UNWTO/UNDP Project for the Government of Timor-Leste

Sustainable Tourism Sector Development and Institutional Strengthening, Republic of Timor-Leste

Environmental Planning Inputs

November 2006

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1 Core Attractions Key Environmental Concerns

1.1 Key Environmental Features and Core Attractions

The UNWTO Phase 1 assessment of tourism for Timor Leste highlighted that the country is heavily dependent on its natural resources for tourism. The surrounding marine environment with world-class coral and abundant fish life is arguably the country's core tourism asset.

According to The Nature Conservancy (TNC, 2004), East Timor is situated in the "Coral Triangle" and the country's reefs have the following assets:

- High diversity (both of habitat and species)
- Cetacean migration route
- Areas of Manta aggregation
- Spawning areas
- Coral Resistance to bleaching
- Turtle nesting sites

In addition to the marine environment, the rugged mountainous interior and system of protected areas provide additional natural attractions for potential visitors to the country. The rich birdlife is especially important with six resident globally threatened bird species occuring in Timor-Leste. A total of 31 globally restricted-range bird species (species with global ranges of less than 50,000 km^2) occur on Timor Island (Trainor, 2004).

Timor Leste's beaches, while not the primary attraction for the country are nonetheless attractive and provide attractions catering mainly to the existing resident week-end visitor market.

Maintenance of these important natural assets is important not just for tourism purposes, but for future generations of Timorese. The resource-use decisions made today for these fragile natural areas will have far-reaching implications in the future. The commitment to protect these areas is a global responsibility and this in turn becomes an asset for tourism and an economic means to justify the protection and derive income through visitation, research and sustained fisheries.

The objective of environmental planning is to ensure that developments (tourism included) are properly planned and located in areas able to withstand the impacts brought on by the development. Assessing the impacts of potential or proposed develops is an important part of the process to identify the significant impacts and the measures required to mitigate these. In some cases, lack of development can be as damaging as poorly planned developments. When the lack of development includes shortfalls in the provision of facilities for waste management or handling visitor numbers, deterioration of the resources will inevitably occur. As much as tourism depends on the strength or quality of the environmental resources, tourism concerns also have to be planned into the system and support the conservation and environmental concerns.

Timor Leste has recognised the importance of the environment and the natural attractions for the country and the need to protect and provide management of these resources. Most of the appropriate institutional and legal frameworks have been developed or initiated, but the agencies tend to be under-resourced in terms of financing and experience.

Tourism has been identified as one of the desired key economic components for the country with the aim to promote the abundant natural resources to attract foreign visitors. Ensuring that the current high quality of the reefs and fish life and the unique natural is maintained will take the coordination of the agencies responsible for managing these resources and the cooperation of the tourism industry. Addressing these challenges requires an understanding of the on-going environmental issues as well as the potential impacts and stresses from tourism.

1.2 Existing Environmental issues

The purpose of this review is to examine the impacts of tourism on the Timor Leste environment and to provide direction and recommendations on how tourism can be developed to lessen any potential impact. The impacts of tourism development can be both positive and negative and the aim is to mitigate the negative impacts and enhance the positive.

While the environment of Timor Leste's is the country's main tourism asset, this environment is already under considerable amounts of stress from activities outside tourism. Many of these stresses are the results of long years of resource use by local people and while other stresses have resulted in more recent times as the population pressure on specific areas has increased.

In a review of the important bird areas in Timor Leste carried out by Birdlife International, key bird habitat areas were highlighted as well as the main threats to these areas. This review on-going threats to the environment is important to understand as ultimately these threats (if left unchecked) will have a negative impact on the country's ability to attract nature-based tourism. While the Birdlife review covers mainly the threats to bird habitat, the threats apply in general to the overall environmental condition of Timor Leste.

Some of the environmental threats that have been identified include:

- Illegal timber cutting
- Conversion of forests to plantations
- Fire
- Cutting of forests for fire wood
- Swidden agriculture
- Hunting,
- Developments for hydro electric power
- Turtle harvesting for meat and souvenir trade

- Rubbish

Other threats that could be included that are more related to the marine environment include:

- Over-fishing
- Coral collection for sale as souvenirs
- Coastal zone development
- Pollution (sewage, solid waste)

The environmental stresses outlined above and the sources of these are for the most part, local demands based on economic need. For example, cutting of forests for firewood is most pronounced around the major urban centres such as Dili and Baucau. The demand from these two populations centres place a high level of stress on the forests within at least a 40km radius for supply of firewood. While this does not have a direct effect on tourism, eventually the loss of forest cover will affect the landscape resulting in increasing erosion and impacts on watersheds. Bird and wildlife dependent on the forests will eventually disappear. Similarly, as fishing pressure continues, the numbers of large fish (a primary dive tourism draw) will gradually be reduced.

Addressing these impacts requires the cooperation and efforts of a number of agencies, all working towards improving the overall environmental condition of the country. Tourism benefits directly from these efforts in that the natural resources so important as attractions are preserved.

1.3 Tourism Development Issues

As a land use, tourism development must be implemented in a manner that has the least impact on the environment. Unlike urban developments that are placed in areas designed to deal with large numbers, tourism development (and especially nature tourism) often are placed in areas that are attractive but inherently more susceptible to impacts from alteration and development. Areas such as beach zones and mountains are prime tourism attractions but they are also fragile areas requiring relatively greater measures to mitigate the potential negative impacts from the development. Therefore, the development planning for tourism has to be mindful of the areas that area being designated for tourism development to ensure that areas designated as environmentally sensitive are avoided. Identification of these areas requires that the agencies responsible for the environment and relevant stakeholders be called upon and able to provide inputs at the development planning stage.

Timor Leste tourism is based on promotion of the country's natural assets, both the marine and the terrestrial natural environment. Therefore, the key stakeholders in determining the parameters for tourism to these areas are the agencies responsible for conservation and management of the marine resources, the national parks and terrestrial resources and the protection of the environment.

2 Towards Environmentally Sustainable Tourism

Sustainable development has been defined as: *development that meets the needs of the present without compromising the ability of future generations to meet their own needs.* (The Bruntland Report, Oxford University Press, 1987)

This cannot be achieved by one person or one agency and requires coordination of policies towards an overall country objective that embodies environmentally sustainable development. Chapter 10 of Agenda 21 calls for mechanisms aiming to promote a constructive and productive dialogue between the full range of stakeholders. These include ministries, provincial and municipal government departments and their policy development entities, research and resources data base development institutes such as a topographic service or statistics institutes. This also includes the inputs from the private sector, public-interest organizations (NGOs) at both national and local level, such as nature conservation societies, farmers associations and community groups.

Thus, it follows that land use planning should be a decision-making process that "facilitates the allocation of land to the uses that provide the greatest sustainable benefits" (Agenda 21, paragraph 10.5).

Development of a sustainable tourism industry thus requires the coordination and cooperation of many agencies all fulfilling their roles towards the country objective of sustainable development. Timor Leste tourism relies to a large degree on the environmental assets and successful realization of tourism as an important economic driver will depend on safeguarding of these assets.

3 Who is Responsible for Managing the Environment?

Tourism as a land use needs to be planned for in the same manner that land is allocated for any other land use function. However, unlike other land uses, tourism depends to a large degree on the overall attractiveness of the landscape and the features surrounding. Tourism has a double edge in that not only can the development have an impact on the landscape and environment, but any deterioration in the quality of the surrounding environment will have an impact on the quality of the tourism product. Thus, it is essential when planning for tourism development to examine both the planning for development as well as the on-going land use and environmental management once development has occurred.

Delivery of high quality tourism depends on the coordination of many aspects and there are many agencies involved in the development and delivery of ecologically sustainable tourism. The development of tourism for Timor Leste is very much in a beginning stage and there is an opportunity to establish a tourism product that is an example for the rest of the world. Obviously, the desire is that this be a good example for environmentally sensitive and sustainable tourism. Given that Timor Leste’s core tourism products are essentially nature-based, it only makes sense that all developments of this industry have a strong environmental component.

Developing environmentally sustainable tourism will require the coordination of many agencies and input from a variety of stakeholders during the planning stages. This is to ensure that the important environmental resources are recognized and given adequate protections. There is also a need to ensure that the impacts and by-products from development are mitigated. The agencies responsible for protection of the environment and natural resources should have input to regional and urban plans at the planning stages. This is to ensure that the environmental concerns are incorporated in the planning and do not come as secondary concerns. Providing input on these concerns to both urban and regional plans is vitally important to provide coherent and transparent guidance for development. Table 3.1 outlines the key government agencies and their roles with respect to development of environmentally sustainable tourism.

Table 3.1 Government Agencies, Roles and Issues related to the Environment

Agency	Areas of Concern / Roles	Legislation/ guidelines / codes of operation	Issues related to Environment
Prime Minister's Office:			
Institute of Trade and Investment Timor Leste • Foreign Direct Investment (Prime Minister's Office)	-Overall project approval		-Input of environmental concerns for as part of the approval process
Secretary of State for Central Planning • Directorate of Environment o EIAs o Biodiversity o Pollution standards	-Environmental Impact Assessments (EIA) -Pollution standards and monitoring -Environmental planning -Biodiversity indicators	-Territorial Ordinance and Physical Development	-Limited staff capacity at the district level. -Position of the EIA in the approval process for investments (environmental concerns addressed post-approval)
• Directorate of Urban Planning	-Development of Urban Master Plans -Development guidelines	-Legislation to be approved with plans	-Connection between plans and project approvals -Implementation and enforcement of urban development zones.
Ministry of Agriculture Forestry and Fisheries			
• Directorate of Forests • (National Parks Division)	-National Parks -Protected areas -Wildlife protection	Regulation No 2000/19	-Management plans needed for core PA's -Human capacity limitations to manage the PA's -Limited resources (financial and

Agency	Areas of Concern / Roles	Legislation/ guidelines / codes of operation	Issues related to Environment
			human) to enforce regulations -Conditions for Tourism as part of PA mgmt plans -Capacity to set and collect visitor and concessionaire fees -Community-based joint management a component PA -Need resource inventories of sensitive areas to provide input to EIA process
• Directorate of Fisheries	-Marine protected areas -Fisheries resources -Protected species (coral, dolphins, whales, species of fish)	Regulation No. 2000/19 Fisheries law, 2004	-Need inventories and information on marine resources -Management plans for PA's -Conditions for visitor use as part of mgmt plans. -Capacity to set and collect visitor and concessionaire fees -Capacity limitations to manage PA -Staff and resources to enforce regulations -Regulations for sport fishing and use of reefs
• Directorate of Agriculture	-Improving agriculture techniques -Improving livelihood of farmers		-Need for markets for cash crop farming, to stop expansion of farms into forested areas.

Agency	Areas of Concern / Roles	Legislation/ guidelines / codes of operation	Issues related to Environment
	-Promotion of cash crops		
Ministry of Natural Resources and Energy Policy			
• Directorate of Water and Sanitation	-Water management -Urban Sanitation -Energy -Water conservation and water sheds		-Some overlap in water management and sanitation between this and the duties of the city councils. -Important services to protect water supplies and prevent pollution of waterways and beaches. -watershed management is a function that can be shared with protected areas
• Directorate of Mining	-Land reclamation -Sand removal (quarrying).		-Licensing for quarrying of sand and beach areas should be coordinated with the Dir. of environment and the PA management.
• Directorate of Oil and Gas	-Development of the oil and gas industry		-Use of firewood for cooking in urban areas (cause: high price of imported kerosene, diesel and bottled gas)
Ministry of Internal Affairs / Administration			
• Regional Administrators • District Administrators • City Councils	-Licensing of businesses -Urban services -Waste management (sewerage and solid waste collection) -Input to City / Urban planning	Local Authority or Council ordinance	-Management of recreational areas outside the PA network (e.g. beaches, parks, trails, walks) -Capacity for waste management -Location and equipment for waste management -Legislative power for waste planning

Agency	Areas of Concern / Roles	Legislation/ guidelines / codes of operation	Issues related to Environment
			-Legislative power for urban planning -Input to the EIA process -City Garbage is under the city council.
Private Sector	-Operation of tourism services -Use of natural resources -Tourism to reefs, villages and forests (includes protected areas)	-No overall industry standards -Some sector standards related to diving (PADI, NAUI, DAN etc.)	-Impact on the resources from visitor use -Importance of maintenance of health of resource related to businesses (diving / ecotourism / birdwatching) -Inputs to resource conservation -Responsibility for resource management -User / visitor fees -Educational needs -Need for guidelines for operators
Communities	-Resource use (livelihood) -Resource use (subsistence and housing)	-no guidelines or information (NGO's involved with some assistance)	-Impacts on the resources -Deterioration of living standards related to diminishing resources -Roles / Responsibility in resource management -Educational needs -Village structure and "rights / ownership" to resources -usufruct

4 Existing Environmental issues

There are a number of existing environmental issues or stresses that if left unchecked will eventually have a direct impact on the tourism value of the natural assets. Support to the agencies responsible for protection on the natural resources is thus important to ensure that Timor Leste's resources are properly protected and managed. This review deals with only those having an impact on tourism assets.

4.1 Loss of forest cover (agriculture expansion, firewood)

The loss of forest cover due to the collection of firewood is a problem that is particularly evident around the main urban centres of Dili and Baucau. This is due primarily to the large demand for firewood for cooking and the relative high price of alternative fuels. Outside the main urban centres forest cover lost is due more to the expansion of agriculture and unchecked fires. The loss of bird and other wildlife is one concern, the loss of water retention and the eventual erosion hazard is another. As one of the main causes for the loss of forest cover is for the supply of firewood, tourism is unlikely to be a direct contributor to this source of stress to the forest system. However, indirectly the additional workers required in an area for the service sector may place additional demands on this already limited resource. Measures are thus required to seek reasonably prices alternatives for cooking to lessen the demand for firewood.

4.2 Water conservation

The north coast of Timor Leste experiences water shortages during the dry season corresponding to the months of July through to November. As many private residences are without water and rely on local wells, any alterations to these supplies will cause further hardships. Protection of watersheds is the responsibility of the Directorate of Water and Sanitation. Future tourism development will have to be mindful that this is already an existing issue and measures will be required to ensure that the tourism development does not exacerbate this situation.

4.3 Loss of coral and over fishing

A large portion of the country's population depends on fishing for a livelihood or for subsistence. Thus the maintenance of the reefs and the fish stocks is vitally important to support these needs. There is evidence that there is increasing pressure on Timor Leste's fisheries resources and this is resulting in a gradual reduction in the abundance of fish (Deutsch, 2004). Some of the concerns include over-fishing, the occurrence of dynamite fishing and the use of anchors on reefs. The condition of the reefs and the relative abundance of fish has been cited as one of the keystone products for tourism in Timor Leste. However to benefit in the longer term from tourism is it important that

this issue is recognized and the agencies responsible for managing the marine resources are given the necessary support.

4.4 Urban Waste management, town planning and hygiene

Part of the planning process for urban and rural land use includes establishing waste management procedures and then implementing these. At present, the waste collection systems are somewhat less than adequate with the result that waste is often not collected or is dumped into drains or waterways. This waste eventually gets washed downstream and ends up on the beaches. This problem is particularly acute near the main urban centres. Promotion of pristine beaches and clear water can be easily be “undone” by unsightly piles of rubbish and littered beaches. Tourism developments can certainly support municipal efforts by instituting waste management protocols, but there onus is still on the councils to plan and provide these services.

4.5 Establishment of Protected areas

Under the Ministry of Agriculture, Fisheries and Forestry, the National Directorates of Fisheries and Forestry are the key agencies responsible for marine and terrestrial protected areas. A number of protected areas have been identified under regulation UN 2000 / 19, but the boundaries of these have yet to be officially demarcated. To be able to regulate and guide the use of these protected areas, there is a need clearly mark the boundaries and to then draw up management plans that (among other things) outline the conditions for use of these areas. Tourism interests should be represented as stakeholders in support of protected area management with the responsible agencies clearly in the role of management. A concern that is being addressed by both the Fisheries and the Forestry is the need to build the capacities of each agency to be able to enforce the regulations and manage the protected areas. Support in these areas is required.

5 Environmental Impacts from Tourism

Tourism development can bring benefits to a country or region through increased foreign exchange earning. When a country’s natural resources are the key attraction, the tourism industry can also serve to spread the economic benefits away from urban centres. However, tourism as a land use, is not without its impacts and it is necessary to recognize these in order that measures can be implemented to eliminate or mitigate these.

The main attractions for Timor Leste, are the natural resources; the abundant coral and marine life, the coastal areas and the natural and cultural attractions of the interior. All these areas have a limited capacity for absorption of the impacts of tourism development. In addition to the impacts on the natural environment there are impacts on local resources such as water and energy that must also be considered. This section outlines some of the environmental impacts to be considered from tourism development in Timor Leste.

5.1 Beach, Marine and Coral Resources

Alteration to Coastal Zones and Beaches -Tourism developments occurring on beach zones can cause alterations that change the beach profile and disrupt the ecosystem of these areas. These disruptions can result in loss of habitat or nesting areas for naturally occurring wildlife species. The change of beach profile can result in erosion and eventual loss of natural beach areas.

Alterations to the coastal zone in the form of loss of mangrove forests or estuaries results in loss of natural nursery and habitat areas for fish, prawns and crabs.

Increased access to beach areas can result in overuse, trampling and eventual lost of naturally occurring vegetation. The overuse can also result in associated impacts such as litter and the waste generated from the provision of toilets and shower facilities.

Damage to coral -Reefs area fragile and easily damaged through over use and improper use. Damage from fins and people standing or walking on the reef can destroy areas of coral. Collecting of live coral as souvenirs or for sale as souvenir items also destroys the reef.

Boat anchors cause a large amount of damage by smashing and uprooting coral. This problem can be extensive on areas frequented by boats for fishing, diving, or snorkeling. The stirring of sediments from boat engines operated near the coral reef can smother the coral, eventually causing the death of sections of the reef.

Change in access - Fencing of beach areas, prevents access by local people who once may have access to the marine resources via the beach areas. Traditional livelihoods could be disrupted by changes in the access to beach areas and the marine environment.

Disturbance to Wildlife -in spite of the fact that marine wildlife is one of the main attractions for tourism to coastal and beach areas, the associated activities can have a negative impact on the wildlife. Nesting areas for turtles can be destroyed or the disturbance from beach-side resorts too great for the turtles to nest. Disturbance to marine mammals such as whales and dolphins can cause these species to avoid areas of high activity.

5.2 Local Terrestrial Resources

Water supplies Tourism developments are generally large consumers of water and can over-use local supplies. Given the water shortages experienced through much of Timor Leste, this is a serious consideration to be addressed for any tourism developments.

Appropriate developments The protected areas and other areas with special features will likely receive increasing demand for visitation and there will be demands for accommodation and other visitor facilities. Developments inside protected areas have to be questioned as to whether these facilities would be better placed in areas where loss of valuable protected habitat is not required.

Fire wood used for cooking while the majority of the hotels and restaurants in the main urban centres will used bottled gas or electricity to cook meal for their guests, some of the smaller establishments in the more remote areas will still use fire wood. This places an increasing demand on the supply of this fuel and increasing pressure on the forests. In order to reduce the pressure on forests for this use, alternatives need to be sought.

In the urban areas, even though the meals cooked for the guests are using gas, those (meals) cooked for the workers will probably still use fire wood. With increasing numbers of workers the demands for fire wood as a fuel for home kitchens will also increase.

Overuse of key areas Use of the main attractions has limits and in the absence of control or management these limits to use can be exceeded to the detriment of the resource.

Waste Disposal Currently, the urban areas are poorly equipped to handle the demands for disposing of waste. Tourism adds an increased burden to this demand and the problem is especially acute in the remote areas where there are no facilities for waste management.

6 Mitigation of Tourism Impacts

6.1 Establishing the type of tourism

Tourism to Timor Leste is and will be dependent on the country's marine and terrestrial natural resources. Naturally, any visits to these areas will also involve interaction with the local residents, whether through village stays, stopovers or through communication with industry employees. As an overall policy, it is necessary that objectives for the development of the tourism industry are clearly understood.

Increasing visitation to the country's natural resources can result in impacts to all these resources. In order that these impacts can be lessened or eliminated altogether, it is necessary to recognize the range of impacts associated with tourism and to put in place measure to mitigate or eliminate these impacts.

Recommendation: Given that the main attractions for Timor Leste are the country's natural resources as well as the culture, it is recommended that all tourism be ecotourism. Ecotourism has been given many different definitions and these have often been mis-interpreted or mis-represented. The aim, therefore, is to come up with a workable definition that recognizes the value of both the natural cultural resources and the revenues to be derived from visits

to these resources. As a starting point, it is recommended that Timor Leste use the following definition for ecotourism.

Ecotourism

Environmentally responsible travel and visitation to natural areas, in order to enjoy and appreciate nature (and any accompanying cultural features, both past and present) that promotes conservation, has a low visitor impact and provides for beneficially active socio-economic involvement of local peoples.

World Conservation Union (IUCN)

In the promotion of conservation, it is important to note that ecotourism should also provide revenues that contribute to and support the conservation values outlined by the national agencies with the responsibility for managing these values.

6.2 Water Conservation

6.2.1 Water consumption by tourism developments

Water is a big problem in many areas for tourism development in TL. Over half the population do not have access to clean water and unless the domestic situation is solved it will be very difficult to justify channeling water to tourism development. As a policy, all tourism developments will have to adopt energy saving and water saving technology in order for the industry to be sustainable.

Tourism resort developments, in general, place large demands on local water supplies. Guest demand for water usually far exceeds that of local residents. In addition to the water required for each hotel room and general hotel management activities such as kitchens and laundry, features such as swimming pools, lawns and golf courses can add significantly to total usage. Excessive water use can degrade or destroy local water resources, threatening the availability of water for local needs. These problems may be made worse during periods of low rainfall.

Any development for tourism should incorporate strict water conservation measures. Only drinking water should be drawn from local supplies and all other water (for sewage treatment, watering gardens and general cleaning use) should be recycled from grey-water or drawn from local secondary sources and treated. The local residents should not have to pay for the development either in terms of reduced water supplies or increased water treatment costs.

Disney World, in Florida, USA*; recycles 15.2 million liters (4 million gallons) of wastewater a day for irrigation of landscaping and golf courses. The company found this method was not only environmentally responsible, but cost-effective, as using municipally treated water would have been much more expensive.*

Source: UNEP

The benefits from encouraging efficiency in water use:

- Decreasing overall water use can lead to cost savings, especially during periods of drought, use restrictions or increasingly strict government regulations on water use.
- Reducing water use can conserve and protect local water resources upon which a resort development and the local community depend.
- Preserving the quality of local water resources can eliminate the need for costly drinking water treatment processes.
- Water conservation can enhance reputation among guests and others who are concerned about reducing water consumption and protecting local resources.

These measures have been mainly aimed at protecting and improving sources of water. Policies directed at reducing the water consumption of any development are also required. The types of specific water conservation measures to be implemented by a development or development authority include:

- Identification the main areas of water consumption and where significant water savings may be achieved.
- Regular monitoring water consumption for activities (kitchen, laundry, rooms, general cleaning, irrigation).
- Encouraging guests to use their towels or linen for more than one day. Involve guests by providing them with tips about water saving measures such as turning off the taps in the sink when shaving or brushing their teeth.
- Involve employees to identify water-saving practices, such as avoiding leaving water running, or operating washing machines and dishwashers only when full.
- Engage the housekeeping and engineering departments in an active campaign to detect and repair leaking toilets, faucets and showerheads.
- Install water-saving devices such as low-flush toilets and low-flow showerheads and faucets. Low-flow fixtures in showers can reduce the flow of water by 50 percent without affecting the comfort level of the user.
- Regular maintenance of equipment to prevent or fix leaks, which can correspond to an important loss of water.
- Incorporation of technologies that reduce water use through recycling.
- Avoid wasteful landscaping practices, such as hosing outdoor surfaces and watering gardens during the day.
- Use drip irrigation systems and choice of drought-resistant native plant species for landscaping.

***The Apple Farm Inn and Restaurant**, **California, USA**; this luxury hotel has only seven rooms and uses discharged water from washing machines to flush toilets, saving 15,900 liters (4,200 gallons) of water per day and approximately $5,000 per year.*

Source: UNEP

6.2.2 Drinking Water

Current supplies of bottled drinking water come from Indonesia. A possible initiative to lessen the leakages for imported drinking was could include finding suitable sources of water for treatment and bottling in country. This would be first step to stopping the leakage of currency out of the country and a way of providing a local industry that would generate employment. Baucau with its abundant spring water would be one possibility for consideration.

From a conservation perspective, the source for the Baucau needs to be identified so that measures can be implemented to protect this valuable resource. As part of the urban planning exercise for Baucau, it is important that any industries are located so that there is no chance of pollution of the water supply. Downstream, there is a need to deal with the indiscriminant uses and pollution of the waterways with detergents and other pollutants. This should be addressed in the Baucau urban master plan with clear guideline provided for the local council to implement.

6.3 Waste Management

6.3.1 Sewage Treatment

The current urban sewage treatment system is not capable of handling additional waste from tourism developments. The urban planning guidelines for new developments recommend that the facilities be self-contained in terms of waste management. This involves collecting sewage in main initial and secondary settling tanks. Ideally, these should be a closed systems with the resulting sludge pumped out and treated in a proper septic sludge treatment plant. Having a closed system requires having storage systems of sufficient size to handle the amounts of black-water[1] waste generated. To reduce the volume of the black-water waste, all developments should be designed with separate grey- and black-water drains. Low flush toilets and water-saving initiatives are recommended to reduce overall water usage as well as the amount of resulting black-water to be treated. With proper treatment, the septic sludge can be used as agriculture fertilizer and to produce bio-gas as a by-product (The Agriculture University of Norway, *pers comm.*). Kitchen waste and other organic matter can also be disposed of to produce bio-gas. Bio-gas can be used for cooking fuel to reduce dependency of imported gas.

[1] Black-water is the water containing the waste from toilets or other areas with high amounts of organic waste that is liable to contain bacteria and pathogens.

Should septic tanks systems continue to be used, then efforts are still required to reduce the amount of water used (by installing low flush toilets) and to ensure there are proper septic sludge treatment facilities (and a regime for de-sludging septic tanks). As with the closed system, the de-activated sludge can be used as fertilizer. Effluent and overflow from the settling and septic tanks should be filtered and then run through a constructed wetland and then eventually to a re-established wetland. The required size of the constructed wetlands will depend on the volume of wastewater produced. While constructed wetlands will treat grey-water effluents to a high quality, the bacteria and possible pathogens from black-water present problems that must be addressed to ensure that the substrate is of sufficient size and composition handle these factors.

> ***Sandals Negril Beach Resort & Spa, Jamaica****; uses low-flush toilets and urinals which use only 5.7 liters (1.5 gallons) of water per flush, aerators and low-flow devices on faucets, water-saving showerheads with a maximum flow of 9.5 liters (2.5 gallons) per minute, and ground care water-saving techniques to reduce water loss from evaporation. In the three years from 1998-2000, total water consumption per night was reduced 28.6 percent.*
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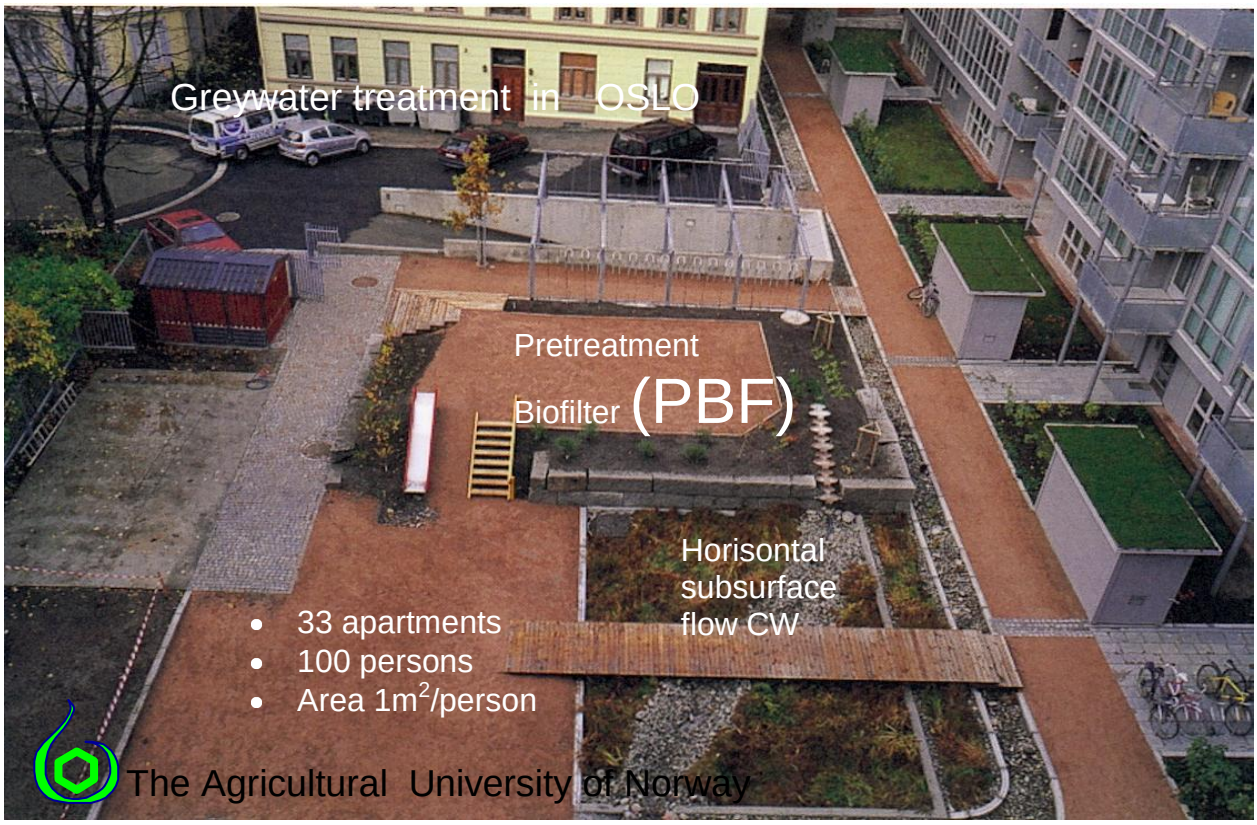
> Source: UNEP

6.3.2 Grey Water

Tourism facilities are large volume users of water and large volume producers of grey water (water from washing areas, kitchens, laundry, showers, baths etc.). Grey water treatment needs to start by ensuring that separate grey water infrastructure (the pipes draining all the above sources) are planned into the designs and then these designs are implemented during the construction. In many urban areas, greywater is treated as a fraction of the general sewage load placing additional loads on the sewage treatment system. Emerging eco-sanitation technology for treatment of greywater involves the use of on-site preliminary bio-filters and then final filtration through constructed wetlands. The system is relatively inexpensive to set up and results in clean, recreational quality standard water. This water can be re-used as irrigation water, laundry, flush water, for recreation or discharged safely into surrounding water bodies. This technology has the subject of much interest in Norway and Sweden where there is a growing trend to incorporate the ideas into the overall urban design (Figure 6-1).

Figure 6-1 Greywater treatment in Oslo, Norway



To further lower the potential pollution from wastewater, many governments have already initiated policies to reduce the use of no or low phosphate detergents. These policies should be supported and additional efforts to reduce the amounts of phosphates entering the water sources should be advocated. Also, all restaurant or food preparation areas for all facilities should be designed with grease traps and grease separators for primary treatment of grey water (grease and kitchen waste would then have to be properly disposed along with septic sludge).

In the larger urban areas, kitchen scraps should be collected from restaurants on a regular basis. The collection of kitchen scraps and waste should be the responsibility of the municipal agency in charge of the waste management. As part of the grey-water treatment requirements, grease traps should be installed in all facilities to prevent waste cooking oil, grease and other accumulated fats from entering the drains. Accumulated grease and oil should be collected and disposed properly at dedicated waste treatment facility.

The Eco Lodge on Atauro island provides a low-cost example of grey and waste water treatment using a simple type of bio-filter. This example can be taken a step further by use of a compost heap or bin for kitchen scraps or simply by adding the kitchen scraps to the composting toilets. However, as a proto-type example, the Eco Lodge should be the basic model from which guidelines for developing more eco-friendly waste management techniques can be developed (Figure 6-2). The treatment of the greywater works by

passing the water water through a filtration system and then a form of constructed reed-bed.

Figure 6-2 Atauro Island greywater treatment system.

6.3.3 Constructed and Re-established Wetlands

Use of wetlands (both constructed and natural) as greywater treatment areas will encourage regional avifauna to the area and provide additional recreational opportunities for bird watching.

> ***The Le Sport resort, St. Lucia****; treats wastewater in three interconnecting lagoons that filter wastewater with aquatic plants and mesh. The filtered water is then disinfected further with ultra-violet rays and used for irrigation on the resort's grounds. In its first year of operations, the new treatment method saved about 3.8 million liters (1 million gallons) of water and thousands of dollars.*
>
> *Source: UNEP*

Encouraging species such as the bulrushes used at the Eco Lodge or n Atauro or Vetiver grass in the wetlands along rivers and around lakes can potentially relieve ultrophication problems and can also reduce any soil erosion. In addition, the grass can be harvested for fodder, providing potential increases to local farmers' income. (Vetiver contains 0.44-0.68% crude protein and 0.068-0.076% P) (Marshall, 2003).

References to reed bed technology for waste water management can be easily found on the internet and the following links provide good sources of information:

- *Glenn Marshall, WaterWays Asia-Pacific, Australia: http://www.nwnet.co.uk/eathwise/3makers/makersum/wwap.htm*
- http://www.nor.com.au/environment/perma

Wetlands and constructed wetlands work best when integrated into a system that includes pre-treatment using bio-filters such as the eco-sanitation technology.

6.3.4 Solid Waste

As with any development that concentrates people in one area, tourism has the potential to produce large amounts of solid waste. By implementing solid waste reduction programmes as part of the resort management the amounts of waste produced can be reduced to reduce the demand on municipal landfill sites. Municipal waste management systems should be will upgraded to be able to deal with not only the current urban waste production but also waste generated from existing and proposed tourism developments. Currently, the agency responsible for the collection of domestic waste is the City Council. There is an urgent need to upgrade the capacity of the council to plan for and to deal with waste management in the urban areas. Failing to do so will have a direct impact on the quality of the tourism attractions in Timor Leste.

Landfill sites need to be properly designed and managed to ensure that the sites are sanitary landfills, lined, covered and frequently maintained. This is to prevent odour, and to guard against pollutants leaching into groundwater. The area should be sheltered from the wind as much as possible to prevent rubbish dispersal from strong winds. The location of any landfill site adjacent to tourism development has the potential to affect remote values and tourism amenity.

Organic and green waste should be collected, composted and stored appropriately for use as mulch, soil improvement or fertiliser. Organic waste not used for this purpose and all inorganic waste should be transported to a licensed landfill facility.

A stipulation for any tourism development proposals should be the preparation of a waste management program outlining estimated waste production and measures to be employed for disposal, re-use and recycling.

Great Keppel Island Resort, Australia; *organic wastes are shredded, composted for several weeks and then fed to the worms at the resort's worm farm. The worms produce a rich product that is used in the resort's gardens instead of fertilizer. This system reduces waste and eliminates the costs of removing trash from the island.*

Banff Springs Hotel, Canada; *The hotel's recycling program has cut waste by more than 85 percent.*

Source: UNEP

6.4 Guest house guidelines

The current stage of development of the tourism industry is conducive to the establishment of small guest-houses operated by local owners. These facilities should be encouraged in areas associated with the core tourism attractions to provide services for visitors to these areas. However, some for of guidance is required to ensure that development of these facilities does not adversely impact the surrounding environment. None of the villages or outlying areas in Timor Leste have sewage systems or municipal waste collection, thus the guesthouses must be responsible for their own waste management. Guesthouse owners should be required to follow set guidelines for dealing with waste.

Using the example of the Eco Lodge on Atauro island as a template, guidelines for the development of "Timor Guesthouses" can be established. Using these guidelines as a standard, this could also provide the basis for a brand that could be used to market the guesthouses. The core objective is to ensure that the guesthouses are environment-friendly and the guidelines outline the basic requirements for hygiene and waste management. Once guesthouse operators see the value in being part of the system, they become part of a larger marketing effort. By promoting the concept of Timor Guesthouses there is a standard for the type of accommodation and visitors know what they can expect.

The type of Guidelines for Development of Local guesthouses can be as follows:

- Local ownership or direct involvement
- Community-based or community involvement
- Location does not require alteration of sensitive habitat or loss of public use land
- Water supplies to local communities are not affected

- Supports development of community solid waste management
- Development practices solid waste reduction protocol
- Construction uses renewable or recycled materials in construction
- Landscaping is local design, sensitive to local water requirements
- Design incorporates Grey water separation and treatment systems

- Operation includes composting of kitchen waste and scraps
- Kitchen cleanliness guidelines for; storage of food, cleaning utensils, water conservation and overall cleanliness.
- General area hygiene; serving hygienic food, keeping the area clean and pest free, mosquito control.
- Rooms are swept clean each day
- Cleanliness and hygiene of staff and premises

- Use of composting toilets or low-flush closed septic systems (note: this depends on some system for treating septic sludge)
- Toilets and wash areas are to be cleaned every day
- water conservation
- laundry areas are designed to treat waste water

- Local sources of food
- Rooms incorporate local style, use mosquito nets
- Guests are informed of efforts and encouraged to reduce and recycle

These simple basic standards for guesthouses provide guidelines for people wishing to start up an operation. A simple brochure should be prepared outlining the types of things that need to be done based on the Atauro eco lodge or following the WildAsia responsible tourism guidelines (www.wildasia.net). The brochure should include guidelines for methods to save water, harvest rainwater, and re-use grey water. While the primary focus for these guidelines is the small operator, these concepts should be stressed for any new developments, especially those that will be developing extensive gardens.

Wild Asia; *Wild Asia believes that Responsible Tourism is a business ethic that all tourism operators should adopt. Wild Asia works with Asian tourism operators to help them understand the principles of sustainable tourism and to promote best management practices amongst them*

Wild Asia's ***Responsible Tourism Initiative*** *has just been recognised as one of APEC's 10 best practices in Sustainable Tourism. This initiative promotes self-evaluation and improvement of tourism operations in Asia.*

www.wildasia.net

6.5 Sustainable Marine Use

There are a number of initiatives in the region for fostering sustainable use of coral reefs and protection of marine resources. Reef Check is one such initiative that has already provided some training for some of the residents of Biqueli village on Atauro island. Involvement of the villages as well as the diving community (both the private divers and the companies) provides a large pool of manpower for monitoring and assisting with managing of the

resources. The coordination of these efforts with the Directorate of Fisheries providing an overall framework for marine resource management will make the most use of all these energies. Reef Check has operations in the Philippines and office in Bali and has had some involvement with the Timor Leste communities. There are, however, other similar initiatives that can be adapted to the local situation.

BleachWatch *is a community-based coral reef monitoring initiative developed by the Great Barrier Reef Marine Park Authority (GBRMPA). It is an example of a successful partnership between reef managers and the community to detect large-scale coral bleaching. BleachWatch was established in 2002 during a mass- bleaching event. In subsequent years, both the number of participants and its spatial coverage have expanded. BleachWatch is a key component of the GBRMPA's Coral Bleaching Response Plan, a comprehensive management response to mass coral bleaching.*

Reef Watch *is an environmental monitoring program run by the community and coordinated by the Conservation Council of South Australia. Reef Watch is a unique and exciting program where recreational divers gather data about the health of the oceans. Diver involvement develops community awareness about the state of marine ecosystems and triggers action for their protection.*
Reef Watch aims to gather and disseminate quality information on the status of our marine environment. We do this with the input of many of South Australia's top marine scientists and educators along with the help of hundreds of volunteers.

Reef Check *is an international program that works with communities, governments and businesses to scientifically monitor, restore and maintain coral reef health. Reef Check objectives are to: educate the public about the coral reef crisis; to create a global network of volunteer teams trained in Reef Check's scientific methods who regularly monitor and report on reef health; to facilitate collaboration that produces ecologically sound and economically sustainable solutions; and to stimulate local community action to protect remaining pristine reefs and rehabilitate damaged reefs worldwide.*

7 Recommended Actions / Interventions

7.1 Planning and Development Approvals

Timor Leste is currently in the stage of re-writing several laws related to the environment and planning that were initiated during the UNTAET time. In general, the laws being drafted are well considered and provide adequate mandate for the responsible agencies. However, the sequencing of the approval process for new investments should be reviewed to ensure that there is sufficient emphasis given to the existing and proposed environmental requirements and laws prior to the granting investment approval. As part of the investment guidelines, potential investors should be directed to refer to the existing urban development plans and regulations as well as the requirements for EIAs and any other stipulations. The sequence of this process is important and should come before project approval so that any measures required as a result of the EIA can be incorporated in the final costing of the development. This type of technical input is vital so that sound, well-informed political

decisions can then be made. In the absence of this information, decisions will be based on other agendas.

As the key agencies in this process are all under the Prime Minister's Department coordination of these activities requires only procedural changes in the sequence of approval and information provided to investors. The key agencies are as follows:

- Institute of Trade and Investment (Prime Minister's Office);
- Directorate of Urban Planning (Secretary of State of Central Planning, also under the Prime Minister's Office); and
- Directorate of Environment (Secretary of State of Central Planning, also under the Prime Minister's Office).

In advance of investment approvals, there is a need to clarify the existence of environmentally sensitive areas such as national parks, other protected areas and watersheds. From a tourism perspective, maintaining the quality of the environment is of paramount importance, especially if this is to be the main selling point for TL. Diving and nature tourism is potentially lucrative, but if the resources on which these activities rely are not adequately protected, this business will not have a chance to develop.

For the environment, there is a need to outline a clear process for tourism development. This process needs to be endorsed by the Ministry of Trade and Investment so that the environmental concerns are heard up front and the development supports both the environmental objectives and the tourism goals.

The aim is to provide prospective investors with the full details of the environmental requirements they need to fulfill. The results of the EIA will advise whether changes to their proposal are required and whether adjustments to investments in terms of increased environmental protection are required.

There is a need to ensure that the environmental protection process is built into the investment approval process so that any developments are mindful of and serve to support conservation and wise management of these important resources. The overall aim is to ensure that development occurs in the right place and in the right manner. The purpose of this is not to stop development but to ensure that any development occurs in a manner that is sustainable both in the environmental sense as well as the long-term economic.

7.2 Coordination of development

The Dili Urban Master Plan prepared by the Grupo de Estudos de Reconstrucao de Timor-Leste (GERTiL) has defined the guidelines for urban development and the regulations for set-backs and beach zones. These guidelines and regulations should be incorporated into all regional planning to provide a coherent set of regulations and to ensure that all developments (including beaches) in other parts of the country are developed in a sustainable manner. Defining public access zones and areas with low and

medium density development has been done for the Dili and Baucau urban master plans and these can be used as templates for other areas. The development guidelines also address the main physical planning issues and can be used as a guide for development as well.

In order that the natural resources so important to the country (and to tourism) are adequately protected, the responsible agencies should be included in the planning process. This is to ensure that these important areas are identified at the planning and land use allocation stage and developments appropriate to the resources are planned. The regional administration staff also should be included in the process so they are part of planning and able to provide a linkage between the planning and the implementation. Also important is that the regional administration fully understands both the development and the environmental needs so these can be balanced during the implementation phases.

The GERTiL example is excellent and should be used as a template for all other areas for how cultural and natural landscapes are to be incorporated in the urban context. These plans were built on consultation and through the inputs of many agencies with environmentally sensitive areas incorporated as a part of the process. These plans and laws that will go along with the plans the regulations for planning should form the guiding regulations for planning for the rest of the country.

7.3 Support to Protected Areas

7.3.1 Development and implementation of management plans

The current protected area network provides good coverage for protection of the important natural resources in Timor Leste. The National Parks Division under the Directorate of Forests has been given the mandate to manage the parks through the national parks and protected areas legislation. One of the first activities required is to establish the boundaries of the protected areas so that management plans can be prepared for each.

Planning for tourism in these areas is an important task and should be an integrated component of the management planning process. However, before this can happen a priority need is support for the institutional strengthening and capacity building for managing protected areas. The two agencies requiring support are the National Parks Division under the Directorate for Forests and the Fisheries Department.

Both these departments have the legislation providing them the mandate for management of protected areas, but both need considerable capacity strengthening and hands-on practical training for staff involved in the management.

In support of the management, sufficient resources are also required for equipment and logistics as well as for training of staff to be able to set management objectives and prepare plans to achieve these. Yearly budgets

should be prepared based on yearly management plans and linked to clear objectives and realistic goals. Progress towards these goals should be monitored to provide an indication of management success or needs for alteration.

According to the Fisheries Directorate (Narciso de Carvalho, 2006. pers comm.) the preparation of management plans for marine protected areas is a requirement of the Fisheries law. The department wishes to start pilot projects in a couple of areas with the view to incorporate villages in the management process. There are currently two villages; Batugade in Bobonaro district and Biqueli on Atauro island. This later group is the same one that went to Apo island in the Philippines with the Roman Luan group. Tourism will certainly play a major role in the later and can be also considered for the former (Batugade).

7.3.2 Stakeholder involvement in Marine Protected Area management

There is already in existence a Joint Working group that consists of 11 agencies (mainly government agencies) to oversee protection of marine resources; The Joint Patrol Development Authority (JPDA).

The JPDA, should include a tourism component as well as involving the local dive and fishing charter operators to enlist the help and cooperation of the private sector agencies that rely on the health of the resources. Any deterioration in these resources will adversely affect the business. As Timor Leste is to be promoted as a “pristine” “frontier” dive destination, in order to live up to this billing it is important that the resources are protected. By promoting the private sector’s involvement in the protection of the resources, this demonstrates an industry-wide concern and involvement in ensuring that the resources are protected. Fisheries sets the rules and enforces them, the private sector help to ensure that the resources are protected and can serve as a monitoring network to assist the JPDA in doing their job.

There has been some cooperation with the private sector and this needs to be enhanced. Regulations are not meant to stop business, but to ensure that the business can continue for many years to come. Once this is understood by all and provided this is evenly and equally enforced over all, the resources will be protected.

One of the problems faced by Fisheries is getting the involvement of all partners. Involvement of the tourism sector (both private and public) can facilitate the liaison process as tourism interests are over-arching (ensuring there are the resources that provide the core attractions). By assisting in the coordination of the various national and private sector agencies, tourism can provide a view of the need for resource conservation and serve as a middle ground for what may be (in come cases) competing interests.

Support (financial and human resources) to the Directorates of Forestry and Fisheries is required to assist with the building of the capacity to manage the protected areas and resources. However, there is a corresponding need to

coordinate and support with the stated goals of the directorates so that efforts are not duplicated but aimed at achieving the directorate's goals. Support projects should be of a duration long enough so that there can be a chance for technology transfer and training and the project will not die when the foreign consultants leave.

7.3.3 Priority Protected Areas

Given the current staff strengths in both the Fishers and the Forestry, there is a need to establish the priority PA's and MPA's so that some sort of management can be started and entrance fees can be charged. Ideally, these PA's should be linked with the core attractions, where visitors are already going. Once management objectives have been established, the plans can be drawn up and implemented and user fees can start to be charged. Revenue from user fees collected can then be channeled towards PA management.

Some of the priority marine areas requiring protection and management include:

- Pertamina Jetty (exceptional marine life)
- Metinaro- Mantuto (K35- K57) (popular day-trip dive destinations and under increasing fishing pressure)
- Atauro (the whole island, exceptional quality of coral and marine life)
- Tutuala, Com, Jaco (exceptional quality of coral and marine life)

7.3.4 External assistance

For improving the management of the protected areas and protecting the country's biodiversity there are possibilities foreign aid funding to assist with capacity building. Areas of assistance generally fall under Coastal Zone Management, biodiversity and forest management and community development. Possible donor organizations include:

- Danida (Danish Government)
- GTZ, (German Government)
- JICA (Japanese Government)
- Cida (Canadian Government)
- DAI (US government)

Project interventions, however, should be aimed at medium term results (3-5 years) involving training of staff to enable local management of the protected areas. In addition to the practical aspects of the day-to-day management, this also involves setting of achievable goals and the ability to monitor progress towards these goals.

7.3.5 Building the capacity to manage

To strengthen their local capacity, the Fisheries Directorate will be receiving 4 volunteers in June 2007. These volunteers will focus on community based projects and development of marine protection regimes at the local level. Support of these initiative and incorporation of tourism concerns is important if

these resources are to contribute to the overall development of the tourism industry.

To increase the effectiveness of any interventions, it is essential that they have a sufficient time span to actually achieve results. The capacity concerns in all departments are such that 1-2 year project periods for capacity building are too short to be able to achieve significant results. There is a need to plan capacity building over 5 year periods and clearly mark the milestones and work towards these. The overall objective should be to train local staff to have the ability to understand and manage the resources in their charge. There are a number of considerations in this regard:

- Academic qualifications should be ignored in favour of a system that can recognize experience and the ability to manage. Thus, training will have to be practical and results oriented as opposed to theoretical approaches that assume a broad background or understanding of model-based management approaches. Setting of an overall objective and then achievable goals is paramount so that progress can be observed, monitored and, importantly, achieved.
- The institutional set-up should be established so that career paths in natural resource management are clear and there are salary scales that are commensurate with the increasing responsibility that candidates will be asked to assume.
- Resources should be allocated to ensure that the support equipment (communication, transport, logistical, operational) is available to carry out the tasks required.
- Monitoring of progress is essential to provide an indication of success and to be able to remedy interventions that are not having the desired effect. Reporting should be based on progress towards the agreed upon goals and any alterations in the process required to adjust for goals not achieved.

The Fisheries Directorate currently has over 100 staff. The majority of these are young and lack knowledge and experience, thus building on this resource base is essential. The building of this knowledge should be done through a mentoring process that allows staff to learn on the job, but at the same time to build their qualifications as they go. There is much to be built and done in TL and the best way to gain the necessary experience is to get out and do the job under the guidance of experienced and committed teachers. Volunteers have the dedication to assist with the linkages at the ground level, but there may also be a need for overall guidance and development of on-going training programmes at the departmental level.

Tourism considerations for use of protected areas should be incorporated in the training and capacity building and in cooperation with the industry stakeholders.

It should be noted that this process can apply to both Fisheries and the Forestry.

Key points to consider:

- Enforcement of the existing regulations is needed (resources and capacity)
- There is a need to involve the community in the management process
- Currently all coral reefs are protected. However, there are no PA's for marine areas as such and all reefs are still open for fishing.)

7.4 Engaging the private Sector

7.4.1 Marine tourism

The companies involved with marine-based tourism rely on the health of the resource and should be involved as stakeholders in the process of managing these resources. In general, the Dive industry has its own codes of ethics and standards and it is important that all companies subscribe to these codes of conduct. An example of the guidelines for handling snorkeling and diving tourism on reefs is included as Appendix One.

In addition to developing a set of guidelines or codes of conduct specific to Timor Leste marine tourism there are a number of other actions that that private sector can participate in to contribute to the management of the marine resources.

Reef monitoring The Directorate of Fisheries should cooperate with the private sector dive companies to develop a reef monitoring system that can be used to monitor the overall health of the country's reefs. The dive companies are on the reefs on a regular basis and having a simple check-list that can be compiled either by dive masters or keen divers would provide information that the Directorate could use to support management decisions. Examples of this type of monitoring exist in many parts of the world and these could be adapted for use in Timor Leste. The information gathered should not be gathered simply for the sake of having information but for a purpose and be used to support decisions or monitor effectiveness in achieving management goals.

Education programmes Programmes to educate the public and the industry on the importance of the reefs and to provide avenues for cooperation on management of these resources.

Enforcement assistance As the divers are on the reefs on a regular basis, they can provide the Directorate of Fisheries with timely information on any infringements to the regulations so that action can be taken.

User Fees Once marine protected areas have been established, it will be possible to determine what fees can be charged for access to the reefs. These fees can be incorporated with community tourism efforts to main the reefs, moorings or landing sites. Note: any move to charge user fees, should have a lead-in time of at least 6 months so that operators can adjust the prices and inform their clients.

Community Reef Management Establishing permanent moorings that are maintained by the local villages will provide some income to the village, prevent potential anchor damage to the reef and instill a sense of resource ownership in the village. Support in this would have to come from the Directorate of Fisheries in terms of establishing the moorings and providing community education programmes. The private sector involvement in this is vital.

7.5 Carrying Capacities

Carrying capacities are generally included as a component of protected area management plans and as such are the responsibility of the protected area management to set and enforce. Part of the management planning process involves identification of the core conservation areas in the protected area and allocation of use zones. To prevent over-use or degradation of sensitive areas, carrying capacities are often set to provide a number beyond which use is not sustainable. The first step in this process is to be able to identify the sensitive areas, so the use zones and limitations can then be determined.

Carrying capacity has its origins in wildlife management and implies some threshold number below which all factors are in balance and the system can continue to function. In the wildlife context, as soon as the numbers exceed the threshold, one or more of the resources the population depends on comes under such severe stress that further use is unsustainable and the population crashes. With the population pressures relieve, the resource recovers and eventually the population also recovers.

To a certain degree this model of limited resources and a level beyond which uses is unsustainable can be applied to tourism. However, the notion of a “magic number” becomes difficult to manage as soon as management approaches the set threshold or when the resource limitations have been solved. Further, enforcing these numbers requires considerable management capacity on the part of the agency responsible for the resource. The enforcement of the carrying capacity becomes even more problematic as numbers approach the set capacity number (for example, if the number is 120 persons per day and 121 show up). Guidelines for visitor carrying capacities have been calculated for many protected areas in North America and an adaptation of one of these is included in Appendix Two.

7.6 Recreational Opportunity Spectrum

Another approach for managing visitation to recreational areas is to use the recreational opportunity spectrum (ROS). ROS advocates an assessment of the visitor or user market, the types of recreational desired and the settings sought. By providing a range of settings it is possible to distribute the visitor loads according to the types of recreation and setting. Management then concentrates on managing the settings.

Many of the beach areas along the Timor Leste coast provide settings for people wishing to partake in recreation such as picnicking, snorkeling, diving or relaxing. By providing a number of these settings along the coast, visitor loads can be spread out so that one site does not receive the full impact. Signage or guidance in the form of brochures can inform the visitor of the range of facilities and enable the visitor to make their choice based on what they desire of the setting.

Visitors seek a setting that provides them with a desired recreational opportunity in a preferred setting. Recreational settings range from those providing opportunities for active recreation to those providing relaxation. The environmental settings range from settings that provide solitude to those that accommodate large numbers of visitors. Planning the recreational opportunities and the environmental settings to pursue these is the core of the Recreational Opportunity Spectrum (ROS) management tool. Most often applied to protected areas, where there settings range from high use public areas to wilderness areas, the ROS provides a useful tool and terminology for guiding what developments are appropriate for a given setting.

Recommendation: For protected areas; the management authorities require the resources (both financial and human) to prepare management plans for the key protected areas. From a tourism perspective, the protected areas in most urgent need of management planning are

- Jaco-Tutuala area (including the Conis Santana),
- Atauro Marine protected area and Manucoco,
- Christo Rei,
- Tata Mailan Mountain
- Mundo Perdido and
- Matebian (22,000 ha)

Recommendation: the coastal regions from Maubara to Manatuto are important recreational areas for the residents of Dili. These areas are also the most accessible due to the proximity of the main highway to the coast. Development of coastal recreational sites in association with the local villages is an important method of providing not only a range of recreational settings but also for spreading the visitor load across a wider area. Through cooperation with the local villages, the management of the sites can be the responsibility of the village with revenues from collection of entry or parking fees going directly to the village. Other forms of revenue can be derived from the sales of drinks, food and other refreshments. The village would be responsible for the up-keep and maintenance of the recreational area and the promotion of the area would be the responsibility of the tourism department.

Development of these recreational areas would require funding for establishment of picnic tables, shelters and toilets / showers. Priority should be given first to the venues currently receiving visitation with these used as an example for future developments. By providing information to visitors regarding the various rest stops, choices could be made based on the availability of facilities or the numbers of people.

7.7 Studies and Education

Protected Areas -There is a need for continued research and studies to better understand the country's resources. This information is required to provide the basis for determining management zones and to understand how best to manage and protect the resources. In turn, this information can be used to highlight the importance of the protected areas and why they are such special places to visit. As the body of information grows, this can be used to further justify the protection of the areas and to potentially identify areas that require further protection or increased management attention. The key agency responsible for this is the National parks Division in the Directorate of Forestry. However, assistance from universities and other institutions as well as projects should be encouraged. Importantly, this information should be coordinated through the National Parks division to ensure the studies are directed towards the conservation needs.

Marine Protected Areas The on-going research and inventory proposals for these areas should be supported to document the richness of the area and to provide continued justification for protection and management. One of these projects is a coast survey coordinated by the Northern Territory Government.

During 2007, the Northern Territory Government (in collaboration with James Cook University) will be working with the Ministry of Agriculture, Forestry and Fisheries to develop an Coastal and Marine Ecotourism Strategy for northern Timor Leste. This strategy will build upon existing tourism and ecotourism planning activities (such as the Gertil and WTO activities) and also, significantly, provide the basis for an ecotourism management framework for the proposed Nino Conis Santana National Park (incluidng the proposed marine extension of the park, Timor's first Marine Park) (Karen Edyvane, 2006, pers comm.).

These efforts to underpin conservation planning and sustainable management of community-based, ecotourism and marine resource development activities in the region should be supported. Other interventions should be coordinated with these efforts to ensure that the information base is expanded and not duplicated.

Environmental education -There is a need to distill the information gathered by the various university and departmental studies to a form that can be used for village level education regarding the environment. This type of intervention needs to be coordinated among the various government agencies with regards to development and regarding protection of the environment.

7.8 Appropriate souvenirs

The sale of coral and other marine products for souvenirs needs to be stopped before it can get started. This requires an education campaign targeted at both the consumer and the supplier. The tourists as well as all the

foreign workers in Timor Leste have to be informed and educated on the items that are not appropriate as souvenirs. This also applies for souvenirs made from turtle parts. At the same time, alternative souvenir products need to be investigated so that the communities have other forms of economic activity.

8 Key Actions

Development of Guidelines for Guesthouses	**Ref: ENV-01**
Objective	**Target**
• To establish minimum standards for guesthouses. • To provide guidance for entrepreneurs wishing to start • To establish environmental standards for design and operation of the guesthouses.	• Community-based guesthouse entrepreneurs. • Tour operators collaborating with communities • NGO's wishing to assist development • Hotel operators
Description	
• Guidance is required to ensure that the development of guesthouses does not adversely impact the surrounding environment either through consumption of resources or through production of waste. Lacking community waste management services, guesthouses must be responsible for their own waste management. • The guidelines should include methods to save water, harvest rainwater, and re-use grey water. The primary focus for the guidelines is the small operator, but the concepts should be stressed for any new hotel or tourism development, especially those that will be developing extensive gardens. • The core objective is to ensure that the guesthouses are environment-friendly and the guidelines provide the basic requirements for improved overall hygiene and waste management. • As part of a national intervention, standards are set and the guesthouses become part of a larger marketing effort. By promoting the concept of Timor Leste Guesthouses there is a standard for the type of accommodation and visitors know what they can expect. • Guesthouses that have followed the guidelines or participated in training to support implementation of the guidelines can be included in NDT promotional material. • Linkages with other responsible tourism initiatives such as the Wild Asia Responsible Tourism (RT) check-list	
Private sector participation	
Local communities, Village-based entrepreneurs, Tour operators in collaboration with local villages, Hotels	
Indicators	
♦ Number of guesthouses included in the training or implementing the guidelines ♦ Visitor satisfaction of service. ♦ Guesthouse Scoring on the Wild Asia RT assessment	
Term and duration	
Short-term -development of guidelines and brochures Medium and long term. –Continuation of programme as an on-going action. Training sessions on implementation.	
Budget	
Initial guideline publication -USD 15,000 Subsequent training programme -USD 10 - 20,000 each year (depending on numbers of participants)	

Coordination of Environmental Concerns in Development	Ref: ENV-02

Objective	Target
• To ensure that environmental concerns are considered during planning and planning approval. • To identify the environmental and tourism assets and ensure these are adequately protected and managed. • To provide prospective investors with the full details of the environmental requirements they need to fulfill. • To ensure that development is environmentally and economically sustainable	• Institute of Trade and Investment (Prime Minister's Office); • Directorate of Urban Planning (Secretary of State of Central Planning, also under the Prime Minister's Office); and • Directorate of Environment (Secretary of State of Central Planning, also under the Prime Minister's Office).

Description

- In general, the laws are well considered and provide adequate mandate for the responsible agencies for planning and for environmental protection.
- There is a need to review the sequencing of the approval process for new investments to ensure that there is sufficient emphasis given to the existing and proposed environmental requirements and laws prior to the granting investment approval.
- The GERTiL urban master plans and laws that will go along with the plans should form the guiding regulations for planning for the rest of the country.
- Environmentally sensitive areas such as national parks, other protected areas and watersheds to be included in the planning process. From a tourism perspective, maintaining the quality of the environment is of paramount importance, especially if this is to be the main selling point for TL.
- Potential investors should be directed to refer to the existing urban development plans and regulations as well as the requirements for EIAs and any other stipulations. The sequence of this process is important and should come before project approval so that any measures required as a result of the Environmental Impact Assessment (EIA) can be incorporated in the final costing of the development.
- This type of technical input is vital so that sound, well-informed political decisions can then be made. In the absence of this information, decisions will be based on other agendas

Private sector participation

Investors

Developers

Indicators

- ♦ Developments follow the Urban Master Plan
- ♦ EIAs are completed before investment approvals are granted
- ♦ Protected areas are recognised and incorporated into regional plans

Term and duration

Short-term -Procedural change in approval sequence
Medium and long term. –Continuation of process for coordination of planning and development.

Budget

Short term - Procedural changes only. Involvement of key agencies in process

Support to Management of Protected Areas	Ref: ENV-03

Objective	Target
• To establish the boundaries of the protected areas so that management plans can be prepared for each • To include tourism as an integrated component of the management planning process • To support the institutional strengthening and capacity building for managing protected areas • To promote the private sector's involvement in the protection of natural resources	• National Parks Division under the Directorate for Forests • The Directorate for Fisheries • The National Directorate of Tourism

Description

- The current protected area network provides good coverage for protection of the important natural resources in Timor Leste.
- The directorates have the legislation providing them the mandate for management of protected areas, but need considerable capacity strengthening and hands-on practical training for staff involved in the management.
- The Joint Patrol Development Authority (JPDA), should include a tourism component as well as involving the local dive and fishing charter operators to enlist the help and cooperation of the private sector agencies that rely on the health of the resources
- Sufficient resources are required for equipment and logistics as well as for training of staff to be able to set management objectives and prepare plans to achieve these.
- Proposed pilot projects in areas incorporating villages in the protected area management process require tourism participation and input. Villages proposed; Batugade in Bobonaro district, Biqueli on Atauro island, Tutuala and villages near Conis Santana.
- Priority protected areas:
  - Jaco-Tutuala area (including the Conis Santana),
  - Atauro Marine protected area and Manucoco,
  - Christo Rei,
  - Tata Mailan Mountain
  - Mundo Perdido and
  - Matebian

Private sector participation

Communities living adjacent to the protected areas

Tour operators (ATTL or similar associations)

Developers

Indicators

♦ Capacity to manage protected areas ♦ Master Plans developed for key protected areas ♦ Communities are part of the planning process ♦ Protected areas are recognised and incorporated into regional plans ♦ Tourism contributions to conservation management
Term and duration
Short-term -Support to training of Protected Area staff to manage protected areas Medium and long term. –-Support for continued involvement of villages in PA planning, development and management process
Budget
Mainly in-kind: Support to Directorate of Fisheries and Forestry Budgets Technical Inputs to training curriculum Provision of NDT staff for training (both as student and facilitator)

Support to Studies and Environmental Education	Ref: ENV-04
Objective	**Target**
• To encourage continued research and studies to better understand the country's resources • To ensure that the information base is expanded and coordinated between agencies • To use the information gathered for local and village level education regarding the environment	• National Directorates for Fisheries and Forestry • National Directorate for Tourism

Description

- Timor Leste's natural resources (both marine and terrestrial) have not been well documented and there is a need to continue to build on the existing information base.
- A number of studies are planned to develop an Coastal and Marine Ecotourism Strategy for northern Timor Leste. This strategy will build upon existing tourism and ecotourism planning activities (such as the Gertil and WTO activities) and also, significantly, provide the basis for an ecotourism management framework for the proposed Nino Conis Santana National Park (including the proposed marine extension of the park, Timor's first Marine Park).
- Support to these efforts is important as they underpin conservation planning and sustainable management of community-based, ecotourism and marine resource development activities in the region.
- Further, any other studies or interventions should be coordinated with these efforts
- Coordination of the results of the studies through the Ministry of Agriculture Forestry and Fisheries is required to ensure that future studies are directed towards the conservation needs.
- The information gathered in the studies can also be used to develop environmental education materials for the public, specifically targeting the mobile workforce in Timor Leste as well as the communities.

Private sector participation

Northern Territories / James Cooke University

Charles Darwin University

Environmental NGOs involved with research

Indicators

- ♦ Library resources of studies
- ♦ Use of research for PA management
- ♦ Use of study results for education programmes

Term and duration

Short-term -

Budget

Short term –

Souvenir and Handicraft Development	Ref: ENV-05
Objective	**Target**
• To encourage the development of a sustainable handicrafts industry • To educate and inform the consumer regarding their environmental responsibility • To educate the local communities regarding the importance of Timor Lest environment	• Communities • Handicraft-buying public

Description

- The sale of coral and other marine products such as turtle shell for souvenirs needs to be stopped.
- This requires an education campaign targeted at both the consumer and the supplier. The tourists as well as all the foreign workers in Timor Leste have to be informed and educated on the items that are not appropriate (or illegal) as souvenirs.
- Support for the development of quality handicraft and souvenir items needs to be pursued so that the communities have other potential sources of income.
- This includes support for the development of supply chains from the producers to the markets for Timor Leste weaving and handicrafts.

Private sector participation

NGO's working with village development

LAHO

Private sector retail

Tour operators

Indicators

- ♦ No sale of coral or turtle shell
- ♦ Range of Timor Leste handicraft items
- ♦ Education materials (posters, brochures) on acceptable handicraft items

Term and duration

Short-term -Development of education materials
Medium and long term. –Development of handicraft industry.

Budget

Short term – 1000 posters -USD 1000
Medium to Long -support to development of handicraft industry (e.g. LAHO) USD 30,000 per year

Reef monitoring and responsible use — Ref: ENV-06

Objective	Target
• To develop a set of guidelines or codes of conduct for responsible reef use • To develop a reef monitoring system that can be used to monitor the overall health of the country's reefs • To involve communities in the management and responsible use of the reefs.	• Directorate of Fisheries

Description

- The dive companies involved with marine-based tourism rely on the health of the resource and should be involved as stakeholders in the process of managing these resources. An important aspect of this is having guidelines or codes of conduct for handling snorkeling and diving tourism on reefs.
- Recognising that in general, the dive companies already have codes of conduct; with the contribution of the dive industry the guidelines would serve to establish national guidelines for use of the marine and reef resources.
- The dive operators and local divers should be involved in monitoring to provide information on the condition of the reefs and the activities taking place. The information gathered should be used to support management decisions or to monitor effectiveness of measures employed to achieve management goals.
- Education programmes for the public and the industry on the importance of the reefs should be initiated to provide avenues for cooperation on management of these resources.
- Establishing permanent moorings that are maintained by the local villages will provide some income to the village, prevent potential anchor damage to the reef and instill a sense of resource ownership in the village. Support for this would be required from the Directorate of Fisheries to establish the moorings and provide community education programmes. The private sector involvement in this is vital.

Private sector participation

- Dive operators
- Public divers
- Communities using the reefs

Indicators

- ♦ National guideline for responsible reef use
- ♦ Reef Watch or similar monitoring programme with contributions from private sector
- ♦ Annual state of the reef report
- ♦ Community involvement in reef monitoring and management

Term and duration

Short-term -Development of responsible reef use guidelines
-Initiation of reef monitoring programme
-Education programme and materials for reef management
Medium and long term. –Continuation of monitoring.

Budget

Short term –
-Development of Guidelines -USD 15,000
-Workshop for monitoring -USD 11,000
-Education programme -USD 20,000

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Appendix One: Responsible Reef Practices[2]

Responsible Reef Practices for Snorkelling

- Include snorkeling best practices in operational procedures and manuals.
- Brief your clients thoroughly before they enter the water – include information on the correct use of equipment, snorkelling areas, potential hazards, rules, appropriate behaviour, and information on local marine life. Keep briefing clear and simple such as 'Avoid touching coral, not only could you damage it but some may hurt you'.
- Review your briefings regularly to ensure the information is up-to-date.
- Enhance your clients' reef snorkelling experience by providing onboard interpretation (such as posters, brochures, displays, guided tours, presentations, and videos) on snorkelling, marine life and reef World Heritage values.
- Be aware of your clients' countries of origin and, where possible, provide written interpretive material in appropriate languages.
- Keep the snorkel group sizes small.
- Monitor the wildlife and coral cover at your snorkelling sites to detect any environmental changes.
- Conduct environmental risk assessments for all sites.

Instruct clients to

- Practise at first over sand patches and away from the coral:
  - Get comfortable with buoyancy control and finning techniques.
  - Be mindful of where their fins are to avoid accidentally hitting the reef or stirring up sand.
- Snorkel carefully near the Reef:
  - Move slowly and deliberately in the water, relax and take their time – to remain horizontal in the water, and refrain from standing up.
  - Avoid snorkelling into areas where the water is less than one metre deep.

[2] Adapted from: Great Barrier Reef Management, Queensland, Australia

    - Avoid touching the walls of semi-confined areas (for example, small swim throughs and overhangs), never squeeze through a small area.
    - Use rest stations or other flotation aids (for example, float lines, mermaid lines, swimming noodles, and flotation vests) if they need to rest while snorkelling.
    - Avoid leaning on, holding onto, or touching any part of the reef or moving animals when taking underwater photographs.
- Be mindful of all marine life:
    - Avoid making sudden or loud noises underwater.
    - Avoid chasing or attempting to ride or grab free-swimming animals (such as turtles, whales, and sea snakes). Avoid blocking their path or making them change direction.
    - Avoid touching or relocating any animals or plants – even consider not wearing gloves as an incentive not to touch.
    - Stay more than one metre away from giant clams.
    - Avoid feeding fish.
    - Avoid collecting any shells or ‘souvenirs’.

Responsible Reef Practices for Diving

In general

- Enhance the quality of your client’s dive experience by educating them about the environment they’ll visit.
- Brief divers on responsible reef practices, proper behaviour, rules of the reef, and information about the local marine life – review these briefings regularly to ensure that you are providing up-to-date information.
- Prepare your divers for their world heritage experience - provide onboard interpretation (for example, posters, brochures, displays, guided tours, presentations, and videos) on diving, marine life and GBR world heritage values.
- Include responsible reef practices in your operational procedures and manuals.

Preparing for a dive

- Keep dive group sizes small (6 or less people).
- Provide written material in different languages as required.
- Make sure everyone is properly weighted before diving near a reef.
- Check that all the divers have secured their dive gear before they get into the water so that it doesn't dangle and catch on the reef.
- Give adequate instruction on best buoyancy practices - check new divers for proper buoyancy before they get close to the reef.
- Practice buoyancy control over sand patches before approaching a reef - test buoyancy whenever you're using new equipment such as new wetsuits, BCDs, and cameras.
- Stay more than two metres from the reef if you're kneeling in sand patches during training sessions.
- Train staff in environmental awareness, interpretation, rules and regulations, best practices and incident reporting.
- Dive instructors should keep a close vigilance over divers.
- Monitor the wildlife and coral cover at your dive sites and participate in reef monitoring programs to measure impacts or environmental changes.
- Conduct Environmental Risk Assessments for scuba diving activities at all sites.

Instruct clients to

- Move slowly and deliberately in the water, relax and take their time – relax and avoid rapid changes in direction.
- Avoid making sudden or loud noises underwater.
- Avoid leaning on, holding onto, or touching any part of the reef. This needs to be especially emphasised for clients taking underwater photographs.
- Avoid touching the walls of semi-confined areas (for example, small swim throughs or overhangs) – never squeeze through a small area.
- Avoid kicking up and disturbing the sand, if they're over a sandy area.
- Avoid touching any animals or plants.
- Avoid feeding fish.
- Stay more than one metre away from giant clams.

- Keep clear of free-swimming animals (such as turtles, whales, and sea snakes). In particular, they must not chase, ride, grab or block the path of these animals.
- Consider not wearing gloves (unless they're required for safety reasons) as they are less likely to touch the coral.
- Avoid collecting any shells, coral or 'souvenirs'.
- Avoid relocating any marine life - particularly when taking photos and filming.
- Collect all litter from the Reef, even that which is not theirs.

Marine Parks Legal Requirements

- You must not damage, collect or otherwise 'take' coral, including dead coral, and protected shell species (e.g. triton snail, giant clam) in the Marine Park. Note: 'Take' includes removing, gathering, killing or interfering with, or attempting to take. There may be special arrangements for Traditional Owners.
- You must not approach closer than 30 metres to a whale or dolphin if you are in the water. If a whale or dolphin approaches you while you are in the water, move slowly away, do not touch or swim towards it.

Appendix Two: Visitor Carrying Capacity Guidelines

VISITOR CARRYING CAPACITY GUIDELINES[3]

National parks and protected areas have a primary conservation role as well as a role to fulfill in providing areas for recreation. Management of these areas must ensure that the designated locations are able to (a) provide opportunities for quality outdoor recreation experiences, and (b) preserve representative and unique natural areas of the state.

Deterioration of recreation sites through normal use can be minimized provided visitor service design is sensitive to the plant communities of the recreational area. Some plant communities are significantly more tolerant of man's presence than others. To assure the consideration of these factors, it is helpful to map plant communities existing at each site. This, coupled with analysis of plant communities' characteristics should insure selection of the best available site, which in turn will minimize the degree of deterioration from normal use.

Other factors, such as wildlife, soils, topography, and hydrology, should also be considered during the site planning process. Plant communities, once identified, suggest the soil makeup and animals, which will be found at the site, but geology and hydrology should be considered separately.

Plant Community Limitations

Wherever possible, use sites should be located in communities and on terrain resistant to trampling. Similarly, communities are considered to be rare or endangered, should be avoided. These areas best serve the public in scenic, interpretive, and biological research categories.

In some instances, planners are faced with the dilemma of not having a stable community in which to place a use site. In areas which do not possess suitable plant communities, and yet some degree of use is determined desirable, the degree of development and corresponding intensity of use should be low.

Additional biological factors must be considered during the initial planning. Early field investigations for the purpose of inventorying plant communities, will provide such information.

Overcrowding and Site Deterioration

Carrying capacities -limitations on the number of persons to use each site at a given time- can protect users' experiences by preventing overcrowding which

[3] Adapted From: Florida Department Of Environmental Protection; Division Of Recreation And Parks

(a) causes deterioration of the natural attribute of each use site and (b) impedes each user's ability to move freely and to fully enjoy the natural setting without undue distraction.

Optimum Carrying Capacities for Users

The carrying capacities determined by these guidelines should be followed in the preparation of site plans for new use sites and for authorized alterations of existing use sites. The applicable carrying capacity for a given use site also governs the number of parking spaces, the size of restrooms, and all quantities of support facilities to be provided.

Carrying capacity computations are vital to planning of new use sites and continuous management of all areas of the system, to prevent overcrowding and resource deterioration. The estimated optimum carrying capacity should be included in each approved park unit management plan. This estimate should be evaluated and revised, as needed, as part of the periodic unit management plan update procedure

OPTIMUM CARRYING CAPACITY FOR OUTDOOR RECREATION ACTIVITIES: LAND-BASED ACTIVITIES

Recreation Activity	**Required Land Base**	**Area Requirements**	**People/Unit of Facility**	**Turnover Rate**
Camping Hike-in	10-50 acres/site	Sites clustered to a maximum of 4 sites/acre	4/site	1/day
Camping Short-walk, Tent	2-10 acres/site	3-8 sites/acre	4/site	1/day
Camping Limited Facility	1-5 acres/site	3-8 sites/acre	4/site	1/day
Camping Standard Facility	1-3 acres/site	3-10 sites/acre	8/site	1/day
Camping Groups	20-50 acres/area	5-20 acres/area	10-30/site	1/day
Camping Cabins	1-3 acres/cabin	2-6/acre	4-12/cabin	1/day
Amphitheater/Campfire	1-2 acres/facility	1/4-1/2 acre/facility	1/2 camping	1/daycapacity
Museum/Visitor Center	1-5 acres/structure	1/4-1/2 acre/structure	1/20 sq. ft.	4/day
Picnicking	1/4-4 acres/site of exhibit area	8-15 tables/acre	4/table	2/day
Trails General Hiking (Nature Trails)	min. of 25 acres/mile of trail, max. length 1 mile	5-20 groups/mile	2/group	4/day
Primitive Hiking	min. of 100 acres/mile of trail, min. length 1 mile	1-5 groups/mile	2/group	2/day
Bicycle	min. of 25 acres/mile of trail	10-20 bikes/lane/mile	1/bike	4/day

OPTIMUM CARRYING CAPACITY FOR OUTDOOR RECREATION ACTIVITIES WATER-BASED ACTIVITIES

Recreation Activity	**Required Water/Land Base**	**Area Requirements**	**People/Unit of Facility**	**Turnover of Rate**
Swimming	min. 1/8 acre of land/ swimmer	50-200 sq. ft. of water and 200-500 sq. ft. of beach/swimmer		2/day
Fishing Shoreline	min. 1/4 mile of shoreline for a fishing area and 1/8 acre of land/fisherman	1 fisherman/20-100 linear feet		2/day
Jetty Pier	min. 1/8 acre of land/ fisherman	1 fisherman/10-40 linear feet		2/day
Boating Limited Power (10 HP or less)	min. 200 acres of water and 1/4 acre of land/boat of water	1 boat/5-10 acres	2/boat	2/day
Unlimited Power	min. 600 acres of water and 1/4 acre of land/boat	1 boat/10-20 acres of water	4/boat	1/day
Sailing	min. 200 acres of water and1/4 acre of land/boat	1 boat/5-10 acres of water	2/boat	2/day
No Power, Still Water	min. 50 acres of water and 1/4 acre of land/boat	1 boat/5-10 acres of water	2/boat	2/day