-growing areas, as well as in urban areas. In short, the success or failure in integrated watershed management may influence the lives of all groups in East Timor.

Problems with availability and quality of drinking water is related to watershed management, and it is an issue in most parts of East Timor. Water quality deteriorates during the rainy season, causing diseases and increased child mortality. In Dili, water availability is poor due to the destroyed infrastructure. The problems related to irrigation water are restricted mainly to the arid parts of the country, where availability of water is strictly seasonal.

Maintenance of the natural forest cover, e.g., through establishment of protected areas, and reforestation, is but one aspect of integrated watershed management. Adoption of suitable agroforestry methods may facilitate continued and improved production in hillside areas where agriculture is maintained. Improved agricultural practices for steep terrain should also be adopted. Integrated watershed management must involve the local communities from an early planning stage, and communities must be given responsibility for the implementation of activities. Collaboration among local communities within watersheds is necessary to achieve the goals. Questions related to land tenure will obviously be important in these activities.

### Coastal zone management

The coastal zone of East Timor includes unique resources both on land and in the sea. This ecosystem is at present largely unspoilt. If utilised in a non-destructive and well-planned manner, it will provide great possibilities for economic development, while providing necessary products to sustain the coastal population. If not controlled, economic interests relating to the coastal zone, particularly oil exploration and tourism, will constitute significant threats to this unique resource.

Destruction of near-shore marine resources typically impacts the poor segments of the population. Small-scale artisanal fishermen are most dependent on fish resources close to shore. On land, uncontrolled development and unplanned area use most seriously marginalises the poorer segments of the population.

### Biodiversity and environmental status

The present knowledge of the environmental situation in East Timor is very scarce. The necessary knowledge about ecosystems, biological diversity, and effects of alien species is almost completely lacking. The institutions and legal structures that are to be developed in order to implement responsible and correct management regimes will lack the necessary basis for this task. Systematic work should be started to improve the level of information about the present situation, to form basis for a National Environmental Strategy and Action Plan. This work should take the form of a relatively long term, low volume programme, adapted to the capacity of East Timorese institutions. It should enlist the collaboration of local communities, district officers of relevant institutions, the University, and other relevant institutions.

### Public awareness and education

Awareness raising and environmental education is essential for any environmental policy. Raising the general public awareness about environmental issues may consist of three main aspects: information to the general public, development of environmental programmes for primary and secondary school curricula, and inclusion of relevant environmental concerns in programmes of higher education.

### Solid waste and pollution

Solid waste is restricted to the urban centres, particularly Dili. Solid waste was also obvious in various coastal areas (beaches) visited by tourists. In rural inland areas, this is not a significant problem at present. Pollution of soil and water is also mainly restricted to the towns. However, increased use of agrochemicals in irrigated rice production may change this situation in the near future. Highest priority in this field should be given to the solid waste problem in Dili.

This report will form the basis for a selected number of project proposals for consideration by UNTAET/ETTA, UNDP and the donor community.

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## **1. Introduction**

East Timor is emerging as an independent state after five hundred years of colonialism and foreign occupation, when natural resources were exploited for short term profits and management practices included forced transmigration and other unsustainable policies (UN 2000, [www.easttimor.com/history](http://www.easttimor.com/history)). In addition to the long term mismanagement under colonial rule and occupation, the unrest and destruction after the independence referendum in 1999 left the country with seriously damaged infrastructure and very little economic activity. In this situation, first priority has been given to reconstruction and establishment of viable political institutions. In a short-term perspective, it is important that the environmental impacts of the reconstruction activities are taken into consideration. In a longer perspective it is important that East Timor develops environmental policies to ensure sustainable management and utilisation of natural resources. To assist in the latter process, this report outlines the major environmental issues facing East Timor today, and identifies the main priorities that may need to be addressed by the East Timorese authorities, civil society, and supported by the donor community.

## **2. Methods and approach**

This report is based on information collected through interviews and meetings, field surveys, and from secondary sources (previously published data). The interviews and meetings were performed during two periods in East Timor: 14 November – 18 December 2000, and 19 January – 10 February 2001. The development of this study consists of five phases. In short these phases are:

1. Initial desk studies of secondary data;
2. Introductory fieldwork in East Timor;
3. Subsequent desk studies/analysis of primary and secondary data;
4. Follow-up fieldwork period
5. Final data analysis and writing of final reports.

The core project mandate concerns integrated environmental assessment for establishment of East Timorese environmental needs and priorities. Thus, the integrated methods utilised focus on natural resource issues. In addition to finding support in secondary sources for environmental as well as social aspects, primary data-collection methods used in the study include *direct observation* and *Participatory Environmental Appraisal* (PEA) techniques (Annex 2).

Firstly it was seen as necessary to establish useful categories for environmental resources or ecosystem types in East Timor (cf. Table 2.1 and Chapter 4.1). This was done to facilitate the process of relating social assessment results to the natural science findings of the project. The environmental categories provide an environmentally guided map for the social analysis. Most districts of East Timor have been visited, and a helicopter survey has provided an improved overview of the physical dimensions and environmental conditions. Further, interviews or casual conversations with individuals or groups of people in their natural setting, and semi-structured discussions with groups of stakeholders complement the picture obtained from direct observation. In addition, the relatively sparse literature on East Timor's environment and natural resources was reviewed where available.

A set of stakeholders was identified through discussions and consultations with UNTAET/ETTA at national and district level, and with a wide spectrum of

associations and organisations (The details are given in Annex 2). The stakeholder groups met and interviewed in the various ecosystem types during this study are summarised in Table 2.1. Based upon the background of the environmental categories and mapped social concerns, the relation between the set of stakeholders and the East Timorese environmental issues and problems may be established.

*Table 2.1 Conceptual matrix for analysing the relationship between stakeholder groups (cf. Annex 2) and ecosystem types (cf. chapter 4.1). Figures indicate number of people/groups interviewed within each stakeholder group and ecosystem.*

Stakeholders	Coastal zone	Arid lowlands	Moist lowlands	Mountainous areas	Highland plains	Urban areas
<b>Citizens</b>	28	44	21	24	6	20
<b>Chief de aldeia</b>	-	8	-	-	-	-
<b>Chief de suco</b>	2	5	-	10	2	3
<b>Zona adm.</b>	-	1	-	1	-	-
<b>District adm. (UNTAET/ETTA)</b>	8	21	5	6	6	2
<b>NGOs</b>	2	4	2	2	3	2
<b>Professional associations</b>	1	1	-	-	-	1
<b>Women's association</b>	1	2	-	5	-	2
<b>Youth association</b>	-	1	-	-	-	1

### **3. Background and knowledge status**

#### **3.1 Natural conditions: geology and climate**

East Timor, or Timor Lorosa'e ("Timor of the rising sun"), includes the eastern end of the island of Timor, the enclave of Oecussi (a.k.a. Ambeno; 2500 km<sup>2</sup>) and the islands of Atauro (144 km<sup>2</sup>) and Jaco (8 km<sup>2</sup>) (Fig. 3.1). Timor is the easternmost of the Lesser Sunda islands, positioned between 8° 17' and 10° 22'S and 123° 25' and 127° 19'E. To the north lies the Banda Sea, and to the south, the Timor Sea. The distance to Australia in the southeast is only approx. 500 km. The area of East Timor is approx. 14,874 km<sup>2</sup> (larger than Cyprus and Jamaica, but smaller than Fiji) with a total length of approx. 265 km, and a maximum width of 97 km.

Geologically, Timor is part of the Australian continental plate, and the bedrocks are mainly sedimentary calcareous rocks. This differs from most of the other islands of Indonesia, which are volcanic in origin. The variations in sea level in this area are demonstrated by the fact that fossil coral reefs are found at altitudes up to 2000 m in East Timor. The soils tend to be relatively thin, and with low water holding capacity (Carson 1989). Several mineral deposits have been

recorded. The most important at present may be the mineral oil, which is found both on land and in the Timor Sea (Brahmana & Emanuel 1996; Webb 1995).

The country has a quite dramatic topography, dominated by the central mountain range of Ramelau. The highest peak is Tata-Mai-Lau in the western end of the territory, reaching 2964 m, and several peaks reach more than 2000 m. Along most of the southern coast of the island, there is a sizeable coastal plain (20-30 km wide), whereas on the northern side the steep mountains either fall directly into the sea, or there are smaller plain areas, such as at the capital Dili. In Oecussi, the coastal plain is relatively extensive. The northern coast is also characterised by littoral terraces of coral origin. In some areas there are plateaux at 300 – 700 m above sea level. This is for instance the case at the Fuiloro plateau, which is at 500-700 m a.s.l. around Lospalos and the lake Iralalaru in the east, the plains around Maliana in the west, and the area around Baucau airport. These highland plains do, however, differ substantially in soil quality, water availability, etc. Thus, the Maliana plains is an important rice producing area. Around Lospalos the major production is cattle, although there are plans for irrigated sugarcane. At the Baucau plains, the low groundwater level provide restricted potential for agricultural production at present. (In this case we were told “There is too little water on the plains and too much down in the escarpment.”)

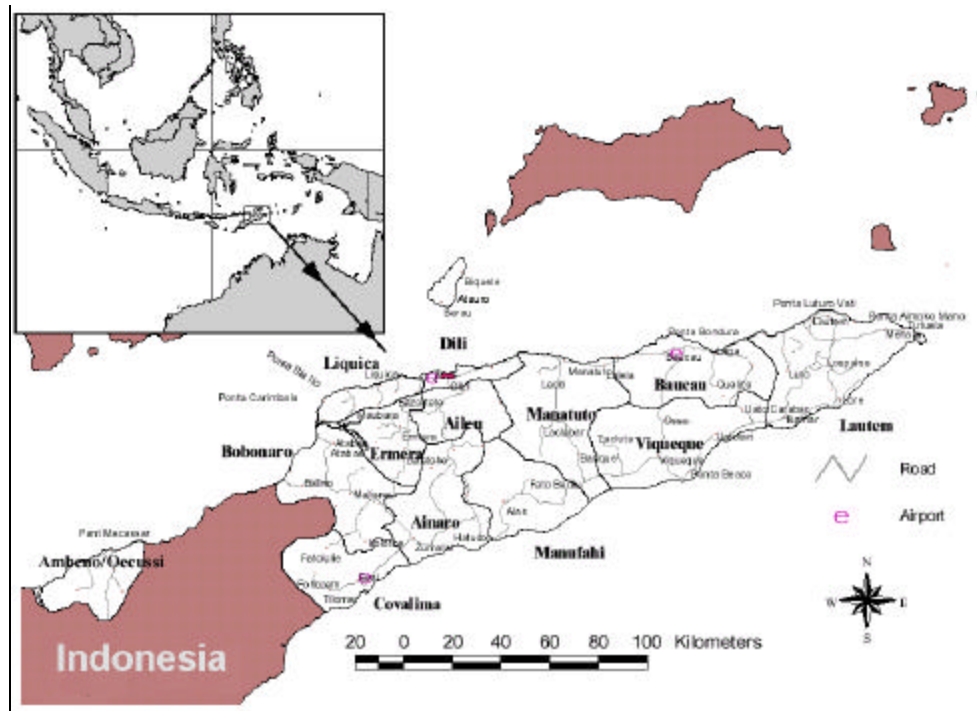


Fig. 3.1 East Timor with districts (names in bold script) and major roads.

Topography influences the weathering, depth, erodibility, infiltration and leaching of a soil. As much as 44% of East Timor's area may have a slope of more than 40%. According to Bierenbroodspot (1986) the following classification of slopes may be valid for Timor:

- Land with less than 17% slope; suitable for cultivation provided that any incipient erosion is controlled.
- Land with 17-30% slope; best used for grazing, as soil erosion cannot be controlled under permanent or shifting cultivation.
- Land with over 30% slope; unsuitable for sustainable cultivation, may require reforestation or crops providing perennial plant cover.

In many parts of East Timor, relatively steep hillsides are cultivated. According to our observations, this occurs in all parts of the country, if soils and water availability allow. The most conspicuous site visited by the team was in Lisadila, Liquica district, where the slope was close to 40 degrees. The coffee trees in the plantation had recently been slashed and maize was to be planted on the slope.

One of the most important factors affecting tropical soil fertility and structure is temperature (Mohr et al 1972). Roughly speaking, at temperatures below 20 °C, humus is allowed to accumulate, thereby enriching the soil. At temperatures above 20 °C, however, humus is decomposed more quickly than it is formed, and soil fertility remains low. In East Timor the climate may in broad terms be characterised as hot and humid tropics. It should, however, be kept in mind that humidity in East Timor varies from “permanently moist” on the South coast (9-12 months per year with more than 100 mm rain), to “permanently dry” on the northern side of the mountain range (0-4 months per year with more than 100 mm rain) (Monk et al. 1997). Mean temperatures vary with altitude. Whereas mean annual temperature in Dili (at sea level) is 27.5 °C, it is only 19.8 °C at Maubisse at 1432 m above sea level (Keefer 2000). Maximum, minimum and mean monthly temperatures may vary by only 1-3 °C. The diurnal temperature variations may be larger. The maximum diurnal variation is up to 13 °C in the south-east monsoon period (May-July), and the minimum is 7-9 °C in the north-west monsoon period (December-March).

The rainfall patterns are more variable. Based on rainfall and temperatures, the country has been roughly divided into three zones. At altitudes between 0 and 600 m along the northern coast, the climate is characterised by a mean temperature above 24 °C, annual rainfall below 1500 mm, and a dry season of five months. The mountain zone is characterised by temperatures below 24 °C, rainfall above 1500 mm and a dry season of four months. Finally, the southern coast between 0 and 600 m above sea level, the temperatures are above 24 °C, a heavier rainfall, and a dry season of three months. The annual rainfall pattern in four different localities is shown in Fig. 3.2.

An important aspect of rainfall pattern is the fact that much rain comes in torrential downpours. Maximum daily rainfall has been recorded at 275 mm in Dili, 398 mm in Lospalos, 217 mm in Suai, and 267 in Lolotoi. This means that in Dili, nearly 30% of annual mean rainfall may fall in one day. Hard torrential rain causes a high degree of surface runoff, and increased risk of soil erosion. In East Timor, the combination of steep terrain and torrential rains may cause disastrous erosion or landslides, in particular when natural vegetation has been removed. One consequence is that maintenance of irrigation systems becomes difficult and costly. Water intake dams and canals may be silted up or destroyed after every major rainfall.

### 3.2 Natural conditions: freshwater

Compared to the other islands of the archipelago, to the north and west, East Timor is unusually dry. The Ramelau mountain ridge forms a main watershed along the island. The rivers originating in the central mountain range are all relatively steep and short, with small catchment areas. The landscape relief, rock types, and the rainfall pattern cause many rivers to be efficient agents of soil erosion. This makes wise management of catchment areas a crucial factor.

There are over a hundred rivers in the country, but only few of them flow regularly throughout the year. Due to somewhat larger catchment areas and more rainfall, and to the prevailing winds, there are more perennial rivers in the south. However, the largest river system of the country, the Lóis River, is on the northern side of the mountains. It is 80 km long and discharges at Atabae. Almost nothing is known about the flora and fauna of East Timorese rivers. The perennial rivers are important sources of water for domestic use and irrigation.

The lake Iralalaru in the eastern part of the country is relatively large (22 km<sup>2</sup>), and constitutes a very interesting wetlands ecosystem of which almost nothing is known in scientific terms (Noor 1997). It was evident from the occurrence of large patches of relatively large drowned trees that lake level changes over periods of several decades. Around the lake, cultivation and cattle grazing is prominent, whereas in the hills and mountains to the North, East and South of the lake, there are large areas of relatively undisturbed forest. We were told that the lake harbours crocodiles (probably *Crocodylus porosus*, saltwater crocodile, cf. Ross 1998), and we observed a young boy spearing catfishes, probably of the Eleotrididae family (Noor 1997). We could also observe a rich bird life. Otherwise, there are relatively few and small lakes in East Timor.

The lake Iralalaru is under threat from many angles. In the Lospalos area, there are plans to utilise water from the lake in irrigation schemes, for production of, i.a., sugarcane. During Indonesian rule, there were also plans to utilise the difference in altitude between Iralalaru and sea level for hydropower purposes. Both these schemes pose a serious threat to the lake ecosystem. As so little is known about this ecosystem, quite extensive research is needed before any responsible environmental impact assessment can be carried out. Iralalaru lake is surrounded by extensive and relatively well preserved forests. In particular, the mountainous areas between the lake and the sea to the South and East appear to be of good quality. Plans have been launched to develop this area into a Biosphere Reserve. This appears to be a good idea, which also would provide access to development funds dedicated to this purpose.

Few people in East Timor have access to piped water. During the period of Indonesian rule, 48% of households had access to clean water, and only 38% to sanitation. These figures have been significantly reduced by the destruction of infrastructure during the 1999 crisis. The general availability of water in East Timor is characterised as moderate to very low (Pedersen & Arneberg 1999). Efforts to improve the water supply situation have high priority in the transitional administration (Abrantes 2001).

The two major issues concerning conservation of freshwater ecosystems and the services provided by them are pollution, and disruption of the hydrological cycle. Pollution of freshwaters in East Timor mainly comes from domestic sewage and runoff from pit latrines and agricultural land, causing serious health problems where the water is used for drinking. Agricultural runoff may cause siltation and eutrophication of lakes and estuaries, with negative consequences for the quality

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The University of California, Berkeley, is a public research university. It is one of the most prominent and oldest universities in the country. On a general note, we were in many villages told that "the UN has administration is in a state of anarchy with no law or enforcement". There were a lot of particular complaints about the UN civil police (CIVPOL) not responding to pleas for assistance from villagers, both at the town and district level. The Environmental Protection Unit (EPU) has initiated a collaboration with CIVPOL to improve this situation (Primavera 1989: 1997).

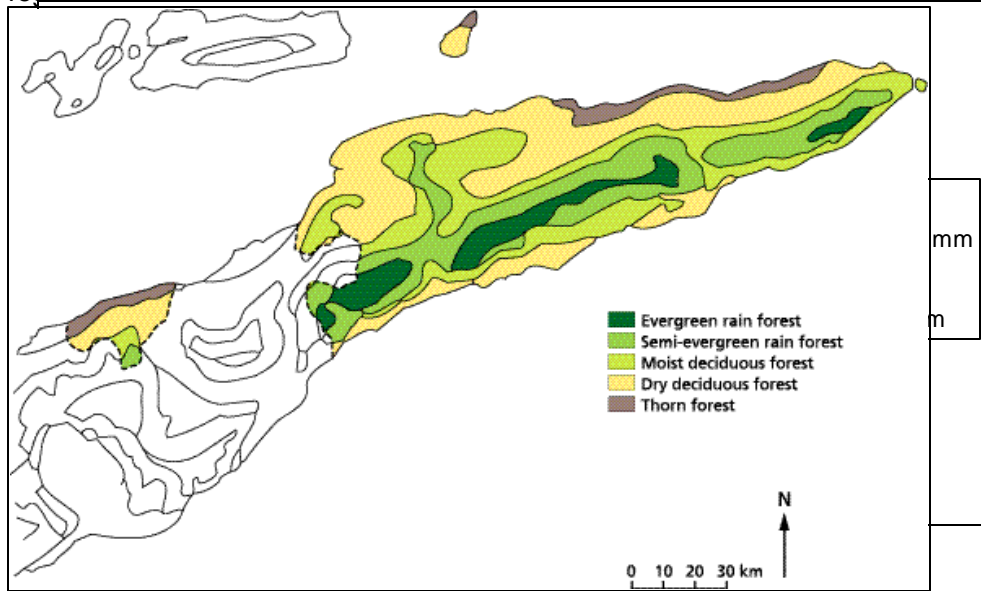


Table 3.2 A brief overview of coastal and marine environmental issues, with an evaluation of their present or potential extent and priority and type of associated action.

ISSUE	EXTENT	PRIORITY
<b>Resource harvesting issues</b>		
Overfishing inshore by artisanal fishers	low	low
Overfishing by industrial / commercial vessels offshore	unknown	investigate
Destructive fishing (dynamite, cyanide)	low ???	potential
Non-local fishers disrespecting traditional management	low now	potential
Unsustainable collection of shells and corals	occasional	moderate
Unsustainable collection of marine aquarium animals	not yet	potential
Mangrove clearance for rice fields, salt or shrimp ponds	fairly low	potential
Mangrove felling for wood	low now	monitor
Capture of sea turtles for meat or shell and taking eggs	occasional	serious
Capture of dugongs for meat	low	investigate
Capture of crocodiles for skin or meat	unknown	investigate
<b>Socio-economic and cultural issues</b>		
Disrespect by foreigners and tourists for sacred places	localised	serious
Unregulated tourism development causing land conflicts	potential	potential
Unregulated tourism causing habitat destruction	potential	moderate
<b>Pollution and waste issues</b>		
Oil and gas exploration and extraction - spillage	not yet	potential
Mineral extraction and mining entrails	not yet	potential
Soil erosion on land causing excess sedimentation	moderate	moderate
Mining of sand and gravel (beaches and river mouths)	localised	moderate
Disposal of untreated sewage, organic wastes to sea	urban	serious
Disposal of industrial pollutants and chemicals into sea	urban	investigate
Pollution by pesticides via rivers to sea	unknown	investigate
Dumping of solid wastes by ship in harbour	localised	moderate
Littering of beaches and shores with solid wastes	localised	moderate
<b>Other issues</b>		
Global warming of sea, sea level rise, coral bleaching	global	monitor
Lack of integrated coastal zone management policy	national	urgent
Lack of institutional capacity for coastal management	national	urgent

### 3.5 Observations from helicopter

We were able to survey a large part of East Timor (excluding Oecussi and Atauro) from helicopter on the 25<sup>th</sup> of November 2000 (courtesy of UNTAET MOVCON). The route travelled by helicopter is shown in Fig. 3.4. The video and photo documentation of this survey is deposited at EPU, Dili. Our observations may be summarised as follows (the numbers refer to Fig 3.4):

1. The landscape eastwards from Dili along the north coast is characterised by dry hills with sparse trees. Only the riparian vegetation along the seasonally dry streams and rivers is denser. The coastal plain is narrow except around the mouth of the larger rivers. On these floodplains the land is cultivated. In most protected bays, there is healthy mangrove forest. Inspection on the ground indicate that exploitation of the mangrove is restricted. There are long stretches of sandy beaches, with interspersed cliffs.

2. East of Ribeira de Laleia, at the western edge of the Baucau highlands, the landscape changes. The slopes from the sea up to the plains have a denser forest vegetation, although to a large extent the forest is cultivated, with coconut palm and other fruit trees. In this area there was a relatively large landslide in December 2000. The Baucau highland plain has a sparse bush/grass vegetation. Small sections on the plain are cultivated. Below Baucau town, there are small sandy beaches in between cliffs.
3. East of the Baucau highland, the wide valley of Rib. Seical is extensively cultivated. There is apparently quite extensive erosion in the steep lowland hills close to the rice fields. Further east, the hills along the coast are dry, but with a somewhat denser forest vegetation than between Dili and Rib. de Laleia river.
4. East of Lautem, the hills have quite extensive and dense forest cover from the coast and over the ridge (Monte Suloho – Monte Vassai) towards lake Iralalaru. Some patches are cultivated. Some of the cultivated lands appear to be grazing land, some are swidden patches with stone walls.
5. The area around Tutuala is mainly forested, but with extensive swidden patch systems, with various stages of secondary forest vegetation. It appears that the fallows periods are long enough to allow re-growth of quite good secondary forest. The topography is steep, and the seafront is mainly cliffs with some small sandy beaches.
6. Jaco island is covered with well developed forest. The island is considered sacred by the local population, and according to traditional rules, all access is forbidden. It appears that this was relatively well respected also by the Indonesians. There is a radio mast on the island, but we did get the impression that the forest on the island has not been exploited. The forest on the island may therefore be quite well preserved primary forest. Jaco island is relatively flat, surrounded by sandy beaches except in the south where there are some low cliffs.
7. Going along the south coast from Jaco island and Cape Cutcha, the landscape is dramatic, with mountains (Monte Paitchau) and relatively dense forest covering most of the area south and east of lake Iralalaru. There are some patches of swidden agriculture and grazing land, particularly on the slope towards the lake.
8. The water level of lake Iralalaru appears to fluctuate over long periods. We observed relatively large dead trees standing in the water. This would indicate that the area had been dry for at least 25 years to allow the trees to grow to that size on dry land.
9. The area around the lake is mostly cultivated, or characterised by secondary forest mixed with swidden fields. The villages of Poros and Mehara are situated along the road on the northern side of the lake. Swidden agriculture is prominent along the road.
10. The plain between the lake and Lospalos town is mainly grass covered, and apparently to a large extent grazing land. The plain west of Lospalos is also mainly grass covered; the forest only reappearing at the edge of the plain, where the landscape descends to lower altitudes with river valleys and steep hills. The hills are to a large extent cultivated (swidden agriculture) between the edge of the plains and the south coast at Ilomar. Several small landslides could be seen. The coastal plain is quite extensively cultivated.
11. Going inland in the direction of Baucau, the landscape is hilly, with a lush character, and a mixture of fields and forest vegetation. The fields are to a large extent terraced, and slash and burn methods seem less common. In this area, three relatively large landslides can be seen, the largest being the one between Quelicai and Bualali village. It is 13 km long, and is said to have destroyed 500 houses or buildings.

12. Between Quelecai and Baucau, the valley of Rib. Seical is the dominant landscape feature. The valley floor is extensively cultivated. From the Quelicai area towards the northern coast there is a steep humidity gradient, the vegetation changing from a lush green in the higher altitudes to a dry savannah-like character as we approach the coast.
13. The course almost due south from Baucau airport towards Viqueque town shows a variable landscape. The bush and grass covered plain around the airport is somewhat more cultivated in the southern part than in the north (see point 2 above). The highland plain ends quite abruptly and on the slope there is forest. However, there is quite extensive cultivation, and the area around Ossu town is mainly agricultural lands. There are small patches of erosion and small landslides. As we approach the coastal plain and Viqueque town, cultivated areas are smaller, mainly along rivers.
14. The coastal plain from Viqueque town and westwards is generally wide, with the hills approaching the coastline at intervals, indicating the watersheds between rivers. The hills are in some cases little cultivated, or there is swidden agriculture. The coastal plain is to a large extent cultivated, or covered by plantations. The apparently well regulated transmigration settlements from Indonesian time is a dominant feature on the plains. The rivers are numerous and mainly with very little or no water. They are all characterised by extensive transport of sediments, gravel and rocks in floods, leaving broad bands of gravel and rock "deserts" at low water levels. Close to the coastline, there appears to be a more or less narrow band of forest, and in some areas quite interesting wetlands.
15. Leaving the coast just east of Suai, we are quickly over very steep landscapes, with a mixture of cultivation and apparently secondary forest. The typical picture is a road and villages on hilltops and ridges, and cultivated land along the ridges in many very steep hillsides. Swidden agriculture seems common. Passing over Bobonaro village just west of the dramatic peak of Monte Loelaco, we were able to see quite extensive erosion in the cultivated areas, as well as natural landslide areas close to the mountain summit.
16. The Maliana plains area is extensively cultivated. The rivers bordering the plains (Rib. Bulobo and Rib. Be Bai) are characterised by the extensive sediment and gravel transport which seems typical of East Timorese rivers. There seems to be more fine sediment in these rivers than in the south coast rivers.
17. From the northern edge of the Maliana plains towards the coast the Balibo hills are characterised by swidden agriculture. Towards the coast there is a steep gradient from relatively lush green vegetation to the more arid woodland vegetation of the north coast.
18. Along the coast the landscape is similar to that around Dili (point 1 above). There is an arid type of vegetation, some patches of well developed forest and other areas denuded with only grass and bushes. There are sandy beaches with occasional rocky outcrops. At Atabae town, we turn in-country towards Ermera.
19. Upstream along Rib. Loes, where the floodplain is extensively cultivated for rice production. Following Rib. Marobo and Rib. Batuto into very steep terrain with some landslides. Also some villages on hilltops and ridges, and in some very steep hillsides there are apparently newly built farmhouses or shacks and slash and burn fields.
20. Flying through the pass north of Monte Maulo into the valley around Gleno town. The hills are to a large extent covered by coffee and shade trees. From the air, this vegetation looks much like good primary forest. From Gleno in the direction of Dili the landscape is steep, changing from coffee to other cultivation. Some areas seem very erosion prone, and some landslides are

seen. Again there is a steep gradient from quite green vegetation to the more arid landscape on the coast around Dili.

In summary, our observations from helicopter indicate that there is quite obvious soil erosion and relatively high frequency of small landslides in all areas that are hilly and cultivated. The only large landslides were seen southeast of Baucau, on both sides of the Rib. Seical. Here three large and relatively recent landslides could be seen, including the 13 km long landslide between Quelicai and Bualali. Otherwise, there are some areas with apparently good (primary?) forest, in particular at the eastern end of the island, between lake Iralalaru and the coast, and secondary forest in various stages is a prominent feature over most of the country. Swidden agriculture is also a prominent feature. Although the actual role of this practice in the problem of soil erosion is unknown, it appears reasonable that slash and burn with short fallow periods in steep terrain is important.

The vegetation on the north coast looks much less lush than in the mountains and on the south coast. This is obviously a result of the arid climate, but it also raises the question of what the natural vegetation on the arid hills would look like without the influence of humans through fuelwood collection, logging and animal grazing. It is a fact that the hills around Dili have been denuded for a very long time, as described by Wallace (1890) during his travels in 1861.

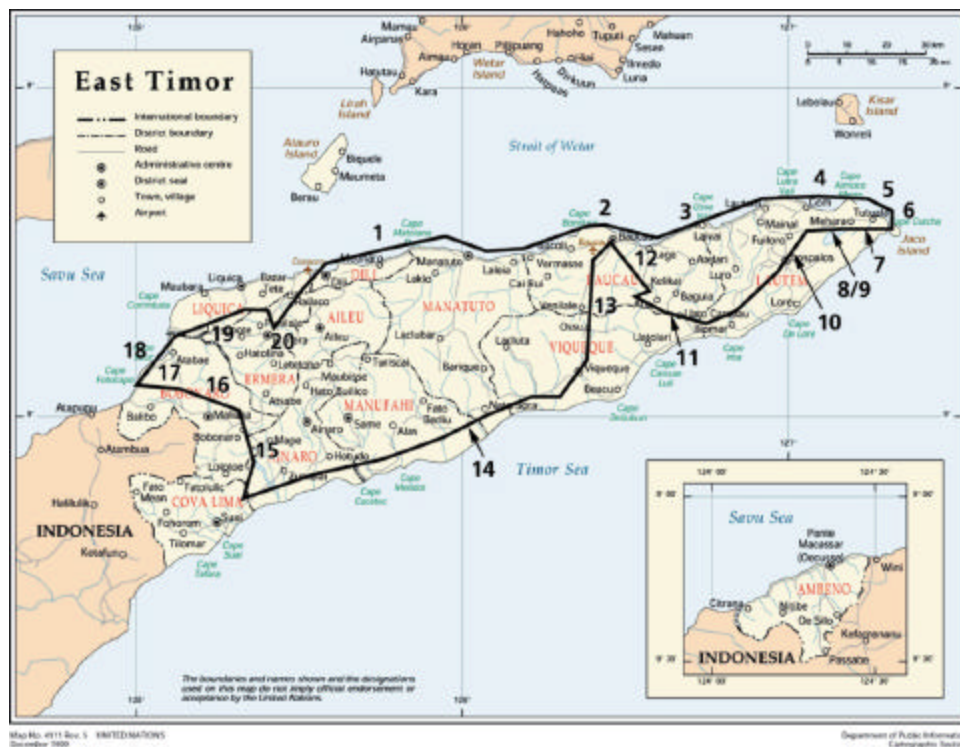


Fig. 3.4 Route travelled by helicopter during the aerial survey 25 November 2000. The figures refer to the text in chapter 3.5.

### 3.6 Social and economic aspects

As described above, the environment of East Timor is highly diverse; in terms of geology, topography, climate, as well as terrestrial and aquatic flora and fauna. Obviously man has affected the East Timor environment, but it is equally true that

most resource uses are curtailed by and adapted to the island's natural conditions (Fox 1988). The differences in practises and livelihoods found throughout East Timor reflect these varying natural conditions in highly specialised systems for resource use. Although Timorese societies throughout the island share many common features of social and political organisation, variations at the ethno-geographic level and local adaptations make for significant variations in social and economic patterns of development.

To a large extent, the available information on socio-economic factors in East Timor is outdated. The tumultuous and tragic events after the independence referendum in 1999 caused great changes in population, settlement patterns, agricultural production, and all other economic activities. To illustrate the destruction, it may suffice to mention that approximately 70% of all houses and most infrastructure were destroyed, and that 75% of the entire population was displaced (UN 2000). Many people were killed, and many are still held in camps in West Timor. These circumstances have a strong bearing on environmental conditions and management problems. The traumatic events are also clearly very prominent in peoples' memory.

The present population is assumed to be approximately 800,000 people, including the refugees still in West Timor. Before the troubles in 1999, the East Timorese, of 12 different ethnic groups, constituted 78%, whereas 2% were of Chinese, and 20% of Indonesian origin (UN 2000, [www.easttimor.com/history/history.html](http://www.easttimor.com/history/history.html)). The ethnic complexity is reflected in the linguistic complexity, as each group has its own language. However, Tetum is now spoken by approximately 60% of the population. Many also speak Portuguese and/or Bahasa Indonesia. It has been decided by ETTA that Portuguese should be the common language in addition to Tetum.

Until the mid-1990s, more than 90% of the population lived in rural areas (UN 2000). This has been changing rapidly over the last few years, but more updated figures are not available. However, there is now a rapid urbanisation, with people moving to towns, mainly Dili. In 1998 it was assumed that 75% of the workforce was employed in agriculture, mainly at subsistence level.

As a small island state, East Timor has a long coastline relative to surface area. In spite of this, there are relatively few fishermen in East Timor. In 1997 there were 9000 fishermen, but less than 50% were fulltime (Pedersen & Arneberg 1999). Somewhat exaggerated, it is said that the only fulltime fishermen are found in Atauro island. In 1997, there were 995 outrigger dugout canoes, 402 small boats of other types, and 630 boats with outboard engines. Most engines and many boats were destroyed in 1999, and most fishermen we talked to listed lack of equipment as their main problem. In 2000-2001, there was some very few somewhat larger fishing boats with inboard engines, in the Dili-Atauro area.

East Timor was a poor country before the troubles and destruction related to the referendum in 1999, but it has been estimated that it will take sustained growth rates for 5-6 years before the pre-crisis income levels are regained. Luckily, according to FAO (1999), destruction of agricultural crops was not as severe as first feared. On the Maliana plains, however, we were told that due to the lack of seeds and draught animals, large stretches of cultivated land had still not been planted in late 2000 (Sharafat Nazir, pers. comm.). Similarly, farmers that we talked to in various parts of the country said they could have increased production if they had better access to seeds and buffaloes. The gross domestic product (GDP) per capita was estimated at USD 375 in 1998, and USD 304 in

1999. It is assumed that more than 50% of the population live below the poverty line of an income of USD 1 per day. In this context it may, however, be important to remember that poverty in a rural-dominated, subsistence-oriented economy may not be properly understood in terms of monetary income per capita (cf. UN 2000).

According to the UN Common Country Assessment for East Timor (UN 2000), the problems facing East Timor have structural causes that reach beyond the crisis in 1999. These include:

- The dualistic nature of the economy, with a commercial or “modern” sector, dominated by non-Timorese, and a rural, subsistence-oriented agricultural economy.
- Environmental damage.
- Confusion regarding land and property rights.
- The poor quality of roads, and marketing and transportation systems.
- The marginalised and unequal position of women.

The area of land suitable for agriculture in East Timor has been estimated at approximately 4,500 – 6,000 km<sup>2</sup>. This area consists of 50% lowland coastal areas, and 50% flat to undulating uplands and river valleys. It should be kept in mind that in subsistence or semi-subsistence economies as found in the rural areas of East Timor, 25-90% of the real income of people is non-cash income derived from local plant and animal resources (Thaman 1994). Maintaining this resource base therefore particularly supports the poorest segments of society.

### 3.6 History of resource use

Timor has been populated by humans since the time of *Homo erectus* approximately 1 mill years ago (Rowland 1992). *Homo sapiens* probably arrived from the west about 40,000 years ago. The hunter-gatherer societies adopted agricultural practices from 8,000 to 2,000 years before present (BP) (Bellwood 1980, Glover 1986). The first cultivated plants were rice (*Oryza sativa*), millet (*Setaria italica*), yams (*Dioscorea* spp.), taro (*Colocasia esculenta*), and sugarcane (*Saccharum* spp.), and the first domestic animals were dogs, pigs and chickens (Bellwood 1980). Breadfruit (*Artocarpus artilis*) and banana (*Musa* spp.) were introduced about 3,500 years BP. Approximately 6,000 years BP, Papuan peoples from the north invaded Timor and brought several animal species that are now considered part of the natural fauna, such as deer, civet, cuscus and shrews (Bellwood 1991). Consequently, the natural ecosystems of East Timor have been to some extent influenced by humans for a million years, although the significant impacts on vegetation cover probably only came with agriculture 8,000-2,000 years BP.

The first Portuguese trading post was established in 1562. Before that, however, Timor had been within the area known and visited by Chinese traders. Chinese descriptions from the fourteenth century stress the abundance of sandalwood (Rockhill 1915). This resource is also noted repeatedly in the first European descriptions of the area (reviewed in Fox 1988). The more efficient commercial exploitation of resources started in the 1700s, after the first Portuguese Governor was installed in East Timor in 1701. The most attractive product from Timor for both Chinese and European trade was sandalwood (*Santalum album*). Other goods were honey and beeswax. The overexploitation of sandalwood in East Timor brought this species close to extinction. In 1926, the Portuguese authorities prohibited trade in sandalwood (Fig. 3.5). Some illegal harvesting and

trade probably continued, and during Indonesian occupation most of the remaining stands were extracted (Saldanha 1994; Gomes 1998). In particular, the remaining sandalwood stands in Oecussi were devastated (Mario Carrascalao, pers. comm.). The official Indonesian statistics are confusing, and probably not reliable. However, from the statistics for East Timor during 1991-1997, it appears that at least around 150 metric tons may have been exported in some years (BPS 1998). This corresponds to the amount exported around 1920 (Fig. 3.5).

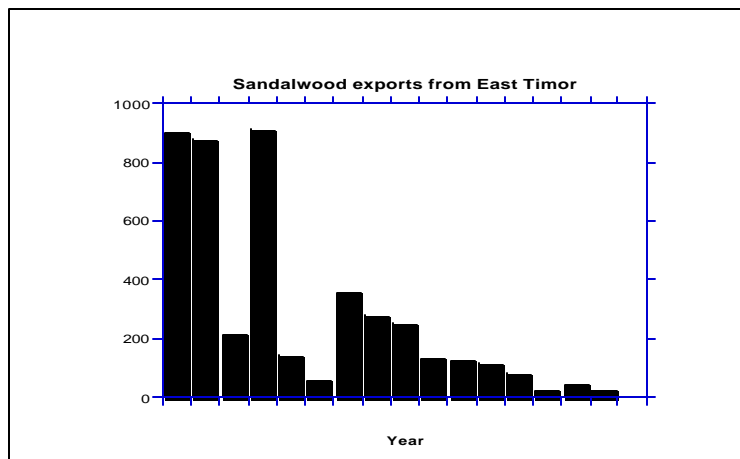


Fig. 3.5 Exported quantity of sandalwood (*Santalum album*) from East Timor 1910 – 1926. Data from Cinatti (1950). The actual export quantity is probably larger.

It appears that the natural forest around Dili and other towns may have been heavily influenced by over-utilisation for a long time. Wallace (1890) travelled inland from Dili in 1861 and describes denuded hills. However, two aspects during the last few years have aggravated the situation concerning forest cover around the urban centres. Firstly, the population increase has increased the need for fuelwood in the cities and towns. Secondly, the removal of subsidies on kerosene oil (with the withdrawal of Indonesian administration) has dramatically changed the price of fuel for cooking in favour of wood. Although no exact data are available, it appears presently to be a serious over-harvesting of fuelwood around Dili as well as other urban centres.

#### 4. Environment and people

The Participatory Environmental Appraisal approach (Chapter 2; and Annex 2) is based on a matrix with two sets of data. Firstly, the areas should be classified according to various ecosystem criteria, obtained by own observations and from secondary sources. Below, these classes are called ecosystem types. Secondly, information should be obtained from all stakeholders living in these ecosystems, as well as from secondary data sources.

#### 4.1 Ecosystems of East Timor

For the purpose of this analysis, the area of East Timor may be split into six ecosystem types:

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

The **marine and coastal zone** consists of the shallow seas close to land, with coral reefs and other valuable marine ecosystems, specialised coastal vegetation like mangroves, and land areas close to the sea where the population obtain important resources for subsistence and income from the resources in the sea. The marine fisheries are also important for the coastal zone population, and the marine ecosystems are therefore included here.

The **arid lowland areas** may roughly correspond to the climatic zone constituted by altitudes between 0 and 600 m along the northern coast, where the mean temperature is above 24 °C, annual rainfall is below 1500 mm, and the dry season lasts five months. Vegetation is to large extent reduced from the original deciduous forest to cultivated land, savanna-like grasslands, badlands or secondary forests. The flat coastal plains are narrow, and a large proportion of this zone is steep hillsides.

The **moist lowland areas** may roughly correspond to the climatic zone along the southern coast at altitudes between 0 and 600 m, where the temperatures are above 24 °C, there is a heavier rainfall, and the dry season lasts three months. The original vegetation was mainly moist deciduous forest, semi-evergreen forests or rain forests. Human activities have changed this zone into cultivated lands, plantations, secondary vegetation, and some badlands. On the southern coast, the coastal plain is quite wide, but this ecosystem also includes steep hillsides.

Mostly, the **mountainous areas** are characterised by very steep terrain, at altitudes above 600 m. Temperatures are below 24 °C, rainfall above 1500 mm and the dry season lasts four months. Vegetation was originally rainforest, semi-evergreen forest or moist deciduous forest. In this region we find the major part of primary forest left in East Timor, but generally large tracts of even very steep slopes have been cultivated. Partly as a consequence, this is where we find the major part of the frequent landslides presently experienced every rainy season.

The **highland plains** lie mostly between 300 and 700 m above sea level, and are presently dominated by agricultural land. The highland plains in East Timor differ significantly in soil types and availability of water. Large parts of the Maliana plains are cultivated for irrigated rice production, and will in normal years constitute an important part of the “bread basket” of East Timor (Sharfat Nazir, pers. comm.). The plains around Lospalos, on the other hand, are mainly used for grazing. The soil types cause the area to be swampy in the rainy season, whereas in the dry season the clayey soils dry out and crack up. The plains around Baucau airport are generally drier and less cultivated. The ground water level is low, so that while people in the escarpment (Baucau town and towards

the sea) have an abundance of water all year round, people on the plains have to dig deep wells to access water during the dry season.

The **urban areas** in East Timor are small, but face specific environmental problems, while also influencing the environmental situation in their surrounding countryside.

It may be important to point out that these ecosystem types of East Timor are interconnected. The soil erosion, landslides, and ensuing problems for farmers and communities in the higher altitudes lead to increased particle transport in the rivers; the soils are moved downstream. These sediments cause siltation of irrigation channels and destruction of related infrastructure in lowland areas. Removal of forest vegetation in the upper parts of watersheds increases the frequency and size of flash floods. Thus, poor, or ill-informed management in the upper watersheds harm the livelihoods and property of people in the lower watersheds. Environmental management thus needs to take a landscape approach, seeing the various elements of the landscape in relation to each other.

Similarly, the socio-cultural, economic and political conditions in the various ecosystems are interconnected. Poverty and poor livelihoods in the rural areas are the major factors behind the migration of people to town. The high influx of people to town cause social and environmental problems in towns. This is indeed demonstrated by the comments we received in local communities in East Timor. In villages, community leaders were concerned that the youth migrate to Dili looking for jobs, but “ending up unemployed and becoming involved in crime, etc.”. In Dili, however, local leaders were very concerned that the high influx of people created housing problems, crime and social unrest in the urban neighbourhoods. Conserving the natural resources and creating sustainable livelihoods in the rural areas is consequently one of the most important aspects of poverty alleviation in East Timor.

## 4.2 Environmental issues

### 4.2.1 Background

The population in East Timor live in different ecosystem types, facing varying natural and man-made conditions. In the rural area, we might have expected that some of the environmental issues raised by people in our meetings and discussions would vary in a major way with their natural environment. However, it turned out that many of the major issues and problems to a large extent were repeated from village to village. Some problems were also shared by the urban groups. The issues raised are summarised in Table 4.1 and chapter 4.2.5.

### 4.2.2 Issues and problems perceived by the rural population

#### Water quality and availability

The interviews revealed some general aspects regarding living conditions. In both rural and urban areas, a general problem is access to sufficient drinking water of good quality. In most cases, people depend on surface water or water sources that are heavily influenced by surface water, and water quality is normally particularly poor in the rainy season. Infant mortality and morbidity in East Timor is among the highest in the world. This is to a large extent due to water-borne and water-related diseases, caused by poor drinking water quality. These problems may be reduced by boiling the drinking water, and in some areas, e.g., Oecussi, people claimed to routinely do this. However, this increase the need for fuelwood, and exacerbates the deforestation problems (see below), particularly around towns.

Access to water is obviously more difficult in the dry season. This usually increases the workload of women, as fetching water is normally the task of women and children. In some cases, e.g. in suco Lisadila in Liquica district, and Sulamali in Covalima district, men claimed to take equal part in the work of fetching water. However, these are probably exceptions. In some areas, e.g. in Nunturi village (also in Liquica), we observed a fairly advanced water supply system based on piping made from bamboo. This is obviously feasible in hilly terrain, when surface water sources (streams, etc.) are situated at higher altitudes and not too remote from villages, so that no pumping of the water is required. We were told, however, that this system needs continuous maintenance.

#### Agricultural production

The second issue mentioned by many people in rural areas is the problems related to subsistence agriculture. In many cases, farmers said they would be able to produce more, but that there was no market outlet for surplus production. An issue mentioned in many districts is the problem of transport to markets and the low purchasing power of people even when products do reach the markets. In areas with more modernised agricultural production, the present problems regarding production are to a large extent related to the 1999 troubles. The militia actively stole or killed draught animals, and seed stores were burnt down. Thus, there is a serious lack of seeds and draught animals, so that the previously cultivated areas of relatively good soil quality are not properly utilised. This was for example the case around Maliana.

Difficulties regarding access to markets were also mentioned by interviewed fishers in areas distant from Dili. For both fishers and farmers, the lack of cash income makes it difficult to invest in improved equipment to increase yield or catch.

Farmers in the Bobonaro district also pointed out that some donor activities hampered the development of a functioning local economy. In a situation with almost complete subsistence agriculture, but with relatively good potential for a production increase, the "Food for Work" programme of WFP makes people more dependent on aid. If the labourers (farmers) were paid in money, they would be able to invest in seeds, fertilisers and tools to increase their agricultural output and become economically self-sustained. Monetary income would also enable them to become customers in the local market. Free provision of imported food consequently undermines local markets.

#### Deforestation, soil erosion and landslides

The third issue mentioned by many rural informants in most districts is the damage caused by torrential rains and flash floods. In upland areas this causes soil erosion in the form of surface erosion and landslides, and in lowland areas disaster floods in rivers, which destroy fields and property. In many cases the informants related this problem to deforestation in the steep hillsides, although in other instances, removal of forest was not perceived as a problem by the interviewees. In some cases, e.g. in Samalari (Baucau district) and Carabau (Bobonaro district), people seemed reluctant to take preventive action by planting trees to reduce landslide risk and soil erosion, in spite of an apparent perception of the potential value of such work. In other cases, e.g. in Bobonaro village, we were asked "is there a connection between slash-and-burn agriculture and landslides?", indicating an emerging awareness.

In some areas, the transport problems related to bringing produce to markets are related to the fact that roads are damaged by landslides. Tree planting along roads as a means to reduce erosion risk and road maintenance costs, was appreciated by the people we met in Aileu. Appropriate tree planting programmes and conservation of roadside vegetation may significantly reduce road maintenance costs in East Timor (Michael A. Ross, pers. comm.).

“Slash and burn”, or swidden agriculture is a system widely used in many areas of East Timor, and is possibly at present the most widespread agricultural production system. The main characteristic of the system is the rotation of fields in a cycle of cropping and fallowing. The soil normally shows decreasing fertility over the cropping period, but soil fertility is subsequently restored through vegetative regrowth over the fallow period. Lately, swidden agriculture has also been recognised as a weed control strategy. In many places the tilling period is determined by weed susceptibility rather than loss of soil fertility.

The major types of shifting cultivation found in East Timor may be classified as follows (Watters 1960):

1. Dependence mainly on shifting cultivation, although indulging in some hunting, fishing and gathering.
2. Predominantly pastoralists, but also practising some shifting cultivation.
3. Dependence mainly on shifting cultivation with some pastoralism.
4. Dependence mainly on shifting cultivation but with some form of permanent cultivation.
5. Some shifting cultivation, some permanent cultivation and also some pastoralism.
6. Dependence mainly on permanent agriculture with some shifting cultivation.

The systems adopted locally depend to a great extent on the climatic and topological conditions of the area as well as market conditions. The local systems are often remarkably complex, involving several supplementing activities as indicated in the above classification. For example, it is not uncommon for the irrigated rice producers on the Maliana plain to cultivate corn simultaneously or sequentially on swidden fields in the hillsides. Likewise, in cattle dominated areas as Oe-cussi, swidden cultivation and home-gardening is prevalent. In these systems the cattle is used also as draught animals in the agricultural lands. In the central highlands and mountainous areas of Ermera and Liquica, coffee production for cash is combined with both pastoralism, irrigated rice production, as well as non-irrigated production of food crops. Coffee and other cash crops, such as vanilla, might even alternate with food crop production on the same piece of land.

Slash-and-burn agriculture is rational and sustainable in areas where population densities are low, and fallow periods are sufficiently long for the vegetation to rejuvenate itself. This appeared to be the case in the areas we observed, for instance in Tutuala in Lautem district and in Beilaku in Covalima district, where stone walled fields and well-developed secondary vegetation in the fallow fields indicated a well functioning rotation system. The system may, however, become nonviable in cases where population densities increase. Expansion of swidden agriculture into primary forest or forest habitats crucial for threatened flora and fauna should be avoided by conservation measures in collaboration with local people. In some areas, our informants both at suco, zona, and district level indicated that the system of swidden agriculture was considered a problem in relation to soil erosion. This was also pointed out at the national level by the CNRT agricultural coordinator (Jose Abel, pers. comm.).

However, the process of getting the shifting cultivators to change their practices may be quite problematic, and each case should be carefully evaluated. Swidden cultivation is based on the temporary removal of trees, but not complete removal of the forest. To understand the relation between swidden cultivation and deforestation, we need to understand the succession of secondary vegetation and recognise the positive and negative implications of swidden agriculture on biodiversity, watershed hydrology, etc. It also relates to alternative uses of (forest) resources and alternative sources of livelihood for vulnerable populations. One of the main results from the ICRAF system-wide program of *Alternatives to Slash-and-Burn* (ASB) is that the environmental benefits of the 'best bet' practices will not be achieved unless appropriate socio-economic incentives, policy interventions and institutional frameworks are in place to facilitate adoption by farmers (van Noorwijk et al. 1998) It is likely that farmers will need several 'best bet' options in a mosaic to enable them to meet household food and cash needs, deal effectively with climate and market risks, and have a positive impact on environmental outcomes. That is, options need to feature similarities to the customary systems as described in the above classification.

The increased dependence on fuelwood for cooking was mentioned on several occasions. The reason for this change is that the subsidies for kerosene has been removed after 1999. Even in rural areas this may lead to over-utilisation of forest resources. This problem becomes more serious around the major towns, however (see chapter 4.2.2. below).

In coffee areas, in e.g. Ermera, Dili and Liquica districts, the combination of coffee plants and their shade trees on relatively steep hillsides appear to be a beneficial form of agroforestry, reducing soil erosion. However, in many cases we were told that soil erosion may be quite significant also in coffee plantations. Thus, further development of the agroforestry techniques used in coffee plantations may be feasible. In general, there is a need to develop appropriate agroforestry techniques for East Timorese conditions.

In some cases, we were informed that during Portuguese times, tree planting was required by law as an element in any forestry activity. On the other hand it was said that, during Indonesian occupation "it was only a question of exploitation". However, in some areas reforestation were performed by local communities during Indonesian times, e.g., as described to us by the environmental group we met with in Aileu. In this case, planting of trees along roadsides to prevent road erosion was an important element in the organised reforestation work, and the motivation to resume activities based on, i.a., community nurseries appeared to be good. We also heard complaints that the present lack of law enforcement allows people to log the protective forest, although this is prohibited in the UNTAET Regulation no. 17/2000. It was also said that FALENTIL personnel were involved in this illegal activity.

#### Social issues

In rural areas, the lack of jobs and income opportunities for young people was repeatedly mentioned as an important social problem. Our informants expressed serious concern that the young migrate to towns, mainly Dili, to face unemployment and related social problems. This was pointed out in several villages in many districts. Another impact of this migration is that the villages are drained of labour, reducing the capacity to plant and harvest.

### Traditional law

In most rural areas, traditional law still had significant relevance for natural resources management. The traditional system of “tara bandu” is in active use. In suco Basar Tete (Liquica) we were told that the tara bandu system had been re-installed in 1998. They were satisfied that this system now had the support of CNRT and UNTAET. However, in many cases the lack of backup and support from the transitional administration in conflicts stemming from enforcement of rules, was pointed out as a problem.

### Land tenure

Conflicts over land tenure were not often mentioned as important problems by our informants. However, in some areas, conflict over land between sucos or villages were indicated (e.g. in Maliana, and in Liquica district). In zona Maubara (Liquica), conflicts between sucos over the right to cultivate land or over grazing right were said to be common, in spite of the tara bandu system being in use in all the sucos. Our impression based on information from local communities as well as from district or national authorities is that the potential for land tenure conflicts may be most serious in areas in transition between traditional systems (often based on some form of collective ownership) and “modern” systems (based on individual ownership). The question of the possible property rights claimed by Indonesians or other groups that left the country in 1999 will further complicate this picture.

Another type of land use conflict was indicated by our informants in Liquica. In some areas hunters use fire to catch deer and wild (feral) pigs. These fires frequently get out of control and destroy bush and forest.

### Traditional use of resources

In most areas, the forests are extensively used as a source of non-timber forest products. In Quelecai (Baucau district) people claimed that they utilised 50% of the forest plant species in traditional medicine or similar uses. In all areas where natural vegetation is still to some extent intact, we were informed that the forests are extensively used for collection of medicinal plants. This indicates that local community knowledge about the occurrence and abundance of many groups of plants may be very extensive. In some cases, people said that it became increasingly difficult to find the medicinal plants. This probably indicates that the extent of the vegetation types containing the attractive species is reduced rather than the medicinal species themselves being overharvested. In Sulamali, Covalima district, people said that the best availability of plants for medicinal use was in patches of primary forest.

### Pollution

In rural areas, pollution was not a prominent theme in our discussions. In Aileu, however, it was pointed out that the Indonesians used “Agent Orange” in Lequidoe. Our informants suspected that the soil had been polluted on that locality. If correct, this may mean that there is dioxin pollution of soil and water. Considering the potential serious health effects of dioxin, it is advisable to analyse some soil and water samples from the locality to establish the facts in this matter.

Pollution related to use of agrochemicals was not considered a serious problem at present. Due to the lack of economic capacity in East Timor’s rural communities, very little is used in terms of chemical fertilisers or pesticides. In coffee production, many informants said that chemical fertilisers destroyed the taste of the coffee. In fact, there is a conscientious policy to market East

Timorese coffee as ecologically grown without the use of agrochemicals. When production of irrigated rice has reached previous levels, it will be important to ensure correct and controlled use of fertilisers and pesticides.

#### **4.2.2 Problems perceived by the urban population**

*"If you start a new nation with all this garbage, what's it gonna end up with?"  
(OMT representative)*

##### Urbanisation in East Timor

The towns in East Timor are relatively small. The capital Dili, however, has been growing quickly in the last decade. According to Indonesian censuses (BPS 1998), the population of Dili district increased from 139,875 in 1992 to 174,200 in 1997, i.e. an increase of 24.5% over five years. A large part of the population left during the troubles in 1999, but most indications are that the population today may be close to 200,000. Zona and suco chiefs we met in Dili maintained that many social and economic problems stem from the increasing number of people coming from rural areas. It may be noted that people we met in rural areas were concerned that the youth left for Dili and other towns, where they were expected to end up as unemployed with social problems. In 1997, Baucau district, including Baucau town, had 96,800 people, whereas Lautem district with Lospalos town had 51,900 people. Whereas the population in Dili district increased by approximately 12,000 people from 1996 to 1997, seven of the thirteen districts showed a decrease in population numbers over the same period.

##### Water and sanitation

The population growth together with the destroyed infrastructure (e.g., houses and water and sanitation systems) since the 1999 unrest create large problems for authorities and citizens. The available public water is of poor quality, and in some parts of town there is no public water available at all. People appeared to prefer availability over quality. An important reason for the poor sanitation and water quality is the fact that the piping systems are not in a condition to keep water supply, sewage and surface waters separate. There are relatively large projects underway to repair and improve the water and sanitation system, but people express impatience with the authorities (i.e. UNTAET). A comment we heard repeatedly was "They have been talking about it for a long time, but nothing happens".

##### Fuelwood and deforestation

Issues related to fuel for cooking was mentioned by several informants in towns. The removal of subsidies for kerosene has made this type of fuel too expensive for most families. Presently, fuelwood is significantly cheaper than kerosene, although prices are rising quickly. Prices quoted to us in Dili indicated that one bunch of wood sufficient to cook an "ordinary lunch" costs 2000 rupiah, whereas one litre of kerosene (which is not sufficient to cook the same meal) costs 4500 rupiah. The demand for wood for cooking may cause a serious deforestation problem around the urban centres.

##### Solid waste management

The lack of a solid waste management system is evident in Dili. There are piles of garbage along many streets and on abandoned lots. Occasionally the piles of mixed garbage are put on fire, pestering the air. Much of the garbage ends up in the open channels or creeks leading through town. When the rains start, the floodwaters transport the garbage towards the beach. The chefe de aldeia

Oriente, which is on the beach in zona Cristo Rei, said “the whole town’s garbage ends up on our beach”.

The apparently most dramatic situation is at the Dili market. In the roundabout at the entrance to market, garbage is piled up and burnt, with goats or other animals rummaging around in the burning and smouldering pile. At the other end of the market, there is a large abandoned plot, where a major proportion of the garbage is slaughterhouse waste. Market traders at the front of the market said that the only way to get rid of garbage was to throw it out on the roundabout. However, people inside the market area said that they paid a person to collect their garbage every day. The collected garbage was transported to a specified site outside the market, where it was collected by truck every week. There is some doubt whether this system actually works at present, and it seems evident that a large portion of the market garbage is just left on any available open space.

Most people we met with in Dili wanted a garbage collection system. It must, however, be accompanied by an awareness campaign, and it must probably be paid indirectly (from tax incomes) or by donors. At present, there is probably little motivation among ordinary citizens to pay a direct garbage fee, even in Dili.

During the Indonesian occupation, there was a garbage collection system in Dili, operated by the City Council. Thus, it was free of charge, although restaurants and shops evidently had to pay a fee. During the Portuguese colonial time, there was a garbage collection system for the city centre.

In the smaller towns, the situation is probably somewhat different. In Lospalos, it was stressed by the CNRT representative that people did not really see the problem with garbage. In Oecussi, it was claimed that 98% of the garbage brought to the garbage dump was from expatriates, and that ordinary citizens did not see the problem with littering. This may of course be related to the fact that in the small towns, the amount of solid waste is too small to create direct problems for people.

In Dili, the present garbage dump is in Tibar west of town, and seems to function relatively well. A collection system for Dili town could probably be quite easily established (Anonymous 2000). However, in the medium to long term, the capacity of the dump has to be analysed. The effect on groundwater etc is unknown, but we were informed by people in the vicinity that oil and other dangerous waste is dumped at the site. The garbage dump is a neighbourhood problem because children are not kept away from the dump, and adults are allowed to sift through the garbage. In Baucau, there is a relatively large garbage dump close to the airport. The capacity appears good, but the actual feasibility of the site with regards to, e.g., pollution of groundwater, etc., is not known.

#### Pollution

Industrial pollution is probably quite restricted and localised. Pollution of soils from oil and other chemicals is not known. Local leaders in Dili pointed out that they had no way of knowing the extent of this problem, as information about possible cases had never been provided to them, neither from the authorities nor from industry itself.

It was repeatedly pointed out that car traffic during the recent years has become so dense that air pollution from cars is a significant problem in Dili. The fact that car maintenance is not up to standard contributes to this. It would also seem probable that the density of cars leads to quite significant amounts of oils and

lubricants being dumped in places where they pollute soil, surface water or groundwater.

In several places, the Peace Keeping Forces (PKF) or UNTAET perform fumigation against mosquitoes. We have not been able to ascertain which active ingredient is used in the fumigation programmes. However, in Lospalos a former chefe de suco informed us that the fumigation against mosquitoes performed by the local PKF (Korean forces) had the opposite effect of what was the intent. By fumigation being done in the streets, the mosquitoes were chased into houses, increasing the risk of people being bitten. This effect was also observed in the barracks at UNTAET headquarters in Dili. During the first days after fumigation outside on the compound, the number of mosquitoes inside the barracks showed a remarkable increase.

#### **4.2.3 Problems perceived at district and national level**

##### Watershed management

In Baucau district, the District Administrator, Mr. Marito Reis emphasised the problems emerging during the rainy season. For example, the rains cause landslides that destroy agricultural lands, roads, and other infrastructure. The floods bring large amounts of sediments, which deposit on lowland agricultural land, silting up fields and irrigation systems. The flash floods also destroy intake structures for irrigation systems. During the rainy season, it is impossible to obtain clean drinking water in most parts of Baucau district. This means a surge of diarrhoea and other water related diseases in the rainy season.

This complex of problems is mainly related to the poor watershed management. Removal of vegetation (forest) on steep upland hillsides unsuitable for agriculture causes soil erosion both as surface erosion and as landslides. Denuded hillsides also increase the size and frequency of flash floods. These aspects create problems for the population in the upland areas, but it is important to keep in mind that the eroded soil transported downstream as river sediments, and the flash floods, create additional problems in lowland areas. Within the watershed, efforts to reduce the problems experienced by upland communities will consequently also benefit lowland communities.

Similar concerns were also expressed in other districts, and the problem of poor watershed management is of major concern in several UNTAET agencies in Dili. In general this complex issue appear to us to be the major environmental problem in rural East Timor. As a consequence, the issue of watershed management is listed as top priority by the Agricultural Division of UNTAET.

##### Water and sanitation

The question of water availability and quality was repeatedly pointed out as important for people's living conditions and health, both by national institutions and at district and local level. At the local level, availability was of higher priority than quality. It is considered better to have water of relatively poor quality available close to the living quarters, than to have prime quality water available many kilometers away. There is a clear gender difference in this issue, as fetching water normally is the work of women and children. Concerning drinking water quality, it was said that water for drinking easily may be boiled. This obviously increases the consumption of fuelwood, contributing to deforestation, particularly in areas around towns. National authorities, on the other hand, appeared to some extent to think that quality is as important as availability.

The water supply issues are to a large extent related to reconstruction and rehabilitation of infrastructure. However, the quality and stability of groundwater and surface water sources depend to a high degree on the condition of watersheds. This is realised by the Infrastructure Department, who listed improved watershed management as an important issue.

#### Deforestation

An important environmental problem mentioned by almost all our informants at the national level is deforestation. This issue obviously is a prominent factor in the watershed management problems. However, mismanagement of forest resources also damages the production potential of forests, in terms of timber as well as non-timber forest products (NTFP). Deforestation also harms the occurrence and abundance of many wild species of plants and animals, and jeopardises the existence of rare and vulnerable species. With the prominent role traditional medicine, based on wild plants, plays in East Timor, this obviously has a negative impact on people's health and livelihoods. The increasing demand for fuelwood was also mentioned in this context.

The concentration of people and overexploitation of resources may be said to surpass the carrying capacity of the landscape, in terms of deforestation and unsustainable cultivation practices. This leads to, e.g., increased soil erosion, higher frequency of more serious landslides, and more frequent flash floods. Historically, one important factor reinforcing this negative development in East Timor is the relocation and concentration of people enforced by the Indonesian authorities during occupation. This was pointed out both in some of the districts and at national level. The agricultural coordinator of CNRT pointed out that some of the problems related to deforestation and destructive watershed management would be reduced if people accepted to move back to their original homesteads (Jose Abel, pers. comm.). This is, however, a complex social and political problem that is not easily solved.

The serious mismanagement of forests and overexploitation of timber species in East Timor, have been going on for a long time, but may have been particularly serious during the Indonesian occupation (Mario Carrascalao, pers. comm.). As a result, an UNTAET regulation (No. 2000/17) prohibits logging operations, export of wood, and burning or other destruction of forests. The exemptions are related to logging for traditional farming or other domestic uses, e.g. construction of traditional houses or religious buildings. Logging is also only allowed below 1500 m a.s.l. and on slopes less than 25%.

#### Knowledge, awareness and competence

In national agencies, the lack of knowledge about the environmental status in East Timor was repeatedly pointed out. The Forestry Unit of UNTAET has sought funding of projects to improve this situation.

On many occasions, the issues of public awareness, environmental education, and competence development, were raised in our meetings. One aspect mentioned a few times at district level was the idea of teaching people correct environmental and natural resources management practises. It is, however, important to point out that many traditional practises in local rural communities in East Timor are effecting sustainable use of resources. Thus, public awareness is a two way process. The Minister of Education, Fr. Filomeno Jacob, pointed out that public awareness and vocational training was the most immediate need. Making available television information programmes in Portuguese concerning nature, natural resources, biodiversity, environmental conservation, etc., would

be a simple first step. Any programme dealing with community forestry, agroforestry practices, etc. will obviously have to include an element of public awareness and education.

It was pointed out that environmental education must become an integrated part of school curricula from primary school onwards. At present, the school system in East Timor suffers from enormous problems caused by the events in 1999. A majority of school buildings was burnt down by the militia, and furniture, teaching materials, and equipment was destroyed. In addition, the majority of teachers were Indonesians, who decided to leave the country and go back to Indonesia. There are also serious problems related to the change from Bahasa Indonesia to Portuguese as the common language in addition to Tetum. Most younger teachers do not know Portuguese, and the required language test for teachers caused riots and exacerbated the lack of teachers. However, when the basic needs of the school system has been fulfilled, a national school curriculum has to be developed. This should include an environmental education curriculum adapted to East Timorese conditions.

Most East Timorese with higher education in subjects related to natural resources management (e.g., forestry, agriculture, natural resources management, fisheries) have received their education abroad, to a large extent in Indonesia, but also Portugal and Australia. The University of East Timor suffered serious destruction in 1999, and is presently being rebuilt in terms of buildings, furniture, teaching materials, equipment, library, etc. The University has five faculties, of which Agriculture and Economics is most relevant for natural resources management (Armindo Maia, pers. comm.). The programmes under these faculties are Indonesian in their approach, and there is a clear wish to revise and adapt the curricula and study programmes to East Timorese needs and conditions. One important goal would be to develop a natural resources management programme, concentrating on East Timorese conditions, and along modern multidisciplinary lines.

#### **4.2.4 Problems identified by secondary sources**

##### Deforestation

Most literature on the natural conditions in East Timor identifies deforestation as a serious problem, that appears to have been going on for at least 150 years (Wallace 1890, Metzger 1977, Monk et al. 1997). Gomes (1998) claims that vegetation cover in East Timor was reduced from approx. 2.3 million hectares in 1960 to 1.2 million hectares in 1990. Information to verify these dubious figures has not been available to us, and good data on the present situation and the rate of deforestation are not available. An attempt will be made by the project to estimate forested area in the 1970s compared to 1999-2000 by means of satellite images and ground-truthing from helicopter and field visits.

The reasons for deforestation are complex, and the process is often a result of a combination of factors. Among these are, e.g., extraction of valuable timber, clearing of new land for agriculture, and intensified slash-and-burn agriculture with reduced fallow periods due to increased population density. Increased marginalisation of the rural poor commonly forces this group to occupy lands less suitable for agriculture. The land quickly loses its fertility, and new land has to be cleared. This vicious circle may be broken by improved participatory management practices, including reforestation programmes, agroforestry methods and integrated watershed management schemes.

Deforestation causes several environmental problems, some of which are particularly serious in steep terrain such as is the case in large parts of East Timor.

#### Lack of documentation

What is obvious from the secondary sources is also the lack of updated and reliable documentation regarding the natural resources and biodiversity of East Timor. Search in the scientific reference databases yield only a very few modern references, most of which are given in the reference list (Chapter 6). There is also little research published in the social sciences, although in recent years there have been much published in the media about the political and human rights situation in East Timor under Indonesian occupation, and the development since the referendum in 1999. Although there exist some anthropological literature on East Timor, the material is scarce and biased towards the resistance movement and the cosmology and ritual life of selected indigenous populations (e.g., Glover 1986, Barnes 1990). Human ecology and micro-economic considerations are few, and much wanted information on man-nature relations is not available or non-existent.

#### **4.2.5 Summary: environmental issues**

Table 4.1 summarises the main issues referred to by our informants during field work in the various ecosystem types in East Timor. Although many of the issues are not environmental issues in a strict sense, most economic or social issues in East Timor are related to environmental management issues. In some cases, actions or activities related to the issues influence the environmental situation and the status of natural resources. In other cases, the environmental situation is a major factor in determining the prominence of the issues.

It is remarkable that many of the issues have been identified by our informants in all or most of the ecosystem types. This is for example the case with availability and quality of drinking water. This is to some extent a problem in all parts of the country. The problems related to irrigation water are restricted mainly to the arid parts of the country, where availability of water is strictly seasonal. To some extent, this is also the case in the important agricultural areas of the highland plains. In addition, the disrupted hydrology of the steep upland watersheds results in flash floods and sediment transport that destroys irrigation infrastructure several times per year.

Common for all the rural ecosystems in East Timor is the vicious circle of subsistence agriculture and lack of markets. The unrest in 1999 and destruction of means of production in agriculture and fisheries brought East Timor to a large extent back to a very basic subsistence economy. Although both farmers and fishers in many parts of East Timor would be able to increase production even with the present technological status, there is no market outlet for their produce. With access to markets, farmers and fishers would be able to invest in production means and increase production and incomes. The lack of markets is to a large extent caused by roads being destroyed by landslides and flash floods. Poor watershed management leads to destruction of infrastructure, which in turn negatively affects peoples' livelihoods.

All ecosystem types in East Timor are to some extent influenced by the complex issue of poor watershed management. The erosion and landslide problems caused by i.a. deforestation and unsustainable cultivation practices in the steep uplands and mountain areas is detrimental to lives and property of people in

these ecosystems. The problems are, moreover, transported downstream. Sediment transport and flash floods destroy infrastructure, property and the production base in lowland areas and towns. Thus, integrated watershed management, including reforestation and improved agricultural practices (e.g. adapted agroforestry methods), will benefit people in all parts of East Timor. Improved management practices will particularly benefit the poorest segments of the population, as these groups normally are relegated to the most marginal lands and the most risk-prone areas in towns.

*Table 4.1 An overview of the environmental issues raised by stakeholder groups during our study, related to the ecosystem types of the living area of the respondents!*

Issues	Marine and coastal zone	Arid low-land areas	Moist low-land areas	High-land plains	Mountainous areas	Urban areas
<b>Water access</b>						
Drinking water problems	x	x	x	x	x	x
Irrigation water problems		x		x		
<b>Rural economy</b>						
Access to markets	x	x	x	x	x	
Road destruction		x		x	x	
Lack of production means in agriculture and fisheries	x	x	x	x	x	
<b>Watershed management</b>						
Deforestation		x	x	x	x	x
Soil/beach erosion	x	x	x	x	x	
Sedimentation	x	x		x		
Landslides		x	x		x	
Disaster floods		x	x	x	x	x
<b>Laws and regulations</b>						
Traditional local governance structures	x	x	x	x	x	x
Traditional law in function	x	x	x	x	x	?
Lack of law enforcement support	x	x			x	
Land tenure conflicts		x				
Resource protection and rehabilitation for viable use	x	x	x	x	x	
<b>Resource use</b>						
Use of non-timber forest products (incl. traditional medicines)		x	x	x	x	
Fuel for cooking		x		x		x
<b>Pollution and waste</b>						
Solid waste management	x	x				x
Pollution	x				x	x

It should be noted that the traditional (as modified during colonial times) local governance structure (aldeia, suco, zona) is to a large extent maintained in all parts of East Timor. This is also the case in the towns, including Dili. In most areas traditional law, e.g. tara bandu, is also implemented to some degree. Even so, there is a clear wish to have good national laws to support and reinforce local authorities regarding natural resources management.

Traditional medicines based on wild plants, and other non-timber forest products, are still widely used in East Timor. Thus, conservation of primary forests and other natural vegetation is important to secure access to these products. This is particularly important for poor people who cannot normally afford modern medicines.

Solid waste is restricted to the urban centres, particularly Dili. Solid waste was also obvious in various coastal areas (beaches) visited by tourists. In rural inland areas, this is not a significant problem at present. Pollution of soil and water is also mainly restricted to the towns. However, increased use of agrochemicals in irrigated rice production may change this situation in the near future.

## **5. Environmental issues and priorities**

### **5.1 UNTAET/ETTA, the National Council and post-UNTAET East Timor**

In the UNTAET/ETTA administration, the environmental sector is covered by several institutions. The Environmental Protection Unit (EPU) stands outside the department structure, by being part of the National Planning and Development Agency (NPDA). NPDA is directly under the Deputy Transitional Administrator (probably equal to the Vice President in an ordinary government structure). EPU's main task is to "ensure that environmental concerns are taken into account in national economic planning for development and that they are reflected within the various programmes of the departments and district administration" (UN General Assembly 2000). EPU will provide environmental impact assessments, and advise on appropriate legislation and regulatory frameworks to support sustainable environmental practices.

Responsible for natural resources management is the Division of Agricultural Affairs under the Department of Economic Affairs. The Division includes units of Fisheries, Forestry, Agriculture, and Food and Horticulture. The mandate of the Division, as specified in the UN document, is quite production oriented. The responsibility for issues related to, e.g., biodiversity is not specified in the UN documents (UN General Assembly 2000). The Water and Sanitation Service, under the Department of Infrastructure, is responsible for water resources management and the restoration of water services throughout the country.

The period of transitional administration in East Timor imposes some restrictions on what types of political decisions that can be taken. None of the transitional institutions would appear to have the democratic legitimacy to decide on matters that will bind the national institutions of East Timor for years to come. However, in the case of environmental issues, there is often no time to lose. If detrimental activities are allowed to continue, irreversible destruction may be the result. Thus, the transitional authorities must take decisions, adopt and enforce regulations, and initiate discussions on policies. Fortunately, the establishment of the National Council and the increasing number of East Timorese nationals in UNTAET/ETTA increases the legitimacy with regard to policy development. According to UN

regulations, UNTAET operates on a system of prevailing Indonesian law (Bouma 2000). It seems obvious that there are strong political incentives to move away from Indonesian law and to develop national East Timorese laws. In the transitional period, specific UNTAET regulations are adopted to reinforce the efforts to stem destructive development or maintain the basis for future political decisions by the democratically elected institutions of East Timor. Among the UNTAET regulations in the environmental sector are no. 17/2000 (Forestry) and no. 19/2000 (Protected places). However, in local communities we heard many complaints about the lack of enforcement of laws and regulations from UNTAET and its civil police force, CIVPOL. Hopefully, this is improving as EPU and CIVPOL has initiated collaboration, and CIVPOL has nominated environmental focal points in all their district sections. The establishment of a district network of Forestry Unit employees may also improve this situation. The criticism, however, accentuates the difficult balancing act needed by the transitional administration, between assuming the full powers of law adoption and law enforcement, and the somewhat withdrawn role of a transitional administration that is not democratically elected.

The bottom line is, however, that actions taken and processes initiated by the transitional administration, to the extent possible should create a good basis for the work of the political institutions and national administration of East Timor.

## 5.2 Institutions

The institutional framework that has to be developed for handling environmental issues in East-Timor, has to be closely matched to the existing challenges, cultural and socio-economic preconditions, and priorities of the people. There is a fundamental need to build capacity for environmental understanding and nature management and to gain experience along the road. The institutional set up chosen by the new government has also to be evaluated, and, if necessary, revised after an initial "pilot phase".

When developing this framework, however, account should be taken of certain observations of a more general nature after some 20-30 years of experience in environmental authorities around the world.

Firstly, regardless of the institutional set up for environmental issues in government and administration, there is a need to integrate environmental consideration into all sectors and aspects of national policies. It is therefore necessary to establish horizontal cooperative mechanisms between ministries and sectors, and to strike the necessary balance between the overall environmental responsibility of a Ministry or Department of environment and the more specific responsibilities of other relevant ministries and sectors.

Secondly, the involvement of district and local authorities and the private sector in environmental work turns out to be essential for creating the necessary ownership to the emerging problems and solutions. There is also a growing understanding of the advantages of applying the "Ecosystem approach" (CBD 2000) in nature management, where management is seen more in a socio-economic context, people and their needs are integrated into the systems, and a balance is achieved between conservation and sustainable use.

On the basis of these experiences and the situation in East-Timor, it would probably be wise to consider carefully at least two options for the national level environmental institution:

1. A central Environmental Commission directly under the president that has the overall political responsibility, whereas the more technical responsibilities are allocated to the various relevant ministries. (This option could eventually be the solution for a first phase).
2. A broadly based Ministry of Environment/Natural Resources where the primary production sectors (agriculture, forestry and fisheries) are included. It would probably also be wise to include water management here. In some countries the energy sector is also included in this type of Ministry. The need for integrating environmental concerns into economic sector work would still be important also for the other ministries.

It is important to establish a national level institution responsible for environmental issues, to ensure that these concerns are included in development policies from the beginning. Although the structures established need to be adjusted as experiences are gained with environmental work in East Timor, it is also an urgent need to assess the options for district and local level authorities responsible for environmental issues.

In this context, it is fundamental to build on existing structures of local authority to ensure ownership and integration. In East Timor this would mean the aldeia – suco – zona – district structure. It is also crucial to see environmental issues and nature management in a broad sustainable development context (cf. Conference on Sustainable Development, Dili, 25-31 January 2001). In many countries the balance between central and local authorities with regard to the management of environment and nature is heavily biased towards the central level. This may be necessary for some initial phase also in East-Timor, but the development of district and local authorities needs to be part of the governmental strategy and thinking right from the beginning. Capacity-building and awareness raising activities must be an integrated part of this development. The development of district and local level institutions for environmental issues depends on the general development of such institutions, but should form an essential part of their development.

To be able to tap into some of the global funding mechanisms and to start cooperating with other countries in developing their environmental governance, the new government should consider adhering to some of the global environmental conventions, like CBD (Biodiversity) and UNFCCC (Climate Change). Participation here might be an important part of the capacity-building exercise, and give possibilities for funding environmental projects under the Global Environment Facility (GEF).

### 5.3 Environmental policies

East Timor will need to develop a national environmental policy, in order to conserve their natural resources and to obtain a pattern of development that secures improved livelihoods for all groups of the population. A national environmental policy should outline the principles which subsequently will form the basis for the national environmental legislation. The policy should discuss issues such as:

- management and use of natural resources,
- land tenure, governance, and the role of local authorities,
- the role of traditional law,
- institutional structure,
- biodiversity conservation and use,

- traditional knowledge and intellectual property rights,
- development of the knowledge base for management,
- international collaboration and conventions,
- habitat restoration (reforestation),
- area planning,
- environmental impact assessment, and
- pollution control.

A policy for sustainable development will need to include integration of environmental considerations into all economic activities, and into the policies of all ministries and departments.

In the rural areas of East Timor, the traditional socio-political structure (clan – aldeia - suco) is still quite strong, and in many areas traditional rules for management of natural resources (tara bandu) are still in active use. Traditional knowledge about local biodiversity, as exemplified through the use of e.g. traditional medicine plants, is still very strong in many areas. Policies for sustainable management need to involve local communities, and to enlist the support of these communities in the implementation of policies and enforcement of laws. This also includes respect for traditional knowledge and intellectual property rights. The general observation in many countries is that laws and regulations regarding natural resources management are doomed to fail if they are not supported by, and give proper rights and responsibilities to local communities. The remarkable history of East Timor in resisting foreign or centralised dominance (Fox 1988, 2000) appears to give this point extra significance. On the other hand, local communities are also asking for national legislation to back up their efforts in enforcing responsible practices based on traditional law.

Developing policies that harmonise traditional law and modern national legislation must be based on participation and real involvement of local communities, and it is a complex and time-consuming process. The present transitional administration has to move carefully in this process. The adoption of long term policies and enactment of laws will be the responsibility of an elected East Timorese parliament, and there are probably severe restrictions on how far the transitional authorities may move in this direction. What may be started under the transitional administration is, however, a process of taking some of the central elements of an environmental policy to local communities for discussion. The Cabinet and National Council should assume leadership in this process, with the technical assistance of UNTAET/ETTA and possibly external institutions.

The major environmental issue in East Timor is probably deforestation and the wider concept of watershed management. As pointed out earlier in this report, watershed management includes whole watersheds, involving many local communities from the mountains to the coast. This implies that local communities need to collaborate. Some thought must be given to the political and administrative consequences of the fact that watershed borders may not coincide with administrative borders (of districts, zonas, etc.).

East Timor faces two types of development pressures. One stems from the immediate need for reconstruction. The other from the fact that East Timor is only now being opened up to foreign investment in sectors with great economic potential such as tourism and oil exploration. This gives high priority to development of policies regarding responsible assessment of the environmental

impacts of investment projects. At the same time, policies and modern legislation regarding economic sectors such as industry, tourism, agriculture, forestry, and fisheries must integrate environmental considerations.

#### 5.4 Environmental priorities

##### 5.4.1 Environmental legislation and institutions

East Timor will need to develop environmental legislation, to replace both Indonesian laws and the transitional regulations set down by UNTAET. The development of environmental legislation will need to include i.a. the following aspects:

- Environmental law(s) covering nature conservation, pollution, etc. This may be done through one comprehensive environmental law, or by separate laws.
- Legislation on environmental impact assessment (EIA).
- Inclusion of environmental considerations in all legislation for the productive sectors. Of major importance is forestry, agriculture and fisheries, but also laws regulating industry and business, as well as land tenure legislation should include this element.
- Consideration of and harmonisation with traditional law regarding natural resources management. There is in many places in EAST TIMOR a relatively well functioning traditional law system still in place, but these systems need recognition and backup from future national legislation and law enforcement. In other areas traditional law has lost its influence or significance, in which case new national legislation becomes even more important.
- The traditional knowledge about biodiversity and environmental issues is quite extensive. This knowledge needs to be incorporated into the knowledge base for management. At the same time, the intellectual property rights regarding this knowledge needs to be respected.
- East Timor's access to and ratification of international treaties on the environment. EAST TIMOR may probably want to ratify the Convention on Biological Diversity, the Ramsar Convention on wetlands, and the CITES convention on trade in wildlife species, 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.

Appropriate legislation is the basis for a democratic society where the rights of citizens are respected. The human rights, gender equity, religious and political freedom, etc., has to be embedded in a country's constitution. To create efficient environmental legislation, it appears to be important that people's right to a healthy and clean environment also is secured in the constitution (Lisa A. Ogle, pers. comm.).

The proximate aim of environmental legislation is to protect the environment and secure sustainable use of natural resources. The ultimate aim of these measures is to secure the livelihood, living conditions, and health of the human population of today, as well as for future generations. It is well known that if the environment is allowed to deteriorate, the poorer segments of the population are the ones to suffer. The rural poor have to cultivate the marginal or degraded lands, and the urban poor end up in the most polluted or derelict urban environments.

Legislation to protect natural habitats contributes to protect important resources for local communities. Functioning natural habitats allow local communities to harvest biomass for food (fish, fruit, berries, etc.), fuelwood, building materials,

etc. In East Timor medicines and other non-timber forest products are also very important benefits from natural habitats. The knowledge behind this varied use is normally an integrated part of religious and cultural systems and beliefs, and forms part of people's cultural identity. Thus, environmental legislation, and in particular, legislation to protect biological diversity, protects the basis for local socio-cultural systems.

#### **5.4.2 Forest management**

The information we have obtained indicates that deforestation is a serious environmental problem in most parts of East Timor. The available literature indicates that it has been a problem for many decades, or maybe for centuries. The exploitative activities of the Indonesian occupants are believed to have increased the deforestation since 1975. However, there are no reliable figures to quantify neither present forest cover nor the rate of deforestation. We are performing an analysis of satellite images from 1972 and 2000 to provide some reliable figures on this subject, but the results are not yet available.

The term deforestation may be used to describe different phenomena, but basically it means the complete removal of forest cover, usually to convert land to agriculture. It may be done through logging operations (clear-cutting), slash and burn ("swidden") agriculture methods, or wildfires. On steep slopes this may for instance lead to:

- Soil erosion and landslides destroying productive agriculture and forest areas, property and infrastructure (e.g. roads).
- Water supply becoming less reliable for irrigation, and industrial and household use.
- Water loaded with silt destroying agricultural irrigation systems.
- Drinking water becoming less available, and quality deteriorates, affecting people's livelihoods and health in a serious way. This will often be most serious for children in terms of diarrhoea and other water borne diseases, and for women in charge of fetching water for the household.

Complete removal of the forest obviously removes the basis for timber production as well as the collection of fuelwood and non-timber forest products.

Mismanagement of forest resources through overexploitation have other negative social and economic effects for local communities:

- Reduction of timber production, negatively affecting job opportunities and economic activities.
- Reduced access to fuelwood, leading to increasing market prices or extensive workload for the family members responsible for fuelwood collection (often the women).
- Reduced availability of non-timber forest products (including medicinal plants), with possible socio-economic, medicinal and cultural consequences for local communities.
- Populations and habitats of wild animals and plants decrease, increasing the risk of extinction for rare and endangered species.
- Scenery and recreation values of nature decreases, negatively affecting the potential for tourism development.

The replacement of multi-species natural forests with forest plantations may in fact increase timber and fuelwood production. However, it negatively affects the access to non-timber forest products, and is detrimental to the diversity of wild animals and plants.

It will be necessary to develop community based reforestation programmes in East Timor. The programmes will have multiple aims, such as restoration of mixed production forests for timber and non-timber forest products, creation of plantation forests for timber (teak, sandalwood, etc.), plantations for fuelwood production, and restoration of forest to protect steep watersheds, water sources, roads, etc. Programmes to introduce alternative energy sources, to reduce the pressure on forest resources for fuelwood, should be seen in connection with this.

#### **5.4.3 Watershed management**

Deforestation is one central aspect of a wider environmental problem that may be included in the term poor watershed management. In the steep watersheds of East Timor, improved management of the hillsides is crucial to reduce the negative environmental impacts on local communities and population groups in the steep upland areas, in the flat lowland rice-growing areas, as well as in urban areas. In short, the success or failure in integrated watershed management may influence the lives of all groups in East Timor.

Maintenance of the natural forest cover, e.g., through establishment of protected areas, and reforestation is but one aspect of integrated watershed management. Adoption of suitable agroforestry methods may facilitate continued and improved production in hillside areas where agricultural production is maintained. Improved agricultural practices for steep terrain should also be adopted. Integrated watershed management must involve the local communities from an early planning stage, and communities must be given responsibility for the implementation of efforts. Collaboration among local communities within watersheds is necessary to achieve the goals. Questions related to land tenure will obviously be important in these activities.

Thus, development and implementation of integrated watershed management plans involve complex technical and social issues. Moreover, the issues at hand are within the areas of responsibility of several departments/ministries at the national level. Several interviewees in various parts of the UNTAET/ETTA structure stressed the importance of launching projects for watershed area management and reforestation. Some activity, mainly as community based nurseries and reforestation projects, has already been launched, and there are various projects in this sector in the pipeline. To enable national prioritisation and coordination of donor support and project activities, it appears that there is a need for a watershed management workshop involving the major stakeholders at the national and district level. It is, however, important that this coordination process does not delay the implementation of projects that are already in the pipeline or funded.

#### **5.4.4 National integrated coastal zone management plan (ICZM)**

The coastal zone of East Timor includes unique resources both on land and in the sea. This ecosystem is at present largely unspoilt. If utilised in a non-destructive and well-planned manner, it will provide great possibilities for economic development, while providing necessary products to sustain the coastal population. If not controlled, economic interests relating to the coastal zone, particularly oil exploration and tourism, will constitute significant threats to this unique resource.

Destruction of near-shore marine resources typically impacts the poor segments of the population. Small-scale artisanal fishermen are most dependent on fish resources close to shore. More industrialised fisheries may be able to move

offshore, although in the long run, their resource base will also suffer from a degraded coastal zone. On land, uncontrolled development and unplanned area use most seriously marginalises the poorer segments of the population.

An effort should be made to start integrated coastal zone planning for East Timor as soon as possible. The ICZM should include the whole country, but more detailed plans should be developed for selected areas where the economic interests are immediate. This concerns e.g. areas on the southern coast where the land-based activities related to oil exploration will be located, and parts of the northern coast where the tourism potential is greatest.

#### **5.4.5 Solid waste and urban pollution management**

The lack of solid waste management strikes the visitor as an aesthetic problem in towns and villages. More importantly, in Dili this is a problem stressed also by the Timorese citizens. It was repeatedly taken up as a priority problem by our informants. In the smaller towns, the problem is less dramatic. Thus, it appears that there is a need to develop a solid waste management system in Dili.

It has been claimed that the present solid waste problem is a result of the large consumer oriented expatriate UN community presently living in Dili. This segment of the Dili population probably contributes significantly to the amount of plastic bottles and paper packaging, but there is also a more permanent production of significant amounts of solid waste. During both Portuguese and Indonesian times there was a waste collection system in Dili. Since then, consumer patterns in the town, and in urban centres of East Timor in general, have obviously changed in a direction that produces more waste. A temporary problem is the remains of destroyed houses and infrastructure from 1999, which also contribute to the amount of garbage. The solid waste produced in the Dili market seems to stress the important negative health aspects of the lack of a solid waste management system.

Thus in conclusion, in Dili a solid waste management system appears to be needed, although this has to be developed to a level appropriate for the post-UNTAET situation, when the number of expatriate staff and associated consumption levels probably will be substantially reduced. The system has to be adapted to the economic ability of society to pay for it. The positioning of a garbage dump at Tibar has been criticised for the lack of consultation with local communities (de Carvalho 2000). It is also confirmed that hazardous waste is mixed with ordinary solid waste. The public is allowed access to the dump, so that adults scavenge for usable garbage and children are playing on the dump. Thus, a proper analysis of the suitability of the present garbage dump and development of a system to handle hazardous waste, e.g., from hospitals, car workshops, etc., is also needed.

#### **5.4.6 Biodiversity and environmental status**

The present knowledge of the environmental situation in East Timor is very scarce. The necessary knowledge about ecosystems, biological diversity, and effects of alien species is almost completely lacking. The institutions and legal structures that are to be developed in order to implement responsible and correct management regimes will lack the necessary basis for this task. This work is time consuming and complex, and many activities need to take place simultaneously. The appropriate management institution of the East Timorese Government may want to develop the first generation national Environmental/Biodiversity Strategy and Action Plan as part of the environmental policy development. At the same time systematic work should be started to improve the level of information about

the present situation. This work should take the form of a relatively long term, low volume programme, adapted to the capacity of East Timorese institutions. It should enlist the collaboration of local communities, district officers of relevant institutions, the University, and other relevant institutions. Any foreign researcher in relevant fields that would want to work in East Timor should also be advised to feed into this programme by supplying his or her data. Such a programme would be well suited for long term institutional collaboration with an appropriate foreign institution.

Local communities in East Timor possess a large amount of knowledge about the local biodiversity through the active collection and use of medicinal plants and other non-timber forest products. A biodiversity survey programme must therefore be based upon collaboration with local communities. This would also contribute to the awareness raising about the local biodiversity resources and environmental conservation. Developing institutional capacity to undertake these tasks must be integrated into work programmes.

#### **5.4.7 Public awareness and education**

Any environmental policy that is to be sustainable in the long term must be based on the acceptance and support from the population. Thus, awareness raising and environmental education is essential for any environmental policy. However, it should not be forgotten that awareness raising is a two way process. Local communities are fully aware of many aspects of local environments and biodiversity, and possess information that central institutions, organisations, and personnel are missing.

Raising the general public awareness about environmental issues may consist of three main aspects:

1. information to the general public,
2. development of environmental programmes for primary and secondary school curricula, and
3. inclusion of relevant environmental concerns in programmes of higher education.

Efficient channels for information to the general public are radio and television. Radio programmes may be produced cheaply, in local languages, and with a high degree of local relevance. This also means that local communities may have an opportunity to voice their experiences and opinions through the radio. Television programmes are more complicated and expensive, and thereby have less specific relevance. There are, however, good television programmes about environmental issues and biodiversity available in Portuguese (from both Portugal and Brazil). These may be quite relevant for an East Timorese audience.

The school system in East Timor faces tremendous problems because of the destruction of equipment, books, and buildings in the post-referendum violence in 1999. While these basic needs are being fulfilled, the development of a national curriculum may be difficult. Eventually, however, a specific East Timorese curriculum on environmental issues should have high priority. These curricula must take the nature and biodiversity experienced by the children at home as their point of departure. Experience from many countries shows that the most efficient and lasting awareness-raising on environmental issues is done through primary and secondary schools, and through programmes with high local relevance.

Presently, the majority of East Timorese with higher education in environmental sciences or natural resources management are educated in Indonesia or elsewhere. After independence, there are scholarship programmes for students to go to Australia, Portugal, and other countries. For East Timorese students, it is important that higher education, at least up to bachelor level, in the sector of environment and natural resources management has a high relevance for the conditions in East Timor. Thus, there should be an opportunity to take relevant courses in East Timor. At the University of East Timor, the faculties of Agriculture, and Economics, are of particular relevance for environmental issues. There is a desire at the University to change the present programmes from their mainly Indonesian curricula to courses adjusted to East Timorese conditions (Armando Maia, pers. comm.). It would be feasible to develop a programme in natural resources management at the University. It may be given under the Faculty of Agriculture, but with some elements also from economics and social sciences. The development of such a programme would be well suited for an institutional collaboration between the University of East Timor and a foreign University.

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