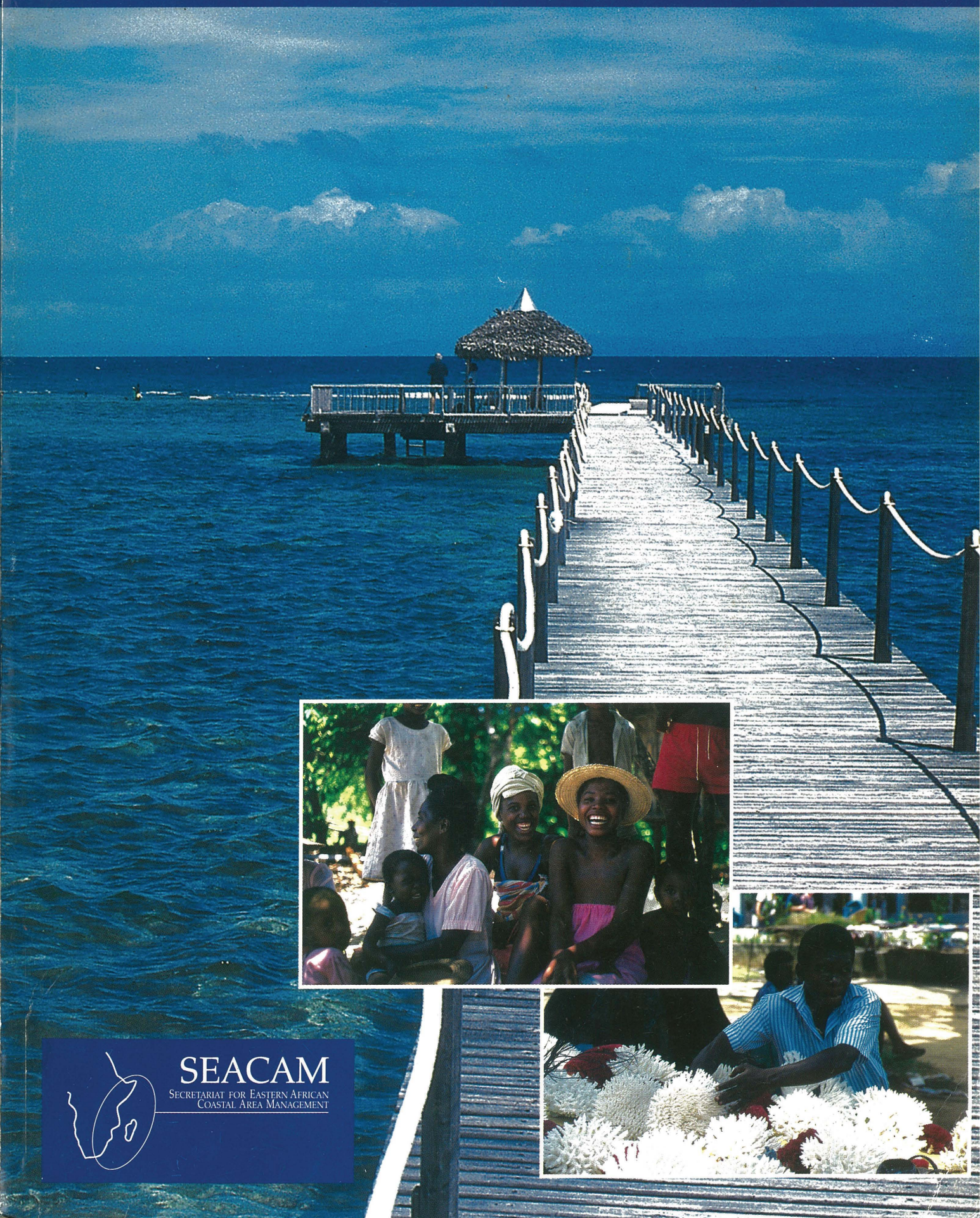
guidelines for the

ENVIRONMENTAL ASSESSMENT OF COASTAL TOURISM



SEACAM
Secretariat for Eastern African Coastal Area Management

guidelines for the

Environmental Assessment of Coastal Tourism

An Environmental Assessment (EA) manual to assist government agencies, tourism developers, non-governmental organisations (NGOs) and community organisations.

Neil Grange and Francois Odendaal

Eco-Africa Environmental Consultants

with support from

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Published by: The Secretariat for Eastern African Coastal Area Management.

Cover photographs by:
Claudia Velasquez / Neil Grange

Cover design and layout by:
CopyCat Communications, 6 Milton Road, Observatory, 7925, South Africa

Available from:
The Secretariat for Eastern African Coastal Area Management (SEACAM)
Caixa Postal 4220, 874 Av. Amilcar Cabral, Maputo, Mozambique, Tel: 258 1 300641/2
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The Guidelines for Environmental Assessment of Coastal Tourism were compiled from an extensive review of published guidelines for the region as well as selected publications from other parts of the world. Where there were gaps, the authors also relied on their own experience in the field. The composite guidelines do not represent an academic treatment of the subject; the emphasis is on their usefulness and relevance to the East African coastal countries and island states of the Western Indian Ocean.

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Acknowledgements

The authors would like to express their gratitude to the many individuals who contributed to the preparation of this document and the SEACAM Environmental Assessment of Coastal Tourism Training Courses held at the West Coast National Park (South Africa) and Ile St. Marie (Madagascar). They are:

The participants of the two training courses for country reports, valuable feedback on draft stages of the guidelines and other information provided:

Yassiem Mohammed, Esther Kerario, Suleiman Nasser, Abdulrahman Issa, BAJ Mwandotto, Jacqueline Kiage, Francis Nkako, Fernando Conta, Hiuane Abacar, Tsudisa !Gonteb, Joseph Stephanus, Johann Kotze, Peet Joubert, Pierre van Dalen, Luthando Maphasa, Alex Wood, Vusi Mhlongo, Vuyani Mosela, Mario Leshoro, Barney Theresine, Marc Nicette, Selwyn Manes, Marie-Jorge Fabien, Bicarima Ali, Hachime Abderemane, Said Djaffar, Rajiv Beedassy, Eddy Seenyen, Venee Kowlessur, Tsialonina Rasolofoniaina, Jean Charles Piso, Chantal Andrianarivo, Laurence Duband, Vololoniaina Jeannoda, Josoa Razafindretsa, Andreas Randrianjafisolo and Chaplain Tsiadino;

The SEACAM Training Course co-trainers, Martine Delmas-Ferre (Societe Impact, Mauritius) and Jacqueline Rakotoarisoa (National Association for Management of Protected Areas (ANGAP), Madagascar);

The authors of the country reports commissioned by PRE-COI (Programme Régional Environnement – Commission de l'Océan Indien); Nasser Eddine Said Ali and Sitti Attoumani (Comoros), Martine Delmas-Ferre (Seychelles and Mauritius) and Victoire Andriatahiana (Madagascar);

David Conlin (Department: Naval Historical Center/Underwater Archaelology, United States Navy, USA) and Stephen Lubkemann (Department of Anthropology, Brown University, Rhode Island, USA) for writing sections on coastal cultural resources and underwater archaeology;

Abdulrahman Issa of the IUCN for providing information on East African countries and facilitating contact with regional role-players;

Hayley Rodkin (Eco-Africa Environmental Consultants) for contributions to Chapter 5;

Merle Sowman and Janet Bodenstein (Environmental Evaluation Unit, University of Cape Town, South Africa) and Sean Schneier (Sub-directorate: Coastal Zone Management, Department of Environmental Affairs and Tourism, South Africa) for their reviews of draft stages of the document; and,

SEACAM - David Moffat, Custodio Voabil, Jeronimo Tamele and Sten Engdahl for facilitating the preparation of the document, contributing information and reviewing the document.

CHAPTER 1

GENERAL INTRODUCTION

Summary

The introductory chapter provides a brief overview of the importance of the tourism sector in East Africa and the Western Indian Ocean and emphasises the need to optimise the development potential of the sector by maximising benefits whilst reducing impacts. The concept of sustainable tourism is introduced as well as the importance of understanding sustainable development in the context of its various sub-components, including; the economic, environmental and social characteristics. The chapter outlines the role of SEACAM in commissioning the present guidelines document, the approach adopted by the authors in compiling the guidelines, the context in which they should be used and concludes with an overview of subsequent chapters.

1.1. Background

Tourism is the fastest growing industry in the world. Increasingly, countries and regions are turning to tourism as a viable option for economic development. Today tourism provides the main income of many countries who have organised themselves to derive maximum benefit from the industry. East African countries and Western Indian Ocean island states have much to offer in terms of tourism. The beauty of their beaches, favourable climate, the unique biological and cultural diversity and frequently favourable exchange rates all add to their attraction for the foreign tourist. The question is not whether tourism potential exists for these countries but how it should be optimised. This means that tourism development and activities need to be structured in such a manner that benefits are maximised and negative influences are minimised. This is a challenge indeed, since tourism is a holistic industry that includes many other sectors, its positive and negative impacts are highly varied and often difficult to balance.

The diversity of tourism's impacts may be simplified by grouping them into three main categories: economic, environmental and social. These divisions are created for pragmatic and analytical purposes; in real life the situation is more complex because these divisions overlap significantly and considerable interactions exist between them. It is therefore important that anyone involved in the tourism industry be trained not only to understand the industry's inner workings but also the diversity and vastness of its impacts on all facets of the environment. This is especially true for countries whose attractions are primarily natural, or cultural-historically-based, and where pristine environments and preserved history carry the highest premium, such as in the countries situated along the Eastern African coast and the island states.

Guidelines for the Environmental Assessment of Coastal Tourism can play an important role in steering the development of tourism in the right direction. The guidelines should also be applied across as broad a region as possible, particularly if the region consists of countries that experience similar challenges and are functionally linked in terms of marketing and resources. Sustainable tourism will be

greatly promoted if the region's countries support the same guidelines and if they are applied as uniformly as possible across the region.

1.2. Drawing up Guidelines for the Region

The Secretariat for Eastern African Coastal Area Management (SEACAM) commissioned *Eco-Africa Environmental Consultants (EAEC) to* review existing guidelines, best practises and lessons learned, and to assess their relevance to the Region. *EAEC* contacted as many of the role players in the region as possible for input into the existing process, and conducted a wider search across the developing countries in the world. The *composite* guidelines contained in this document are a compilation of guidelines to which the consultants had access as well as other information and their own experience.

The next step in the process was to work through the guidelines during two training seminars attended by participants from the representative countries. The first training seminar was held from October 12-16, 1998, at the West Coast National Park in South Africa and attended by participants from South Africa, Mozambique, Tanzania, Kenya and Namibia. The second training course was held from March 21-28, 1999, on Ile St Marie, Madagascar, and was attended by participants from Madagascar, Comoros, Mauritius, the Seychelles and Reunion. Participants contributed considerably from their own experiences to make the guidelines relevant to the region.

1.3. The Purpose of the Guidelines

The main purpose of the guidelines is to provide a tool for responsible tourism development in the Region. They do not represent an academic review[1], but instead were drawn up to be useful specifically in terms of:

- Identifying, managing and mitigating the impacts of tourism developments on the environment and cultural resources in the coastal areas;
- Proposing measures that can be taken by government agencies, developers, NGOs and communities for the prevention or mitigation of environmental problems and for the enhancement of environmental assets for tourism;
- Providing general EA methodologies as well as technical guidelines on the management of coastal tourism development;
- Recommending policies that will successfully integrate development and conservation in coastal tourism planning and implementation;
- The degree to which they can be implemented and practical suggestions of how this can be accomplished;
- Providing a basis for the development of more country-specific guidelines.

1.4. Who Should Use the Guidelines

The guidelines are presented as a hands-on, technical manual with supporting background information designed for use by:

- **Government regulatory agencies** to assist in the formulation of regional and local tourism planning and maintain a balance between tourism development and

[1] Publications that were used in drawing up the guidelines are listed in the bibliography at the end of the document.

conservation priorities, as well as to manage the impacts of proposed tourism development projects;

- **Tourism developers** to recognise potential negative impacts of proposed developments and to provide them with practical, cost-effective measures to reduce the impacts and enhance benefits;
- **NGOs and community organisations** to build their capacity to assess the environmental and social impacts of tourism developments and government policies in the tourism sector.

1.5. The Limitations of the Guidelines

The guidelines deal specifically with *environmental assessment* of tourism development. In this regard it is important to recognise that there is a clear distinction between planning for individual tourism projects and planning for tourism *per se*. The guidelines pertain mostly to the former, yet it is *overall tourism planning* for a region or country (which includes EA guidelines as a tool) that will largely determine the outcomes of tourism development. Tourism policy and overall planning (or *lack* of planning) will influence many aspects of tourism development, from the *type* and *number* of tourists to precisely how the industry fits into the overall development objectives of a region or country. Therefore, tourism EA guidelines should be viewed as *a practical tool* that is particularly effective in the wider context of overall planning. To achieve their maximum usefulness, care should be exercised to integrate the guidelines into national and regional planning.

In coastal areas in particular, tourism development should be firmly locked into an extensive Integrated Coastal Zone Management (ICZM) Plan. However, not all countries represented on the Secretariat have cohesive tourism policies and/or ICZM Plans. Such policy frameworks and management systems will require some time to develop. Tourism development is unlikely to slow down and wait until they are in place. In the meantime, the guidelines, if properly applied, can play an important role in mitigating many of the negative effects of tourism development. To increase their usefulness it is important that appropriate people be trained in their application. Institutional capacity needs to be built to enforce them and programs must be put in place to educate the broader population in sustainable tourism practises.

1.6. How to Use the Guidelines

At the core of the manual lie the technical guidelines (Chapters 5 and 6). To promote their usefulness, however, they are preceded by a short treatment of the coastal environment and its characteristics. Certain aspects of tourism development that relate to EA guidelines are also covered briefly. This background information is cognisant of the complexity of coastal environments and regional variation across the countries represented. It is therefore recommended that the entire manual is worked through at training seminars and made available to coastal players who may not have substantial background information on the basic characteristics of coastal environments.

Chapter 2 provides a general assessment of tourism trends in Eastern African countries and Western Indian Ocean island states and briefly discusses economic, environmental and social and cultural dimensions of tourism development;

Chapter 3 discusses environmental components found in the coastal zone. A basic understanding of different coastal environments is necessary for their interpretation;

Chapter 4 specifically deals with the economic, social and environmental impacts of tourism in the coastal regions;

Chapter 5 focuses on aspects of the *environmental assessment* of tourism, including project cycles, impact assessment, institutional involvement and specific techniques;

Chapter 6 provides technical guidelines and quality standards for tourism development in coastal areas.

CHAPTER 2

TOURISM IN EAST AFRICA AND THE WESTERN INDIAN OCEAN ISLANDS

Summary

Chapter 2 starts with a brief overview of countries represented in SEACAM and highlights the applicability of generic guidelines due to the similarity of impacts associated with tourism development, notwithstanding the diverse character of each country with respect to their cultural, historical and environmental attributes. This recognises that it is the intensity of impacts that vary from one country to another rather than the nature of the impacts. The chapter provides a brief overview of common tourism activities and outlines issues in tourism that relate to the principles of sustainable development. This includes a treatment of the types of tourism and tourism numbers and the concept of carrying capacity as a management tool to address sustainable development. The chapter concludes with an overview of the broader context of planning and management within the coastal zone and frameworks within which tourism development is considered.

2.1. Introduction

The countries encompassed by the guidelines are located in a broad geographic region that comprises the Eastern African coast and the Western Indian Ocean islands (Figure 1). The following countries are included:

The Eastern African coast: Eritrea, Kenya, Mozambique, Tanzania, South Africa

Western Indian Ocean: Comoros, Madagascar, Mauritius, Seychelles and Reunion

These countries represent one of the most alluring corners of the world. Unlike Africa's Atlantic coast which is frequently battered by storms and enormous surges, the Eastern African coast and Western Indian Ocean experience relatively calm conditions throughout much of the year, with monsoons and storms somewhat restricted seasonally. The clear, warm tropical waters, the white sandy beaches and the beautiful coral reefs along these coasts epitomise paradise in the tropics and draw travellers from all over the world. The desert coastlines on either side of the Red Sea feature some of the richest coral reefs in the world. Further south, the coral reefs extend from Kenya to the tropic of Capricorn (which runs through southern Mozambique) and are well represented around most of the oceanic islands. An incredible eighteen marine mammal species have been listed to occur in the Mozambique Channel alone. They include some eight species each of dolphins and whales, several seal species and the dugong.

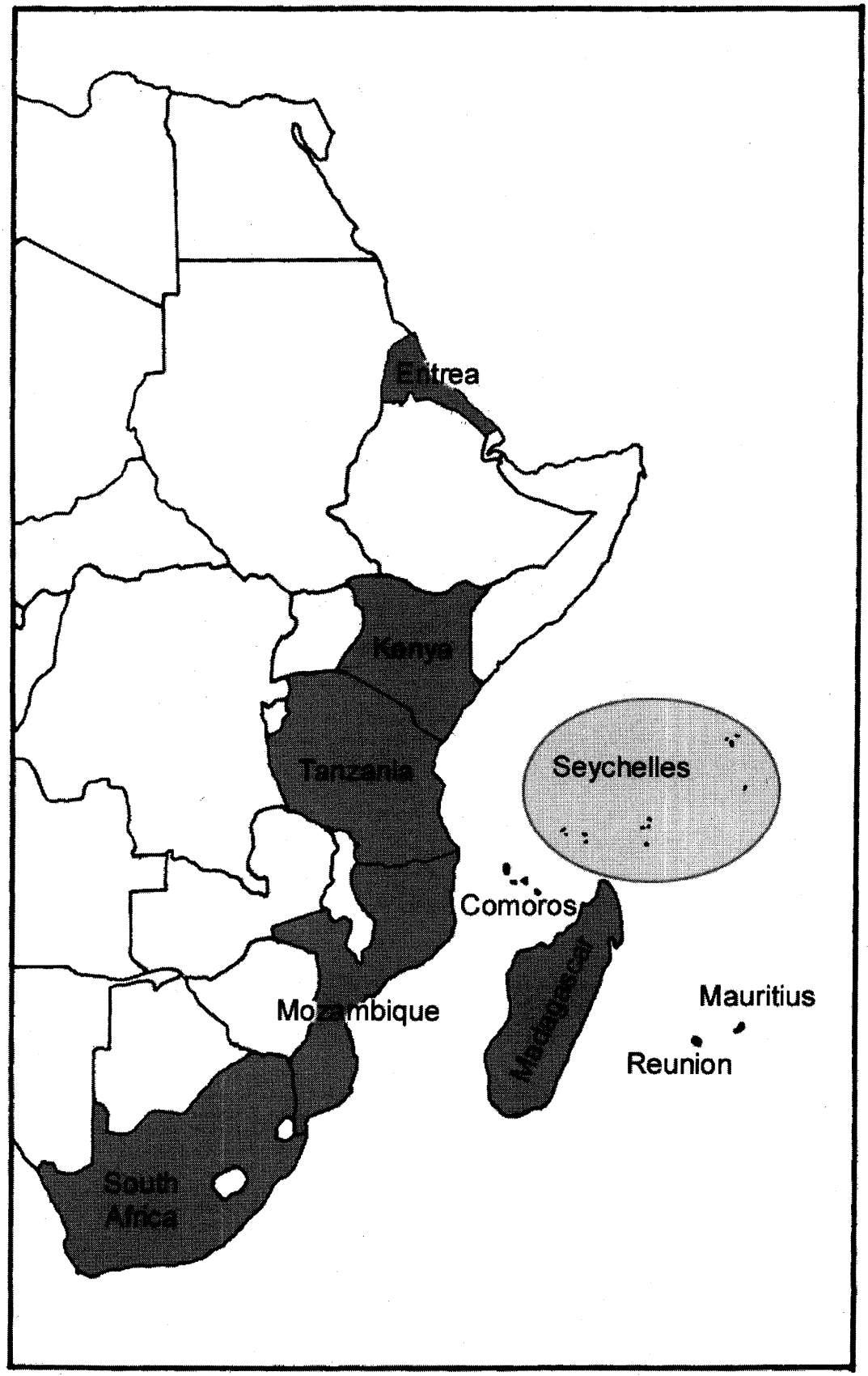

Figure 1. The countries represented in SEACAM.[2]

[2] The boundaries shown on this map do not imply, on the part of the authors, any judgement on the legal status of any territory, or any endorsement or acceptance of such boundaries.

2.2. Trends in Coastal Tourism in East Africa

Each country differs in terms of its tourism development. However, from the available information, and discussions with experts in the region and participants at the Tourism EA Training Courses, it is clear that most countries have the following in common:

- Tourism is rising sharply, and is increasingly viewed as an important economic opportunity at local, regional and national levels;
- Tourism has already shown a range of negative impacts on the environment and society, and there is a growing realisation that the impacts by the industry should be regulated;
- The practise of environmental assessment has started in almost all countries, but in most of them is in its infancy. Capacity to conduct environmental assessment is low.

To make generalisations on individual countries is difficult. In some cases, meaningful tourism statistics are difficult to obtain. For many countries, there is not a clear separation between overall tourism statistics and those pertaining to coastal regions. Data were obtained from country participants, the World Tourism Organisation (WTO), and in-country tourism offices (including internet websites). The short country descriptions below were modified with the help of participants attending the Tourism EA Training Courses.

South Africa

South Africa has a great diversity of tourism attractions and activities to offer, in part because of a climatically varied coastal zone. Furthermore, inland and coastal tourism activities are often integrated as a result of good infrastructure and a variety of nearby inland attractions and national and provincial parks. Various sets of environmental assessment guidelines exist, but the degree to which they are applied is uneven and depends on the realities that govern a particular section of the coast. Industrial development and high volume tourism have made an enormous impact on parts of the coast. There are plenty of examples of virtually every imaginable type of tourism impact on the environment, including the destruction of coastal wetlands and other sensitive environments, organic pollution and cultural erosion. A coastal management policy programme is currently in development by the Department of Environmental Affairs and Tourism (DEA&T). Tourism policy initiatives are ongoing at national and provincial level in the hope of mitigating environmental damage and giving the broader population a bigger share of this lucrative resource. South Africa receives over five million foreign visitors per year, and tourism forms 8.2 % of the gross domestic product (GDP).

Mozambique

Mozambique has an attractive tropical coastline that is one of the longest in the region. Since the renewed political stability in the country, tourism has been growing fast. At present, tourism development is hampered by inadequate infrastructure and tourism support services. A development plan for tourism in coastal areas is in place, however, at the present time, there are problems associated with monitoring and auditing due to institutional weaknesses. Many tourism developers are of South African origin. Most casual tourists bring their own equipment and are relatively self-contained, thus bringing in minimal cash into the country while making a large impact

on the environment. The uncontrolled and often illegal activities of tourists are a cause for increasing concern along the Mozambique coastline, as well as the land grabbing that has arisen over the last few years. Integrated coastal zone management is urgently needed. With 70 % of the country's population living along the coast, tourism has the potential to have a large impact on economic development in the country and management tools are being developed accordingly. Over 350 000 visitors enter Mozambique annually.

Tanzania

The coastline of Tanzania is tropical with several well-established tourism destinations such as the islands of Pemba and Zanzibar. The country has numerous historical and cultural attractions. Infrastructure and tourism support services are poor outside the main centres. The industry is largely underpinned by private operators who own boats and have the equipment to operate self-sufficiently. Investment in tourism by outsiders is generally encouraged and tourism development is being planned for several protected areas. Key areas are experiencing three main types of development: resort hotels, guest houses and villas. With increased tourism development, a number of serious problems have surfaced, including[3,4]:

- Ocean disposal of sewage from hotels threatens to undermine the very resources the tourist have come to enjoy;
- Intensification of tourism is leading to increased urbanisation of the coastal zone, and pressure on resources such as safe drinking water and clean bathing beaches is increasing;
- Contamination of seafood has occurred as a result of inadequate sewage treatment prior to disposal;
- The population increase is leading to widespread subsistence farming, resulting in nutrient loading and increased sedimentation in the marine environment;
- Garbage is accumulating on beaches as a result of inadequate waste disposal systems;
- Certain marine resources are being overexploited through, for instance, shell collecting, damage to corals, lobster fishing, destructive diving practises, pilfering of archaeological materials from shipwrecks, and coral destruction by boat anchors.

Changes to the environment in key tourism areas are small compared to what will be occurring in the next two to five years when the large resort hotels currently under construction come into operation.[5] Tanzania receives almost 400 000 visitors per year, and tourism receipts make up about 8.7 % of the gross national product (GNP).

Kenya

Kenya took the lead in Africa by establishing marine protected areas and today there are four marine parks and six marine reserves, which include about 5 % of Kenya's reef areas. Several well-known luxury tourist and fishing resorts exist along the coastline of this country. Tourism has been the main earner of foreign exchange in this country and coastal tourism has accounted for 60-70 % of the total national

[3] See: *Integrated Coastal Zone Management in Tanzania*, Published by The World Bank.
[4] See: *Towards Integrated Management and Sustainable Development of Zanzibar's Coast*, Published by University of Rhode Island's Coastal Resources Center, 1996.
[5] See: *Towards Integrated Management and Sustainable Development of Zanzibar's Coast*, Published by University of Rhode Island's Coastal Resources Center, 1996.

tourism industry.[6] However, recent reports from Kenya indicate that the coastal tourism industry is in a state of near collapse; occupancy rates were reduced to only 30 – 36 % during 1997, and 90 000 employees out of a total of 150 000 lost their jobs.[7] Since tourism is one of the largest employers, threats to its long-term economic sustainability are a serious concern to government and local inhabitants alike. Aside from external reasons for the decline in tourism numbers, sustainability of the industry has been influenced by all of the negative impacts listed in Chapter 4. The main coastal management issues are inadequate planning and unmanaged growth, erosion of the shoreline, degradation of coastal systems, declining water quality and conflicts in coastal uses. The number and diversity of on-the-water recreational activities now poses serious threats to safety, including collision and pollution. Kenya receives about 800 000 visitors per year, and tourism accounts for about 5.1 % of the GNP.

Eritrea

Eritrea's main industries are agriculture, fishing and manufacturing. The fledgling tourism industry is proceeding at a slow pace and largely on an *ad hoc* basis. Several tourism companies operate in this country, mainly from Massawa. The greatest obstacle to tourism development is political instability and poor infrastructure that is almost non-existent in some parts. Tourism facilities are few and far between outside the main centres such as Asmara, Massawa and Keren. The country also lies off most main regional airline routes. The coastline is attractive and over two hundred islands in the Red Sea, including the Dahlak coral islands, are becoming increasingly desirable destinations for the more adventurous travellers. Assab on the Red Sea is the diving centre for this country. Many of these islands are small and sensitive habitats. Competition comes mainly from Israel which has several well-established diving resorts, for example at Eilat. Reliable tourism data has been difficult to obtain for Eritrea, but the World Tourism Organisation (WTO) states that Eritrea has over 400 000 overnight visitors per year. Tourism has, in all probability, dropped off precipitously since war with Ethiopia started in 1998.

Madagascar

Madagascar's infrastructure is weak except for several well-established nodes such as Nosy Be, Ile St. Marie and Toliara. No tourism planning exists for large regions and the industry is relatively new to the more remote parts of the country. Its nature- and culture-based tourism potential is enormous as a result of the many endemic plants and animals and interesting cultures that occur there. Fortunately, government authorities recognise that tourism should be directed to take advantage of these assets. In the past, tourism developments were poorly planned so that the older centres, such as Nosy Be, exhibit all the negative environmental and social impacts listed in this document. Other areas, such as the Masoala Peninsula can become models of ecotourism development, but only if they are steered decisively in that direction. Although Madagascar is an island it is so large that in terms of environmental management it can be treated in the same manner as a mainland state. Although tourism numbers have risen dramatically and will soon reach over 100 000 per year, the tourism industry is in its infancy in a country that has much to

[6] See: *Towards Integrated Management and Sustainable Development of Kenya's Coast*, Published by University of Rhode Island's Coastal Resources Center, 1996.

[7] Kenya Association of Hotel Keepers and Caterers, Statistics for 1997; in; Moffat et al., 1998. The Reality of the Stomach: Coastal Management at the Local Level in Eastern Africa. AMBIO 27(8) 590-598.

offer both inland and along its enormous coastline. Madagascar receives over 80 000 tourists per year[8] and tourism makes up about 1.7 % of the GNP.

Comoros

The Comoros archipelago consists of four small islands situated at the northern end of the Mozambique Channel. Agriculture is the major industry and many inhabitants rely on fishing as a subsistence resource. The islands have a pleasant tropical atmosphere but unfortunately much of the indigenous vegetation and wildlife has been destroyed. Tourism has made a large impact on the island's resources, including the reefs that have been damaged by spearfishing and other unsustainable practises. Pollution is a growing threat. The greatest tourism potential lies in "beach" tourism and the country is known as a package tour destination. Mayotte is a well-developed diving destination and strong competition exists from Mauritius and the Maldives. Trekking, especially on the massive Karthala volcano, and on the comparatively unspoilt Moheli, is also an important attraction. Tourism numbers are rising (about 26 000 tourists visit the Comoros each year) and the industry represents about 9.1 % of the GNP.

Seychelles

The Seychelles consists of about 110 islands, although tourism is concentrated mainly on the granitic islands in the Mahé group and represents the mainstay of the Seychelles economy today. The surface area of the country is very small indeed so that tourism can easily destroy it if not managed properly. Today the country receives over 130 000 tourists per year and the number is increasing fast. The industry makes up more than 20 % of the GNP. Ribbon development dominates sections of the coastal zone on Mahé. Anchor damage to Seychelles reefs by tourist pleasure boats is of increasing concern as well as the insensitive behaviour of recreational divers. Souvenir sales of coral and other marine creatures are a thriving industry. Tourist areas have shown evidence of increased organic pollution and certain hotels have erected structures intended to improve the visual appearance of the environment, causing damage to coral and promoting erosion. The country has a very active tourism department and tourism policies are in preparation that examine carrying capacity and various ways of controlling tourism numbers. High price structures are considered a mechanism to control numbers. Keeping track of tourism numbers is relatively easy as the bulk of tourists enter the country by way of the airport or harbour on Mahé. Coastal zone management is applied at various levels on the different islands. Infrastructure is generally good and the ecotourism potential of the islands is extremely high as the result of a large number of endemic species. The government of the Seychelles is fully aware of its ecotourism potential and spearfishing, for example, has been banned on all of the islands.

Mauritius

Tourism in Mauritius received a major boost in the early 1950's with the stop-over in Mauritius of flights between South Africa and Australia. Today Mauritius is a well-established tourism destination with good infrastructure and a variety of accommodation and services offered to tourists. Over 500 000 tourists visit Mauritius each year and tourism ranks as the third most important industry. The island is largely flat and most areas are easily accessible. Seaside resorts represent the dominant form of tourism and the majority of accommodation is located on the beach

[8] World Tourism Organisation: 1996.

or very close to it. The rapid growth in the tourism sector and urbanisation in general, coupled with limited space availability, poses distinct threats to the environment. Coastal erosion has increased due to seawalls, jetties and other structures built below the high water mark. Ecosystem degradation is apparent due to deteriorating water quality as a result of the increasing quantities of effluent discharged to the lagoons and sea without adequate treatment. The trend towards ribbon development of the coastal zone has degraded the visual appearance of some areas and further restricted public access to the beaches. In view of the need for economic development and the central role of tourism in the economy, it is nonetheless essential that carrying capacity studies are undertaken as a matter of urgency in order to establish the limits to tourism growth in the context of sustainable development.

Réunion

Réunion is an overseas *départmente* of France. The island is mountainous and rugged for the most part with spectacular scenery. Its beautiful natural assets and the fact that it is a safe environment for tourists add to its attraction. Hiking, helicopter tours, deep sea fishing, snorkelling and sightseeing are major components of the tourism industry. Tourism is the country's most important source of foreign income. Tourism is fairly well managed with an emphasis on services, and today there are over fifty hotels to accommodate over 370 000 tourists annually. The objective is to raise the number of tourists to 500 000 by the start of the new millenium. Because of the mountainous terrain, areas suitable for large-scale tourism development are somewhat limited.

2.3. The *Intensity* and *Nature* of Impacts

In spite of their strong biogeographical ties, the coastal states are very diverse in terms of culture and history. They differ in terms of their colonial pasts and contemporary political histories. They experience different levels of developmental constraints and tourism development, although virtually the entire range of potential impacts can be found in all of them. Such factors predestined them to experience different levels of tourism pressures. The question therefore arises as to whether one set of guidelines can be applied to the entire region. The answer is an unequivocal "yes". The reason is that it is the *intensity* of impacts, rather than their *nature*, that alters from one destination to the next, according to a range of characteristics[9] (see Box 1).

The countries encompassed by the guidelines are highly varied in terms of the characteristics that influence the *intensity* of tourism impacts. This is also true for different destinations within a single country. For instance, Madagascar has upmarket seaside resorts on Ile St. Marie and Nosy Be as well as low impact tourism activities and basic structures in other parts of the country. Some areas are highly sensitive culturally while others are not very sensitive at all, etc. National, regional and local tourism policy and marketing can also influence the intensity of impacts across the above range of characteristics, for instance by manipulating the number and/or type of tourists. In spite of all these factors, the proposed guidelines in this document address tourism developments and activities that are found in all of the countries.

[9] See: France, L. (1997). *Sustainable Tourism.* Earthscan Publications Ltd.

Box 1. Destination characteristics influencing the intensity of tourism impacts[10]

1. Size and destination of country or area;
2. Scale and rate of tourism development;
3. Number of tourists;
4. Fragility and sensitivity of the landscape, flora and fauna;
5. Cultural sensitivity and social make-up of the local population;
6. Attitude of the local population;
7. Political environment and stability;
8. Development incentives;
9. Types of tourists;
10. Level of tourism development;
11. Competition from other areas;
12. Physical and economic accessibility;
13. Degree of foreign ownership;
14. Employment of non-indigenous labour;
15. Government provision of infrastructure and services;
16. Nature and attractiveness of tourism facilities;
17. Level of economic development of the area;
18. Whether the area is rural or urban.

2.4. Tourism Developments and Activities

The Tourism EA guidelines attempt to encompass the entire range of potential developments and activities that may occur in the member countries and different destinations within these countries. They should, however, be flexible enough to allow for country, regional and site-specific additions and alterations to be made to them on an "as needed" basis. Tourism impacts are as diverse as the developments and activities themselves so it may be useful to list the common ones (Box 2). It is also important to note that not all developments are a direct result of tourism activity, but that some relate indirectly to tourism as a result of increased human numbers in the area.

[10] Adapted from Burns, P.H. and Holden, A. (1995) *Tourism - A New Perspective*, in: France, L. (1997) *Sustainable Tourism*; Ryan, C. (1991) *Recreational Tourism*; Shaw, G. and Williams, A.M. (1994) *Critical issues in Tourism. A Geographic Perspective*.

Box 2. Common tourism developments and activities in East African countries

A Infrastructure:

1 *Accommodation*:
1.1 Luxury hotels
1.2 Resort complexes
1.3 Safari camps
1.4 Guest lodges and villas
1.5 Time-share apartments
1.6 Private homes
1.7 Small beach cabanas
1.8 'Bush' hotels
1.9 Camping sites

2 *Transportation*:
2.1 Cruise liner
2.2 Passenger ferry
2.3 Chartered motorised craft
2.4 Local transport (land and sea)
2.5 Railway
2.6 Roads
2.7 4 x 4 (ORV) trails
2.8 Airstrip
2.9 Harbours
2.10 Marinas, small boat harbours
2.11 Jetties

3 *Amenities*:
3.1 Restaurants
3.2 Local eating places
3.3 Bars
3.4 Shopping (e.g. sale of curio items)
3.5 Light railway
3.6 Golf course
3.7 Theme village

4 *Ecotourism/Nature-based tourism*:
4.1 Marine parks
4.3 Nature reserves
4.4 Small island reserves
4.5 Underwater observatory
4.6 Game viewing
4.7 Guided package tours
4.8 Adventure travelling/ backpacking
4.9 Birdwatching
4.10 Whale-watching

B Activities:

1 *Boating*:
1.1 Yachts
1.2 Glass bottom boats
1.3 Sundowner cruises
1.4 Windsurfing
1.4 Jetski's
1.6 Canoeing
1.7 Powerboating (incl. waterskiing, parasailing)

2 *Fishing*:
2.1 Surf and beach fishing
2.2 Boat-based fishing

3 *Diving*:
3.1 Scuba diving
3.2 Snorkelling

4 *Spearfishing*
5 *Swimming/sunbathing*
6 *Hiking*
7 *Off-road driving*
8 *Night life*

C Indirect effects

1 Increased infrastructure
2 Increased consumption of potable water
3 Increased consumption of food
4 Increased support services (e.g. medical care, park administration, etc)
5 Increased waste output

2.5. Principles of Sustainable Tourism Development

Sustainability has many dimensions. It may be defined as; "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[11] In the broadest sense it refers to the achievement of a situation in which tourism development and activities can continue into the future without degrading the natural resource base or creating adverse effects on society. Even the most cursory analysis of the concept of sustainability reveals that finding a balance between its different underpinnings is a difficult, if not impossible, task to achieve.

For example, a protected area on the Masoala Peninsula in a remote part of Madagascar contains pristine sections of rainforests and a shallow but rich coral reef system. *Ecological sustainability* may require that tourism numbers be kept very low and that only a few operators are allowed in the area on a concession basis. This view may be contrary to achieving *economic sustainability* that may require much higher tourism numbers than is environmentally sound.

Social sustainability through tourism may be even more difficult to achieve because tourism tends to benefit relatively few people while everyone shares the costs. The potential to spread revenue more evenly across the population certainly exists, at least theoretically and only if the development of this new tourism destination is carefully planned. Implementation of responsible tourism planning is even more difficult. The most desirable line of action to be taken may vary from destination to destination, and likely through time for any given destination. Government agencies, NGOs and developers should bear in mind the concept of overall sustainability, and it is highly advisable that expert help be accrued to assist authorities in the initial formulation of a dynamic and time-linked tourism development policy.

2.5.1. The Three Dimensions of Overall Sustainability

When assessing the impacts of tourism, planners and managers should consider at least the three main dimensions of overall sustainability:

Environmental Dimension

The environmental dimension comprises those characteristics that attract tourists to the destination in the first place. It also includes those attributes of the environment that are essential to its functioning as a healthy ecosystem, for instance its supply of potable water and healthy coral reefs that are not only attractive to tourists but also help to sustain the local population. All human activities intrude on this dimension, and not all of them have their origin in tourism. These human activities need to be balanced in order to optimise the environmental potential of a region. For instance, mariculture and tourism are two industries that rely on coastal resources. When planned poorly, their effects on one another can be detrimental. However, if balanced properly, some level of synergy can be achieved between them. Inter-sectoral planning is crucial and in coastal zones tourism planning has to be encased in integrated coastal zone management.

[11] In: Chamberlain. K. *Carrying Capacity.* Tourism Focus, No. 8, 1997. UNEP: Industry and Environment.

Social Dimension

Humans are part of virtually all environments in Eastern Africa. Local populations rely heavily on the exploitation of natural resources for survival, and hence any factors damaging their environment also affect them adversely. Local people in turn form part of the experience of the tourist, even in the most protective settings. If a particular environment is earmarked for tourism development, it is therefore essential that the effects of tourism on the local population be anticipated as far as possible, monitored, and negative influences mitigated. For a particular region, the social problems associated with tourism development can be alleviated to a large extent by involving communities from the earliest stages of tourism development and onward to the final outcome. Various techniques exist that promote their inclusion in planning, decision-making and eventually steering tourism development. Unfortunately this community-based approach may not apply for all situations, or at a macro-scale of tourism development. In that instance it is the responsibility of government to ensure as far as possible that responsible tourism development does take place.

Economic Dimension

The economic dimension is closely linked to both the environmental dimension through the economic value of healthy resources and the social dimension through the costs and benefits that tourism brings. There is little doubt that many developing countries require accelerated economic development to address critical problems; ever-widening poverty, disease, lack of education and political instability and widespread environmental degradation. The cash that tourism brings to host countries is not only directly associated with tourist activities, but also with all the other needs that a tourist may have. This includes food, drink, accommodation, transport, medical services, etc. Because of its interface with so many sectors, tourism can be a valuable tool for responsible development. It therefore has to be integrated into other aspects of development in a manner that spreads its benefits as widely as possible while minimising its environmental and social costs.

Tourism development is often seen as a way to regenerate a region's economic development or to provide additional economic growth as an alternative to non-sustainable patterns of resource use. Unfortunately, the weaker the target area economically, the less influence its resident population have in the selection of the type and level of tourism development that is appropriate for the region. Many an NGO or government agency has blundered in their attempts to engineer a new future for a region's inhabitants, their intentions admirable but their actions and programs lacking proper planning. This is frequently true at the country level as well. The weaker the economy and the greater the need for foreign exchange, generally the weaker that country's position in terms of imposing strict controls on the scale and shape of tourism development.[12]

2.5.2. Tourism Type

Tourism type can certainly influence how the intensity of tourism impacts is distributed over a range of developments and activities. For instance, if a country or region decides to focus on ecotourism development, facilities will be erected that are appropriate for this particular type of tourism and activities developed accordingly. This route, however, does not automatically lead to sustainability in spite of the definition of ecotourism and the appeal of the words "nature-based". In fact, many

[12] Wheeler, B. (1997) in *Sustainable Tourism*, L. France (ed.).

developers and operators have donned "green jacket" tourism as a marketing ploy. The question can also be asked, "what causes more damage - thousands of tourists taking their holidays at well-planned tourism resorts where damage is contained, or a number of package tours to a remote and fragile environment such as a rainforest or small island where both the flora and fauna and the local population are highly sensitive to outside impacts and influences?" Clearly, tourism type and number are both important.

2.5.3. Tourism Numbers

While the exact balance between the economic costs and benefits of tourism is country and site-specific, it is widely accepted that its negative social, cultural and environmental impacts are frequently significant and can, in some cases, outweigh the positive ones.[13] Inevitably these are exacerbated as tourism numbers rise and destinations become more popular. The developing world is littered with examples where the impacts became so intense that the tourism potential was finally destroyed. When that happens, everyone loses. Tourism planning and policy will be wise to deploy every mechanism possible to make tourism numbers rise slowly rather than quickly, and then only under a regime of proper control and monitoring. It is far more difficult to reduce tourism numbers once carrying capacity has been exceeded, than to control numbers from the start.

2.5.4. The Concept of Carrying Capacity[14]

Many planners, managers and developers are still under the illusion that a *magic number* of tourists exists that represents the carrying capacity of a particular tourism destination. Instead, carrying capacity should not be viewed as an absolute number but rather as a concept that should be integrated into management systems aimed at achieving sustainability. Carrying capacity is a measure of sustainability and may be defined as; "the level of recreational use an area can sustain without an unacceptable degree of deterioration of the character and quality of the resource, or the recreation experience."[15] It is important to recognise that intrinsic to this definition are the definable limits to visitor use of a given area.

The following are characteristic indications of the carrying capacity being exceeded:

- **Environment** – the environment is damaged at a rate greater than that at which it can restore itself. Consequences include, for example, deterioration of a coral reef, decrease in bird numbers due to disturbance, pollution of a beach due to contamination by untreated sewage waste;
- **Cultural/historical heritage** – monuments and historical buildings are overwhelmed and damaged, and the cultural values of local communities are undermined. The destination loses the "sense of place" that attracted visitors to the area in the first place;
- **Local communities** – many local residents do not benefit directly from tourism initiatives and suffer the consequences of traffic congestion, increased prices of commodities, overcrowding, etc, and as a result are likely to oppose further tourism development;

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[13] See: France, L. (1997) *Sustainable Tourism,* Earthscan Publications Ltd, for various references.
[14] Modified from: Chamberlain. K. *Carrying Capacity.* Tourism Focus, No. 8, 1997. UNEP: Industry and Environment.
[15] Pigram, J. (1983) In: *Field Guide to the Eastern and Southern Cape Coasts*, by R. Lubke and I. De Moor (eds.)(1988) University of Cape Town Press.

- **Visitor experience** – most visitors go on vacation to rest and recreate. If they are unable to do this at their chosen destination because of excessive crowds, high prices, poor service, etc, then they are unlikely to return or to recommend the destination to other potential visitors.

To avoid these problems, it is essential to obtain some measures that will indicate when these impacts are becoming apparent. This requires the establishment of a carrying capacity programme. In practical terms, this programme provides:

- A practical tool that can be used to maintain the balance between development and conservation;
- A threshold beyond which development should not proceed without further planning;
- A benchmark against which future changes and causes of change can be measured;
- An early warning system for trouble.

Despite the obvious benefits of determining the carrying capacity of a tourism destination, carrying capacity programmes are rarely undertaken for reasons that include the following:

- A belief that the concept of carrying capacity is an academic exercise that is difficult to undertake and of little practical application;
- Pressure on government to promote sectors with the potential for economic development and creation of employment opportunities;
- Competitive pressure among private sector operators and the tendency to strive for short-term gains at the expense of long term benefits;
- Entrenched interests that resist restraints on growth, including traditionalists who fight restrictions on principle;
- An unwillingness to accept the need for sustainable development.

Nonetheless, if the principles of sustainable development are accepted, the benefits of establishing carrying capacity are readily apparent. As pointed out, establishing the carrying capacity can involve complex mathematics and this may be off-putting to groups lacking the necessary expertise. However, it is important to recognise that the judgements of people familiar with the area and the issues at stake can be used more quickly, at less expense, and just as effectively. The initial estimate of carrying capacity does not have to be 100 % accurate. It serves merely as the benchmark from which subsequent adjustments to the carrying capacity will be made as new information and greater experience are gained. Determining the carrying capacity is therefore a dynamic process in response to continually changing scenarios.

A carrying capacity programme can be initiated by any group or organisation qualified to make the judgements required and who are representative of those with a stake in the area. These may include a local tourism forum, a conservation authority responsible for the management of natural resources or national, regional or local governmental authorities concerned with economic development.

In general, the issues that need to be considered include:

- The protection of the natural environment;
- Impacts on the local community;
- The quality of the visitor experience.

In establishing the carrying capacity, it is important to focus on places or times where impacts are at their greatest or where specific damage or other problems are of greatest concern. Therefore consideration should be given to the following key elements:

- Variation by season, day of the week, and hour of the day. For example, highest intensity use may occur for a two-week period during the summer season, or all year round but with peak traffic between the hours of 14h00 and 15h00;
- Pressure on specific locations within the area due to volume or length of use, the location being confined, or physically fragile. For example, on Robben Island, South Africa, despite its overall size, the central attraction is the former prison cell of Nelson Mandela and this is located in a confined area with restricted access inside the prison building;
- The degree to which residents and other users of the area are disturbed. For example, the noise of powerboats on a lake early in the morning may disturb residents living on the shores of the lake, particularly where zoning makes provision for the use of these boats in a specific area;
- Observed environmental deterioration. For example, littering and loss of vegetation and erosion along hiking trails due to excessive trampling by visitors;
- Overloading services such as water supply, power, sewage, etc. Growth in tourist numbers may exceed the capacity of the municipal sewage treatment plant to process wastes. It is the responsibility of the local authority to plan for the number of facilities that can be sustained by existing infrastructure, or upgrade to accommodate growth;
- Safety. For example, on water areas, it may be important to zone areas to minimise the interaction between powered and non-powered recreational boating activities.

Qualitative and quantitative measures required to monitor the items mentioned above include:

- Carrying capacities for specific locations in the area that are most used, space restricted, or fragile;
- A threshold level for complaints from local communities, visitors, operators and staff;
- A record of breakdowns in services offered;
- Indicators to be used in assessing environmental damage;
- A threshold for the scale of business operations in the area;
- The maximum desired capacity of facilities such as car parks, lodging and eating facilities inside and adjacent to the area.

Figure 2 illustrates a carrying capacity model proposed for the Robben Island Museum (RIM). The exponential curve is based on real data and represents potential tourism growth. In the case of the RIM, which is essentially all of Robben Island, the number of visitors to the island can easily be controlled because they must use ferries licensed by the RIM. As a new and growing attraction, the initial maximum daily visitor number to the RIM was maintained at a level well below the estimated carrying capacity to allow management to develop experience and become established. A year after operations commenced, the carrying capacity was revised based on the considerations listed above. Key factors in this case included ferry capacity, appropriate length of tour, "bottlenecking" at the prison (the former cell of Nelson Mandela), administrative capacity, disturbance to wildlife on the broader island, water supply and sewage and solid waste disposal.

The proposed model allows for an increase in visitor numbers to a new level (increasing the carrying capacity) at discrete time intervals. At the end of each interval (in this case 6 monthly), the management assesses whether the carrying capacity has been exceeded. Problem areas are identified (e.g. limiting water supply) and control measures implemented to increase the carrying capacity to a new threshold. This process continues until some limiting factor (e.g. space) is reached and no further growth is permitted.

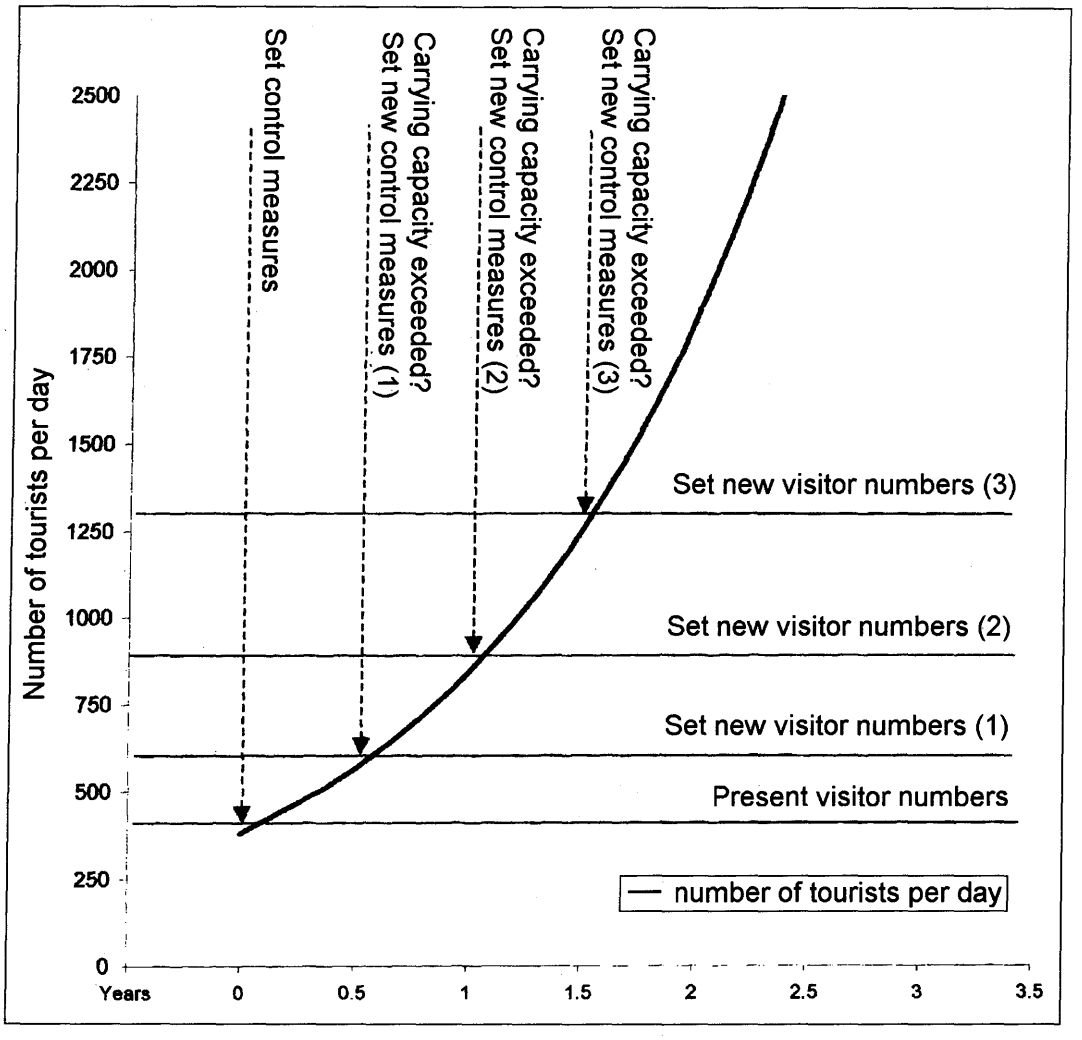

Figure 2. Proposed Carrying Capacity model for the Robben Island Museum.[16]

When implementing a carrying capacity programme for tourism areas, it is important that there is an effective strategy to manage growth. The following are suggestions for improving management thereby enabling the introduction of a carrying capacity programme:

- **Single management authority** – for example, a national parks system, where one authority has jurisdiction over the area and is responsible for controlling development;

[16] From: *The Robben Island Museum (RIM): Tourism Potential and Carrying Capacity.* Eco-Africa Environmental Consultants and Tsoga Environmental Resource Centre, Robben Island Museum,1999.

- **Stakeholder participation** – management of an area (e.g. establishment of carrying capacity) should seek to involve all individuals and groups who have a stake in the area (according to principles of Environmental Assessment – see Chapter 5);
- **Controls** – gates, permits and licences, etc, can be used to control and monitor activities in a defined area;
- **Guidelines** – providing a list of "do's" and "don'ts" aimed at protecting the environment and the well-being and enjoyment of visitors and local residents. These guidelines may include zonings of an area with restrictions on permissible activities in each zone, e.g. no fishing, no camping, non-powered boats only, etc;
- **Enforcement** – if tourism pressures are high it will be necessary to enforce controls for sustainable development is to be taken seriously. For example, if a fishing permit makes allowance for the capture of 50 items of a particular bait species per day, then individuals who exceed prescribed limits must be apprehended and punished;
- **Conflict resolution** – Since establishment of carrying capacity involves restraints, conflict is likely to arise and in order for the programme to be successful (maintain co-operation and inclusion), it is important to emphasise an atmosphere of conflict resolution rather than conflict. In this way opposing views can be understood and not just heard, thus laying a solid basis for agreements to be reached and further co-operation.

2.6. Who Benefits and at Whose Cost?

Tourism is often hailed as a potential saviour of countries from their economic woes. Ecotourism in particular is defined as an activity that protects the environment and sustains local communities at the same time. While this may be true in some cases, the opposite is far more common. In reality, only a fraction of the economic benefits tends to end up in the hands of local communities.[17] At the same time, they suffer the environmental and social costs. Mechanisms have to be found that not only broaden the target of tourism benefits, but also link its development into other aspects of regional development. Environmentally sound and socially sensitive developers can contribute significantly to the protection of the welfare of the local inhabitants of a region and the protection of the environment.

It is reasonable to expect developers to carry the costs associated with having a thoroughly accredited environmental assessment done on their proposed developments, as well as the costs associated with site checks and setting up a monitoring system. Authorities should make it clear to developers from the start that they are responsible for these costs. In addition, Authorities should prepare a database of approved consultants who can demonstrate accreditation with professional governing bodies. Thus "quick and dirty" assessments and situations of conflicts of interest can be avoided. NGOs and government departments can be involved in the monitoring and analysis of developments, provided these systems have been set up correctly in the first place. Clearly, the costs and benefits of tourism can achieve a better balance only through the proper planning and management of the coastal environment.

[17] Odendaal, F. (1996). *Ecotourism Trial Runs as a Tool for Responsible Development.* Yale University Bulletin Series No. 99.

2.7. Planning and Management of the Coastal Environment

2.7.1. Integrated Coastal Zone Management

Development in coastal environments can only achieve its full potential if it proceeds along a trajectory that is properly planned. The coastal environment is a multiple use zone where a wide range of activities occurs, of which fishing, tourism, agriculture and urbanisation represent only a few. Not only do each of these activities have to be planned in their own right, but they also have to be balanced in an *integrated* manner to optimise their overall benefit for the country or region's inhabitants. Furthermore, an Integrated Coastal Zone Management (ICZM) Plan has to be translated into an Integrated Coastal Zone Management system that requires constant attention, reflecting the dynamic nature of the constantly changing coastal zones. Much has been written about ICZM (see Reference List) and the topic will not be treated in this document. However, it must be stressed that the present guidelines will achieve their maximum effectiveness only when firmly placed in a framework of ICZM.

2.7.2. The Planning Framework for the Coastal Zone

The coastal planning framework that should be invoked to ensure the wise use of any particular country's coastal zone will likely differ from country to country, and the comments below serve only as pointers:

The ***national planning framework*** should be consistent with national priorities, both in terms of spatial co-ordination with other sectors of the economy and the choice of areas that have the greatest need of development. The overall conceptualisation of the tourism industry and the desired emphasis (for instance the balance between ecotourism and mainstream tourism) also fit into planning at the national level. Critically important is tourism policy formulation, which must clearly outline the objectives and priorities of tourism development Departments and agencies must be put in place that can enforce policy as manifested in laws and regulations. Legislative measures only have real power if they can be enforced. This is often a near-impossibility along the long coastlines of many East African countries and some of the more remote islands. However, instead of dissipating its resources along the entire coastline, national governments should find ways of delegating this responsibility to local administrations and perhaps other local interest groups, and itself concentrate on making sure that developers adhere to legislation. Decisions should also be made at the national level with respect to overall coastal zonation, for instance by strategically planning the placement of industrial and conservation areas.

The ***regional planning framework*** is concerned with the division of the region into tourism regions or zones. Zoning involves setting goals and objectives for each zone - some zones may be earmarked for tourism development because of their obvious potential while others may be reserved for other economic activities, or remain undeveloped. Regional planning should focus on detailed land-use planning with the purpose of maximising the multiple use potential of the coastal zone. Zonation of the coast into high and low-density areas is also crucial. For instance, one section of the coast could be earmarked for mass tourism development while other sections can be placed in the wilderness category where specific rules are applied to a tightly controlled number of tourists. It is also advisable for a regional tourism policy to be developed, particularly in the developing world where the national power centres are often far removed in practical and administrative terms from those in the countryside.

The ***local planning framework*** is receiving increasing attention. Every effort should be made to incorporate local authorities and communities into coastal planning and its implementation. The reason is obvious: it is the local people who can benefit more from tourism and it is they who first suffer the negative impacts on their environment. The SEACAM Guidelines for Environmental Assessment of Coastal Tourism should be made available to local communities and NGOs, thereby providing some tangible focal point that developers and local inhabitants will agree upon. It is advisable that the guidelines be workshopped with local interest groups, thus incorporating as many interested and affected parties (I&APs) as far as possible in their refinement. The greater the consensus on their contents, the greater will be their applicability. Local inhabitants can also be excellent watchdogs of development, but only if they are aware of what guidelines the latter should follow.

2.8. The Problem of Capacity

The main problem in steering and managing tourism in the developing world is one of capacity and perceptions. Coastlines tend to be long, islands and outlying regions are remote, institutional capacity is often lacking and trained staff are few and far between. In addition, local residents and many developers often have a narrow and short-term perception of tourism as a money earner without taking into account the multitude of medium- and long-term effects.

The following broad directions are suggested:

- Capacity should be built in government structures and agencies concerned with tourism planning, environmental assessment and enforcement;
- Developers and practitioners of tourism should be educated as soon as possible;[18]
- Local communities should be involved in the conceptualisation, planning and management as far as possible;
- Tourism guidelines and other rules and regulations should be available to all parties, including local communities who often are not aware of their rights;
- A direct line of EA implementation should be established from national and regional government to the local level so transgressors can be reported (by local people) and held accountable (by government) for their actions.[19]

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[18] Many developers are ignorant of the need for environmental assessment. The authors recently interviewed a private developer in southern Mozambique who was in the process of bulldozing an opening through the frontal dunes. The developer was not aware that he was causing serious damage or that there existed any regulations regarding coastal development.

[19] For instance, when a foreign fishing vessel recently entered a marine park in Madagascar, local people were ready to fight them but had no access to rules and regulations, nor had they any recourse to administrative/enforcement agencies. If they had a written copy of EA guidelines and a clear line of communication existed to the Minister of the Environment (perhaps via an NGO or provincial government), their resources may have been spared.

CHAPTER 3

THE COASTAL ZONE - ECOSYSTEM COMPONENTS

Summary

This chapter defines the coastal zone and describes the interrelated component ecosystems of which it is comprised. These include:

- *Rivers, floodplains, estuaries, wetlands and coastal lakes;*
- *Coastal forests;*
- *Beaches and dune systems;*
- *Rocky shores;*
- *The marine subtidal environment (coral reefs and seagrass beds);*
- *Small islands.*

The importance and functioning of these systems is described and provides the ecological context for subsequent chapters dealing with the impacts of tourism development and activities.

3.1. Introduction

What is the coastal zone? It is the interface between land and ocean, and encompasses the shoreline and components of the adjacent ocean and terrestrial environment. The most distinctive characteristic of the coastal zone is the diversity and complexity of interacting environmental and physical systems that occur within such a compact area.[20] Consequently it is often difficult to define the geographical extent of the coastal zone in terms of the natural environment. It is has been argued that the boundaries of the coastal zone should include the land area from the watershed to the sea.[21] However this is often impractical due to the vast area involved. Thus, for planning and administration purposes, the coastal zone is often defined by rather arbitrary boundaries that have little to do with coastal processes.

For practical reasons, it is often necessary to delimit the coastal zone according to the specific problems that need to be addressed. For the purposes of coastal zone management, the coastal zone can be defined as, "The area from the Exclusive Economic Zone (EEZ) landward to the inner edge of the coastal plain, where tidal influences are replaced by continental hydrological processes."[22]

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[20] *A Guide to Impact Assessments in Coastal Environments* by J. Sorensen and N. West (1992), Coastal Resources Center, University of Rhodes Island.
[21] *Guidelines for Integrated Coastal Zone Management* by J.C. Post and C.G. Lundin (1996). Environmentally sustainable development studies and monographs series, no. 9, World Bank.
[22] *Africa: A Framework for Integrated Coastal Zone Management*, by M. Hatziolos *et. al.* (1996), The World Bank.

3.2. Components of the Coastal Zone - Ecological Features

3.2.1. Rivers, Floodplains, Estuaries, Wetlands and Coastal Lakes

Rain falling over land can either run off into rivers, lakes, etc, seep into the soil to become groundwater, or be lost to the atmosphere as evaporation. The basic land unit yielding water is the river catchment and comprises a series of interconnected surface-, or subsurface drainage channels. Rivers, floodplains, estuaries, wetlands and coastal lakes are all features of the drainage system of a catchment. Catchments vary considerably in size, ranging from those extending far inland such as the Tugela, Zambezi, Rufiji and the Tana Rivers (which discharge into to the sea off South Africa, Mozambique, Tanzania and Kenya, respectively), to the smaller catchments located entirely within the coastal zone. The river catchments of many of the Island States fall into the latter category since these islands may be considered coastal zones *in toto*. Although most catchments ultimately drain to the sea, some have internal drainage systems culminating in lakes or salt pans.

River flow is determined principally by the size of the catchment and the mean annual run-off (MAR) which is derived from mean annual precipitation (MAP) taking into account losses due to evaporation and infiltration of water into the ground. River run-off is rarely constant throughout the year and fluctuates in response to factors such as the temporal distribution of rainfall and its intensity, evaporative losses, the moisture content of the soil (i.e. recent rainfall) and its permeability.

As with other ecosystems, the ecological productivity of a river system is dependent on sunlight and plant growth (primary production) to provide food sources for the diversity of secondary consumers. Leaf litter of terrestrial origin may comprise a substantial component of the primary production entering river systems, but also includes fringing and in-stream rooted macrophyte plants as well as benthic and planktonic algal communities.

Rivers carry materials such as silt, nutrients and dead and decomposing plant litter that are vital to the functioning of downstream environments including estuaries and the coastal nearshore. During periods of low to intermediate flow, much of the coarser particulate materials are deposited in the river channel or captured by wetland plant communities where the organic components are broken down by the activities of grazers and decomposers. During periods of flood, particulate materials are washed downstream where they may be deposited in coastal lakes (internal drainage), the estuary or coastal waters.

Although coastal lakes may simply represent internal drainage systems with a coastal location, many in fact are relict estuaries that have become separated from the sea by lowering of sea level over geological time scales. Although these systems are generally freshwater in character, residual saline influence may remain, and the biota of these lakes often comprises relict estuarine forms that have adapted to the freshwater conditions. These systems provide important habitat for wetland-associated avifauna including migratory birds, as well as large mammals such as hippos.

Floodplains and river wetlands are characterised by plants such as reeds and rushes that are adapted to living in waterlogged soils. Wetland systems play a vital ecosystem role as "sponges" that moderate fluctuations in river flow by creating resistance to flow as well as absorbing water during periods of high flow, and

releasing it gradually during periods of reduced flow. Thus, wetlands serve as a natural defence mechanism against the physical force of floodwaters, as well as acting as filters of pollutants and excessive nutrient loads.

As rivers reach the coastal plain, they discharge into the headwaters of estuaries. These systems are highly dynamic and are characterised by fluctuating salinity regimes as a result of the mixing of fresh water with seawater. Estuaries are highly productive ecosystems and provide nursery areas for coastal marine invertebrates and fish, including many species of commercial importance. The productivity of estuaries is the result of these systems acting as "nutrient traps" of materials brought into the system by freshwater inflow, as well as the mixing and circulation processes that are driven by tidal energy.

In some cases, river flow may be of such a magnitude that no seawater penetrates inland into the river channel at all. Under these conditions, no "true" estuary is present since the mixing of seawater and river water takes place out at sea. The system is then known as a river mouth.

3.2.2. Coastal Forests[23,24]

The coastal forests of Eastern Africa and the Western Indian Ocean comprise tidal and riverine gallery forests, semi-dry to dry woodlands, tropical forests and mangroves. Many of the tropical forests have substantial commercial value primarily in terms of timber produced. However, this value extends to many other non-wood products that include for example, extractives (gums, fibres, dyes, etc), plants and animals for ceremonial, medicinal or decorative use, as well as recreational use. It is also important to recognise the ecological function of forests in the coastal zone; forests protect watersheds and ensure perennial supplies of fresh water. By stabilising soils and reducing erosion losses, forests limit sedimentation of streams, reservoirs and the coastal nearshore. Forests also play a significant role in stabilising the local climate, particularly in terms of influencing rainfall patterns, as well as improving air quality and enriching soils through nitrogen fixation.

From the KwaZulu Natal region of South Africa northwards throughout Eastern Africa and including the island states, the dense forested areas of the coastal zone comprise mainly mangroves, which represent the characteristic littoral plant communities (trees and bushes) of tropical and sub-tropical sheltered coastlines, bays and estuaries that grow below the level of high water spring tides.

There are two distinct biogeographical zones of mangroves, and Eastern African mangrove communities belong to the "Old World" grouping of which there are 43 species worldwide. Due to their specialised habitat, species diversity in mangrove forests is relatively poor. In East Africa, nine species are represented belonging to the families *Rhizophoraceae*, *Combretaceae*, *Avicenniaceae* and *Sonneratiaceae.* The most common species are *Rhizophora mucronata*, *Avicennia marina* and *Bruguiera gymnorrhiza*. Although the majority of African mangroves are situated on the western seaboard, substantial forests are found in Madagascar (320 000 ha), Tanzania (96 000 ha), Mozambique (85 000 ha) and Kenya (45 000 ha). Smaller areas are found along the coasts of the Red Sea, Somalia, the Arabian peninsular, South Africa, and on the smaller island states such as the Seychelles and Mauritius.

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[23] See: Vantomme, P. 1995.
[24] See: Kramer *et. al.*, 1995.

The largest expanses of mangroves occur in the estuaries of large rivers (e.g. the Rufiji delta in Tanzania), however narrow fringing forests are also found along the coast where rivers are absent. Another specialised assemblage of plants, the saltmarsh community, frequently occurs on the landward margin of mangrove forests. Mangrove communities play an important ecological role, providing habitat for a range of threatened or endangered species as well as nursery areas for the juvenile stages of commercially important fishery species (e.g. prawns and reef fish). In addition, mangroves trap sediments, thus playing a vital role in coastal protection by reducing erosion.

3.2.3. Beaches and Dune Systems[25]

Beaches, dunes and sand bars in the surf zone and river/estuary mouths comprise what is known as the "littoral active" zone of the coast, and are intrinsically linked by a continuous exchange of sand. The sandy shores of a coastline are highly dynamic systems and subject to the constant action of wind, waves and coastal currents that periodically build up and erode the beach (Figure 1). Beach sands are continuously moving, either alongshore, or on- and offshore. Longshore sand movement is caused by waves striking the coastline at oblique angles and setting up longshore currents. The movement of sand on-, and offshore is a seasonal phenomenon brought about by an increase in the frequency of storms. Rougher surf zone conditions generate increased turbulence causing the beach to become eroded, and the sand that is displaced is deposited in offshore sand-bars. The beach becomes narrower and steeper as a result. During periods when calmer conditions prevail, sand transferred offshore is carried back and deposited onto the beach once again.

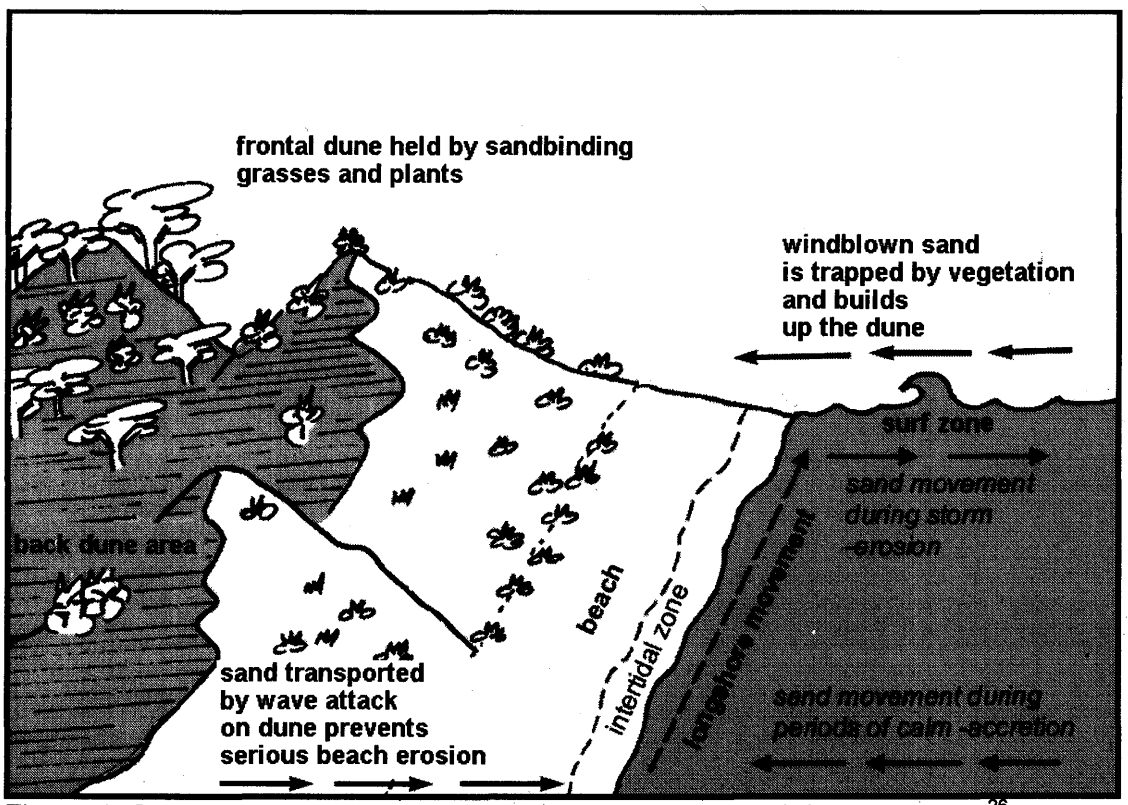

Figure 1. Sediment transport processes between beach and dune systems.[26]

[25] *A Policy for Coastal Zone Management in the Republic of South Africa. Part 2: Guidelines for Coastal Land Use*. Council for the Environment, 1991.
[26] Modified from: Council for the Environment, 1991.

Beaches can be divided into two zones, comprising the backshore and the intertidal zone. The intertidal zone plays an important ecological role by filtering large quantities of sea water and breaking down organic components through the action of bacteria in the sand, a process that is remarkably efficient. Organic material deposited by the tides on the backshore above the mean high water mark is broken down by fungi and bacteria. Nutrients released into the sand are eventually returned to the sea. Seeds and plant fragments deposited on the backshore sprout and form the precursors of new dunes. The backshore may be an important nesting and roosting site for coastal seabirds as well as nesting sites for turtles. It has been noted, for example, that all five species of Indian Ocean turtles nest on beaches along the coast of Mozambique.[27]

Dunes are formed by beach sands accumulated on the high shore by onshore winds and trapped by plants. The cycle of deposition followed by plant growth leads to the formation of the frontal dunes. During periods of beach erosion, the frontal dunes may be exposed to wave action and the sand transferred back to the beach. The foredunes thus form a barrier protecting inland areas from wave action as well as retaining sand on the beach by trapping wind-blown material and returning it to the beach during periods of erosion.

The presence of stabilising rooted plants distinguishes the dune system from the beach zone, and in general, vegetation cover increases in a landward direction. Due to high winds, salt spray and sand movement, the foredunes are usually inhabited by just a few pioneer plant species, whereas further inland, the stability and decreasing harshness of the habitat provides conditions for the development of a richer plant community. Decomposing leaf litter contributes to the fertility of the soil. The specialised dune habitat supports a wide variety of animal life, and the change in vegetation in a landwards direction is accompanied by an increase in faunal diversity.

3.2.4. Rocky Shores

Rocky shores and coastal cliffs are a common feature of the East African and Western Indian Ocean coastlines. Rocky shore ecosystems comprise animal and plant communities adapted to periodic inundation and exposure by the tides. These communities are subject to harsh environmental stresses, and clear vertical zonation is usually apparent, with those organisms best adapted to aerial exposure (heat and desiccation) found towards the upper shore, while those adapted to withstand predation, reduced light levels and wave action, occur towards the lower shore. Photosynthetic seaweeds are situated at the base of the foodchain and these are either consumed directly, or fragment to form fine particulate food resources for filter-feeders. Much of the marine living resources of the coastal zone are dependent on the productivity of rocky shore ecosystems since these systems are intrinsically linked via coastal food chains.

3.2.5. Marine Subtidal (Coral Reefs and Seagrass Beds)[28]

Coral reefs occur in subtropical and tropical waters extending about 35° north and south of the equator, but are generally only well established where the average monthly water temperature exceeds 18° Celsius throughout the year. Coral reefs are well represented along the East African and Western Indian Ocean coastlines,

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[27] See: *Integrated Coastal Zone Management in Mozambique*, by C.G. Lundin and O. Linden (eds.)(1997), The World Bank.

[28] *A Guide to the Seashores of Eastern Africa and the Western Indian Ocean Islands*, by M.D. Richmond (ed.)(1997), Sida/SAREC.

extending from the Red Sea southwards as far as the north-western corner of South Africa and including the Island states.

The most important components in the development of a reef are the reef-building hermatypic (hard) corals that produce a calcareous skeleton. Corals contain symbiotic algae called zooxanthellae that derive their food resources from photosynthesis, transferring some of these resources to the coral polyp which fuses calcium with carbon to form the calcareous skeleton. Bright sunlight and clear waters are therefore critical to the development of coral reefs and they are consequently restricted to depths of less than 30 metres or so. Consequently, reefs usually occur along coastal margins or in areas where the seabed is shallow. The biodiversity of coral reefs is surpassed by few other ecosystems, and comprises the reef-building corals themselves as well as a vast array of other organisms that depend on the habitats provided by the reef. These include a variety of commercially important fish and invertebrates.

Coral reefs may be divided into four broad categories, of which fringing reefs are the most common along the East African and Western Indian Ocean coastlines. Fringing reefs protect the inshore areas from wave action and erosion, and therefore play an important role in coastal defence as well as in determining patterns of sediment transport. Atolls form when a fringing reef forms around a volcanic island that subsequently becomes submerged (e.g. Aldabra). Patch reefs occur close to shores without significant fringing reefs such as in Mauritius or the Zanzibar channel. The Grand Recife (south-west of Madagascar) and the Mahebourg Reef (south-east of Mauritius) are examples of the remaining category, the barrier reefs, which form massive structures offshore.

Seagrasses form extensive beds or "meadows" in protected shallow coastal areas, especially landward of the coral-dominated edge of reefs, the seaward side of mangrove forests and between offshore islands and the mainland. Seagrasses are marine flowering plants that are highly productive by virtue of their rapid growth in shallow water under conditions of bright sunlight.

The fronds of seagrasses represent an important food resource for some browsing species such as the Dugong (*Dugong dugon*) and the Green turtle (*Chelonia mydas*). However, a considerable amount of seagrass productivity is exported in the form of particulate material derived from the fragmentation of dead and decaying plants. This material plays a central role in many coastal foodwebs and is utilised by a variety of filter-feeding organisms.

3.2.6. Small Islands[29]

From a socio-economic perspective, small island states are regarded as those covering less than 1000 km^2 and with a population under one million. However, it should be recognised that many island states actually comprise many hundreds of very small islands (e.g. the Seychelles), some of which may be inhabited and others not. The geographical locality of these islands varies considerably (some are close to mainland environments while others are extremely remote) as does their topography (low-lying atolls, granitic cliff islands). Many small islands share a set of characteristics. Most are entirely coastal entities and characterised by a high diversity

[29] Modified from: Small island States and Sustainable Development: Strategic Issues and Experience, by S. Bass and B. Dalal-Clayton, 1995, IIED.

of terrestrial and marine ecosystems per unit area, with extensive links between these ecosystems. These links provide mutual support between ecosystems, yet on the other hand, impacts upon one are likely to have ramifications for adjacent systems. For example, mangroves and marshes trap silt and sequester nutrients, protecting coral reefs by ensuring the clarity and quality of coastal waters. Hence the ecology of islands is extremely vulnerable to disturbance from external influences.

The ecological significance of small islands is disproportionate to their size and is due to:

- High levels of species richness and biological endemism;
- The comparatively small populations of island species;
- Their isolation from alternative populations of the same species, and;
- The limited array of competitors and specific predator/prey relationships.

Functionally, islands are often regarded as closed systems. However, by virtue of their high ratio of coastline to land mass, islands are in fact predominantly influenced by external coastal and marine influences. The limited resources available to human inhabitants of islands have generally resulted in conservation priorities being overlooked and most of the recorded species losses of the last few centuries are associated with tropical islands. In most cases this has occurred due to the introduction of exotic species (either deliberately or accidentally) and diseases and pests associated with them. Since isolation has resulted in many island species losing their competitive ability, whole ecosystems are vulnerable to collapse where aggressive invasive species are introduced.

Most islands are highly vulnerable to extreme climatic conditions such as cyclones since they are usually too small to deflect the impact or to moderate local circulation patterns. However, island ecosystems are frequently well-adapted to extreme conditions (e.g. coral reefs buffering the effects of storm surges thus reducing shoreline erosion), however where these systems are used for human purposes (e.g. dynamiting reefs for fish, or mining coral for building), the natural resilience of these systems is undermined.

CHAPTER 4

ENVIRONMENTAL, ECONOMIC AND SOCIAL/CULTURAL IMPACTS OF TOURISM

Summary

This chapter summarises the main environmental, economic and social/cultural impacts associated with tourism development in the coastal zone. Environmental impacts are subdivided into 7 broad categories under the following headings:

- ***Water resources and river ecosystems** – role of over-abstraction in river ecosystem degradation, attenuation of flood events and increased destructive effects of floods, and salinisation of groundwater resources;*
- ***Estuaries and wetlands** – sedimentation and loss of ecosystem functioning (including reduction in productivity) due to attenuation of freshwater inflow and reclamation of wetlands for development;*
- ***Soil erosion and sedimentation** – slope failures, loss of topsoil and sedimentation of catchment water bodies and the coastal zone due to poor development practise, particularly on steep slopes;*
- ***Waste disposal and pollution** – deterioration in surface and groundwater quality due pollution from poor waste disposal practises, degradation of aquatic ecosystems resulting from eutrophication and pollution by toxic substances, and loss of aesthetic quality due to littering;*
- ***Coastal erosion** – loss of beaches and increased storm damage through disruption of natural sediment movement patterns in the coastal zone due to inappropriately built structures;*
- ***Marine resources** – Non-sustainable exploitation of marine resources valued as curios or as food together with destruction of natural habitats through the use of inappropriate fishing or collecting techniques;*
- ***Recreational activities** – damage to coral reefs by boat anchoring and scuba diving, pollution by intensive boat activity, overexploitation of fish by recreational fishermen, and destruction of dune systems and disturbance of endangered animals by off-road vehicles (ORVs).*

Economic impacts of tourism can be classified according to whether they are manifested as primary, secondary or tertiary impacts. The effects on tourism on employment and training opportunities are described together with an overview of problems associated with trends such as the seasonal nature of tourism. Approaches that can be adopted to maximise the benefits of tourism (e.g. policy of using local labour) are outlined. The chapter concludes with a discussion on the economic costs of tourism, including the dangers of over-reliance on tourism, and the impacts on cultural values and disruption of social structure.

4.1. Introduction

The impacts of tourism can be vast, and are generally classified in terms of environmental, economic and social/cultural impacts. The SEACAM Guidelines for Environmental Assessment of Tourism were compiled to assist coastal managers and developers to mitigate the negative impacts of tourism. For the guidelines to be as effective as possible, it is necessary that practitioners, planners and managers of tourism have a sound understanding of the impacts of tourism.

4.2. Environmental Impacts

The natural environment is under increasing threat from unmanaged human activities, and in assessing the impacts of tourism, it is essential to adopt a holistic view that recognises both the direct and indirect consequences of tourism activities and their intrinsic link with other sectors. Growth in the tourism sector may generate new impacts on the coastal zone but also raise the intensity of existing impacts by placing additional burdens on resources that are already over-extended. For example, the disposal of sewage effluent in coastal waters, and impacts arising from this are a feature of human settlement and not just of tourism. However, where this is exacerbated by a significant increase in the number of visitors and people employed within the industry, the tourism sector must take responsibility for providing solutions to the causes of environmental degradation. The following sections outline some of the major environmental impacts identified by East African countries and Western Indian Ocean island states. The categories are deliberately broad and include the direct consequences of tourism development as well as impacts associated with activities that support the tourism sector.

4.2.1. Water Resources and River Ecosystems

Fresh water is a vital resource for development and tourism facilities depend upon reliable and clean sources. Daily water consumption per person is generally much higher among visitors than local communities, and this is further exacerbated by the water demand for irrigation (e.g. golf courses) and facilities such as swimming pools. Planning standards (see Table 2, Chapter 6) provide an indication of water requirements for tourism resorts. Tourism facilities frequently compete with other users (agriculture, industry, local communities, etc) for water supplies that are limited due to scarcity or poor infrastructure. The cumulative demand for fresh water by all sectors has frequently resulted in excessive impoundment of rivers and over-abstraction. The consequence of this can be a drastic reduction in river base flows. Limited water resources and degradation of river ecosystems as a result of high water demand has become a serious problem in semi-arid countries such as South Africa, as well as in island states such as the Seychelles that have comparatively small river catchments. Both Zanzibar and Inhaca Island (Mozambique) are constrained by a severe shortage of water resources, and over-extraction from groundwater sources has led to aquifers becoming salinised[30], a situation that is prevalent among many other islands along the East African coast and Western Indian Ocean island states. The lack of available water resources invariably sets a limit to the development potential of a region.

[30] See: *Integrated Coastal Zone Management in the Seychelles*, by C.G. Lundin and O. Linden (eds.)(1995), World Bank, and *Towards Integrated Management and Sustainable Development of Zanzibar's Coast*, Published by University of Rhode Island's Coastal Resources Center.

Although tourism represents just one sector with demand for water, it is essential that the implications of growth in the sector are recognised in water resource management. River ecosystems are dependent upon base flows as well as periodic flood events and major disruption to flow patterns (e.g. periodic cessation of flow, attenuation of flood events) can lead to severe ecosystem disturbance. Base flows maintain biological processes and flood events scour sediments from river beds and flush accumulated toxins and pollutants from the system. However, the destructive effects of floods have been exacerbated in heavily developed catchments by hardening of surfaces (roads, paving, etc) and alterations to the floodplain.[31] Flood scour is particularly important in the depositional areas of the lower floodplain and estuary, where sediments settle and accumulate due to the reduced current velocities.

Summary impacts:

- Competition with other water users for (frequently) limited resources;
- Reduction in base flows and river ecosystem degradation;
- Attenuation of flood events and increased destructive effects of floods;
- Salinisation of groundwater resources.

4.2.2. Estuaries and Wetlands

Estuaries are popular focal points for human settlement and particularly as centres of tourism development due to their aesthetic appeal as well as the recreational opportunities that they provide (e.g. water sports such as boating, fishing, etc). Traditionally these areas have developed around natural transportation networks since estuaries provide sheltered waters for ports and harbours. The river systems that give rise to the estuary also provide an important source of fresh water that is essential to development. The growth in various sector activities with high water demand (e.g. agriculture, industry, tourism, etc) ultimately leads to increasing abstraction of fresh water from the river systems draining into the estuary. Where there has been a significant attenuation of freshwater inflow, this frequently leads to a decline in estuarine productivity that may impact upon, for example, coastal fisheries.

There is currently some concern regarding the impacts of dams in the catchment of the Rufiji Delta in Tanzania; however, the extent of these impacts cannot be accurately determined without adequate monitoring programmes.[32] In some South African estuaries, river base flows and flood events have been reduced to the extent that the estuary has become hypersaline and/or closed to the sea due to insufficient flood scour to maintain the tidal mouth. Some estuaries close naturally at certain times of the year. Unfortunately, dwellings are often built low in the floodplain during periods of low water level (during drought) but become threatened by the rise in water level behind the dune bar following sustained rainfall. Several temporarily closed estuaries in the Southern Cape region of South Africa, including the Swartvlei and Touws river systems, are regularly opened to protect low-lying properties. Artificial breaching of the dune bar to protect low-lying properties interferes with ecological processes since the full scouring potential of the natural breaching process is lost. This also has the potential to interfere with ecological processes such as the seasonal migration of fish between the estuary and the sea.

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[31] *A Policy for Coastal Zone Management in the Republic of South Africa. Part 2: Guidelines for Coastal Land Use.* Council for the Environment, 1991.

[32] See: *Integrated Coastal Zone Management in Tanzania*, by O. Linden and C.G. Lundin (eds.)(1996), World Bank.

In coastal areas where space for development is limited, many wetlands and mangrove areas have been reclaimed by infilling or by the construction of berms to prevent tidal inundation. In the Seychelles, lowland fresh and brackish marshes were once found behind most of the plateaus on the granitic islands, but virtually all have been reclaimed by infilling for roads, housing and agriculture.[33] These wetlands play a vital role in river and coastal ecosystem functioning and the net loss of wetland areas is a significant factor that has contributed to overall environmental degradation and loss of coastal productivity.

Summary impacts:

- Attenuation of freshwater inflow and decline in estuarine/coastal productivity;
- Sedimentation, shallowing and closing of estuaries as well as development of hypersaline conditions;
- Disruption of physical/biological processes by artificial opening of closed estuaries;
- Net loss of wetlands and degradation of ecosystem processes;

4.2.3. Soil Erosion and Sedimentation

Erosion and loss of topsoil are a primary cause of catchment degradation in many East African countries and are due to poor land-use practises such as forest clearance, agriculture and over-grazing. In Tanzania, lack of soil nutrient replenishment and low yields have forced farmers to extend their activities to encroach on marginal areas, river valleys and the coastal zone and have had significant impacts on the coastal zone from siltation.[34] In Kenya, soil erosion has led to heavy siltation of the Sabaki River and consequent accretion of the beach in Malindi where the river discharges to the sea.[35] In Madagascar, incalculable amounts of topsoil are washed into the sea during the rainy season.

Although less widespread, tourism developments also contribute to erosion and siltation and poor management of construction sites, particularly on steep slopes, is often implicated. Developments in which large tracts of land are cleared are of particular concern. During 1996, a golf course development under construction on steep slopes near the coastal town of Knysna in South Africa was washed away during heavy rains and a vast quantity of sediment deposited in the nearby estuary. In 1992, road construction on hillsides adjacent to important tourism beaches in the Seychelles resulted in large amounts of soil being washed onto the beaches and into the coastal zone.[36] Lack of proper planning with respect to the siting of developments (buildings and roads), particularly on steep terrain, has also led to chronic erosion problems caused by disturbance to natural vegetation and drainage patterns as well as inappropriate design standards. Erosion and mobilisation of sediments can have disastrous effects such as slope failures and landslides that are extremely difficult to remedy. Dwellings built close to the coastal cliff edge at Brenton-on-Sea in the

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[33] See: *Integrated Coastal Zone Management in the Seychelles*, by C.G. Lundin and O. Linden (eds.)(1995), World Bank.
[34] See: *Integrated Coastal Zone Management in Tanzania*, by O. Linden and C.G. Lundin (eds.)(1996), World Bank.
[35] See: *Towards Integrated Management and Sustainable Development of Kenya's Coast*, Published by University of Rhode Island's Coastal Resources Center.
[36] See: *Integrated Coastal Zone Management in the Seychelles*, by C.G. Lundin and O. Linden (eds.)(1995), World Bank.

Southern Cape region of South Africa, have caused slope failures due to stormwater run-off discharging down the cliff face.

Sediments eventually enter river courses and can impact severely on the natural sedimentation rates and raise turbidity levels in the river, estuary or coastal zone. Coastal productivity may be impaired by sediments smothering bottom-dwelling organisms, disrupting filter-feeding organisms including commercially important oysters and clams, and limiting the photosynthetic capability of corals and seagrasses.

Summary impacts:

- Loss of topsoil and erosion of coastal catchments;
- Sedimentation and increased turbidity in rivers, estuaries and the coastal zone (ecosystem degradation);
- Slope failures.

4.2.4. Waste Disposal and Pollution

As the number of tourists to a region increases, greater demands are placed on solid waste and sewage effluent disposal facilities. In many East African countries these facilities are often inadequate to service the existing needs of the local population yet tourism resorts are frequently developed without properly assessing the capacity of the local authority to accommodate additional loads. An additional factor that should be considered is that wastes generated by the tourism sector are frequently highly seasonal and may place excessive burdens on waste treatment facilities at certain times of the year. For example, at Hartenbos near Mossel Bay in the Southern Cape region of South Africa, water quality in the estuary into which treated sewage effluent is discharged regularly declines during the summer months in response to the influx of summer visitors.

Tourists generate vast quantities of solid waste either directly or indirectly, and these contain a high proportion of non-biodegradable materials due to the demand for luxury items. Littering has become a major problem, and when local authorities do not have the capacity to collect garbage, large quantities accumulate, polluting beaches and coastal waters and degrading the aesthetic value of the tourist destination. In Zanzibar, collection of garbage from tourist areas is inadequate and the situation is predicted to worsen with the expected growth in tourism. Remote tourist destinations such as islands are a particular cause for concern.[37]

Many towns either do not have formal sewage treatment facilities, or their facilities are extended beyond their intended capacities (see Box 1).

The inadequacy of waste disposal facilities in East Africa has led to pollution and degradation of coastal environments. In the Seychelles, leachate from dumpsites penetrates the coral fill, contaminating groundwater before seeping into the coastal environment. Domestic sewage discharged by pipeline into the sea beyond the surf zone depends on effective dispersal to maintain water quality, but coastal waters are often overloaded or the outfalls are positioned where current patterns circulate effluents back to the shore. In Tanzania, effluent discharges from towns and villages are extensive all along the coast. The disposal of sewage has contaminated coastal

[37] See: *Towards Integrated Management and Sustainable Development of Zanzibar's Coast*, Published by University of Rhode Island's Coastal Resources Center.

waters with pathogens and excessive nutrients and created high biological oxygen demand (BOD), especially in the vicinity of outfalls, creeks and in estuaries. In several countries, including Tanzania, Mozambique and Kenya, concern has been expressed at the health risks associated with the levels of pathogens in edible shellfish. In Maputo Bay, Mozambique, significant levels of pathogens from faecal contamination were detected in shellfish and marine waters from all sites sampled.[38]

Box 1. Treatment and disposal of sewage waste in the Seychelles[39]

In the Seychelles, the major source of land-based pollution, sewage effluent, has become an important environmental and human health concern. Sewerage is recognised as a basic need by the government, but the provision of satisfactory levels of sanitation has been frustrated by the haphazard nature of development projects. Although 85 % of urban dwellings on Mahé are served by sanitation systems, only Victoria possesses a public water-borne sanitation system while others are planned for Beau Vallon and Praslin.

Sewage discharges from the Greater Victoria area, including discharges from industries and public buildings, are estimated at around 9 000m^3 per day. At present, only 1 700m^3 per day are collected by a public collection system, and treated before discharge at sea. The effluent is treated in an oxidation plant constructed in 1973, which now operates at maximum capacity.

There is strong evidence of significant faecal contamination in many of the rivers of Mahé and Praslin. This is attributed to diffuse pollution caused by ineffective and inappropriate sewerage arrangements. Coastal and human health is very much linked to adequate treatment of wastewater; significant pollution could affect the economy and productivity of people.

Sewage effluent is frequently discharged into shallow waters close to popular beaches, posing real health risks to bathers and threats to aquatic life. In the Seychelles and Mauritius, the loading of organic wastes into enclosed lagoons has caused anoxic conditions that have resulted in fish kills and impacted significantly on adjacent reef ecosystems. On a stretch of the west coast of Mauritius, from Baie du Tombeau to Flic en Flac, there are already seven sewage outlets into the sea, only one of which has a deepwater outfall.[40] Nutrients associated with sewage effluents cause eutrophication of coastal waters and prolific growth of certain forms of algae that can smother and degrade reefs.

Summary impacts:

- Overloading of waste treatment/disposal facilities;
- Pollution of surface and groundwater (organic material, nutrients, pathogens);
- Littering and loss of aesthetic quality and potential for spread of disease;
- Contamination of edible shellfish;
- Contamination of beaches and water areas important for contact recreation;
- Enrichment (eutrophication) of coastal waters and ecosystem degradation.

4.2.5. Coastal Erosion

Erosion of beaches has become a serious problem along the coastlines of East African and is well documented. The entire city of Beira, Mozambique is threatened by coastal erosion, as are beaches along the Nyali-Bamburi-Shanzu region of Kenya,

[38] See: *Integrated Coastal Zone Management in Mozambique*, by C.G. Lundin and O. Linden (eds.)(1997), The World Bank.
[39] See: *Integrated Coastal Zone Management in the Seychelles*, by C.G. Lundin and O. Linden (eds.)(1995), World Bank.
[40] *The Journey from Arusha to the Seychelles*, by O. Linden and C.G. Lundin (eds.)(1996), The World Bank.

Kunduchi beach north of Dar es Salaam, Tanzania, and much of the coastline of Mahe, Seychelles, to highlight just a few examples (see also Box 2).

Box 2. Coastal erosion at Kunduchi beach, Tanzania[41]

Kunduchi beach is located about 18 km north of the Dar es Salaam harbour and is a popular recreational bathing beach. Five hotels have been built along the beachfront. Beach erosion appeared during the late 1970's and early 1980's and this initiated a study by members of the University of Dar es Salaam to determine the underlying causes. Erosion rates of up to 50 metres within a 10 year period were reported and emergency measures were undertaken to protect the beachfront hotels. These measures involved the construction of 54 groynes, with an average length of 30 metres, north of the Kunduchi-Manyema estuary. The spacing between the groynes varied from 15 to 35 metres. In addition, other types of groynes were constructed immediately south of the estuary, comprising sand-filled nylon tubes with a diameter of at least 1 metre and an average length of 70 metres, laid at intervals of 60 to 120 metres.

An inspection in 1985 revealed that the groynes could not arrest the erosion problem, although a net accretion on the profiles of the groynes south of the estuary demonstrated some effectiveness. However, studies have shown that groynes do not prevent erosion, but rather interfere with patterns of longshore sediment transport. Investigations to determine the cause of the erosion were not conclusive, however it has been suggested that mining of sands for construction purposes in four streams draining the hinterland of the beach may be responsible for disrupting the natural supply sediments to the beach.

These systems are extremely dynamic and any activity that interferes with the natural sediment processes can lead to the development of serious coastal erosion. This involves disruption of the movement of sand within a beach or dune system, or transfer of sand between them and/or external sources of sediment supply. For example, during periods of high wave action, sand is transported offshore and the frontal dune systems provide a reservoir of sand to replace material eroded from the beach. Structures that prevent the transfer of sand from the dunes to the beach cause a loss of sediment with the result that the beach migrates in a landward direction.

Beach erosion is commonly the result of fixed structures such as hotels, restaurants and bars built on the beach and dunes. In some countries, a legally enforceable setback distance for coastal protection is specified. For example, in Mozambique and Tanzania, a setback of 100 metres from the high water mark is required, and in Kenya, the setback is 100ft (37.7 metres). There are numerous instances where this has been ignored however. Beach erosion is also caused by removal of beach sand for construction, clearing of dune vegetation and flattening of dunes, as well as structures such as groynes and breakwaters that extend from the intertidal into the subtidal zone (Figure 1). Damage to coral reefs protecting the coastline from wave action is another contributing factor. Attenuation of external sources of sediment supply also create erosion problems in the natural deposition zones of the coastal zone. This is commonly the result of dams, barrages and river diversions, particularly where river systems carry naturally high sediment loads.

[41] See: *Integrated Coastal Zone Management in Tanzania*, by O. Linden and C.G. Lundin (eds.)(1996), World Bank.

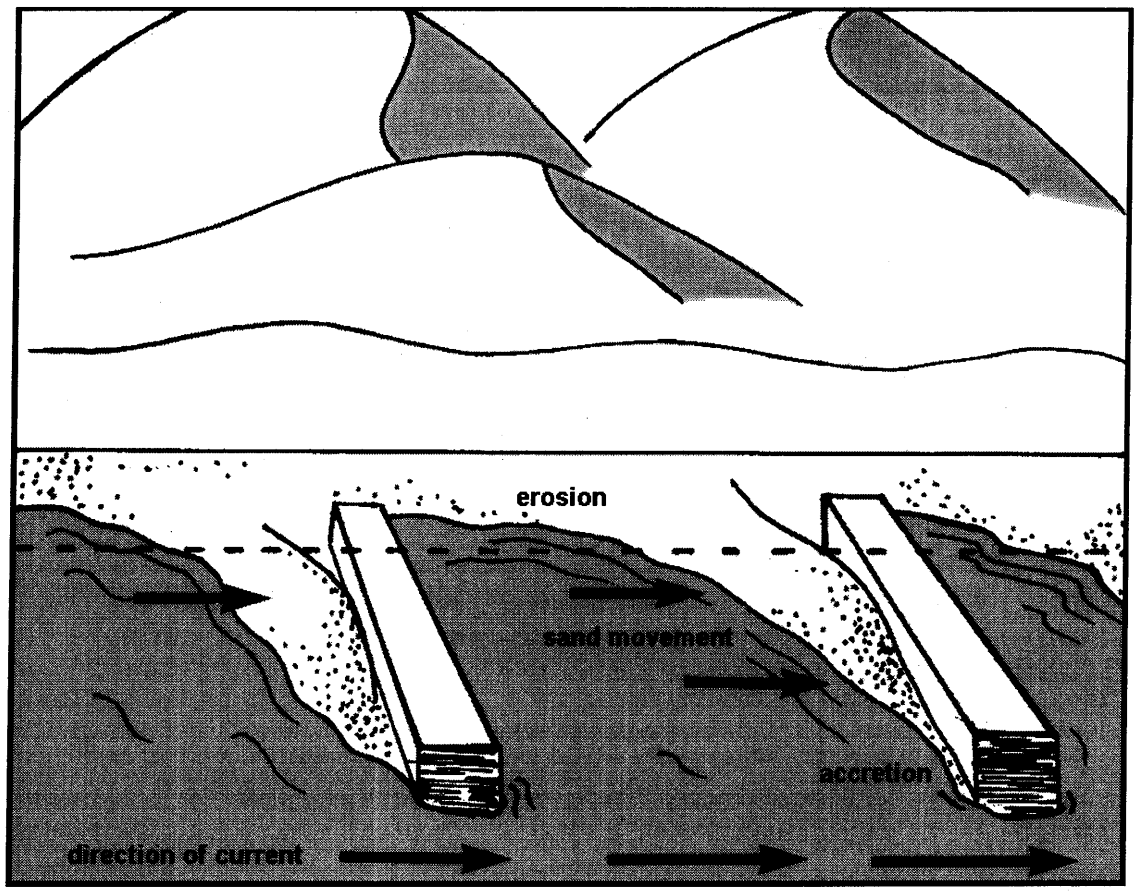

Figure 1. Disruption of longshore sediment transport by structures such as groynes, piers and breakwaters.[42]

In the Seychelles, erosion problems have arisen through the tendency of some beachfront hotels to attempt to "improve" beaches by excavating beach rock and live coral, and constructing breakwaters. The largest breakwater on Mahé at Port Glaud was built by a hotel to "create" and protect a beach but has led to a decrease in longshore sand drift.[43] In practise, breakwaters and groynes interfere with sediment transport and accretion tends to take place on the "up drift" side of the structure while erosion takes place on the "down drift" side.

Where beach erosion has already occurred, sea walls are often constructed to protect properties however, by disturbing sediment transport further, these frequently become undercut and collapse. In addition, engineered structures of this nature are unsightly and do not contribute to the aesthetic appeal of a natural dune and beach system. Once constructed, sea walls must be maintained on a regular basis, a process that involves considerable cost.

Summary impacts:

- Disruption of sediment supply and transport processes;

[42] From: Council for The Environment, 1991.
[43] See: *Integrated Coastal Zone Management in the Seychelles*, by C.G. Lundin and O. Linden (eds.)(1995), World Bank.

- Loss of beaches and dune systems by erosion;
- Degradation of aesthetic qualities by construction of beach protection structures;
- Expense associated with maintaining beach protection measures.

4.2.6. Marine Resources

A wide variety of marine resources are exploited directly or indirectly for the tourism sector. A growth in tourism can generate increased demand for resources such that they become over-exploited and lead to the degradation of coastal ecosystems. These include fish and other high-quality seafoods supplied to restaurants such as lobsters, crabs and octopus. In many cases the coastal fisheries are operated without management or control, and destructive fishing techniques, including the use of explosives, are used despite legislation prohibiting such activities. Coral reefs and seagrasses in particular have been badly damaged by overfishing or by the nature of fishing techniques employed. Many marine creatures are exploited for sale as curio items and include some species that are rare or endangered. For example, there is a prosperous tourist market for turtle carapaces and their products in the Mozambican cities of Pemba, Beira Nampula, and Maputo as well as on Inhaça island.[44] Turtles are also threatened by disturbances to nesting sites including hotel and street lighting that confuses emerging hatchlings, as well as the presence of sea walls that prevent female turtles accessing beach areas to deposit their eggs. In Zanzibar, among other places, collection of corals and shells for the tourist market has increased steadily over recent years. A variety of shells, notably cowries, cockles, clams and oysters are collected in the intertidal areas. The meat of the larger shellfish (e.g. cowries and clams) is eaten, and the shells sold to middlemen. Small shells, especially cowries, are dried in large piles prior to sale. The intensity of harvesting can be severe enough to disrupt ecosystem processes by removing animals that represent key trophic links in these systems.

Summary impacts:

- Over-exploitation of fish and other edible marine resources;
- Destruction of coral reefs by intensive fishing activities;
- Over-exploitation of marine creatures for sale as curio items (including rare, endangered items).

4.2.7. Recreational Activities

Certain activities have the potential to be particularly damaging to the coastal environment. Coral reefs are extremely sensitive to disturbance and in some areas have been extensively damaged by recreational divers. In Mozambique, illegal harvesting of corals by recreational divers in the area south of Inhambane, has given cause for concern[45], and in St Anne Marine Park, the Seychelles, staff of the park have noted the destruction of corals due to the tendency of snorkellers to stand and sit on reefs. [46] Reports of extensive reef damage caused by anchoring are

[44] See: *Integrated Coastal Zone Management in Mozambique*, by C.G. Lundin and O. Linden (eds.)(1997), The World Bank.
[45] See: *Integrated Coastal Zone Management in Mozambique*, by C.G. Lundin and O. Linden (eds.)(1997), The World Bank.
[46] See: *Integrated Coastal Zone Management in the Seychelles*, by C.G. Lundin and O. Linden (eds.)(1995), World Bank.

widespread. For example, in Mozambique, the numbers of yachts visiting from South Africa has increased dramatically over the last three years and use of the anchorage at Inhaca Island has caused extensive damage to coral reefs. Growth in tourism has given rise to an increase in boat activity of a variety of types including glass-bottomed boats for viewing coral reefs, ferries to transport visitors to remote islands, sailing yachts, sport fishing boats, jet-ski's and powerboats. As boat traffic increases, these activities pose risks of pollution from boat fuels, discarded bait offal, etc, as well as the danger to life and risk of collision due to incompatibility of different water uses and lack of zoning controls.

The use of off-road vehicles (ORVs) in the coastal zone is one of the most serious land-based threats and is prevalent along the South African and Mozambican coastlines. ORVs are used extensively by recreational fisherman to access the coast and pose a serious threat to nesting seabirds and turtles as well as to vegetated dune systems when driven above the high water mark.

Summary impacts:

- Damage to coral reefs by divers and boat anchors;
- Over-exploitation of fish by recreational fishermen;
- Pollution from intensive boat activity;
- Destruction of dune systems and disturbance to bird/turtle nesting and/or roosting sites by off-road vehicles (ORVs).

4.3. Economic Impacts

In the developing world economic impacts frequently outweigh other considerations when it comes to tourism development. The need for foreign exchange and the ease by which the industry can be developed relative to other sectors, makes tourism development a national priority for many East African countries. It is therefore important to have a clear understanding of the tourism industry's economic impacts, particularly because not all of them are positive.

4.3.1. Classification of Impacts

There are several ways of looking at economic impacts. The following classification of impacts reflect the multi-sectoral nature of tourism:

Primary impacts arise from the inflow of foreign cash as a result of visitor expenditure. They are fairly well recorded by banks and businesses such as airlines, hotels and restaurants. They are relatively easy to measure.

Secondary impacts arise when the currency inflows penetrate to other sectors. This happens when the tourism industry passes some of its business off to other businesses, for instance when an airline company contracts to provide on-board meals. Wages earned by people involved in sport services also fall into this category.

Tertiary effects arise when currency flows are not the result of tourist expenditure, but when the practise of tourism led to other opportunities. For instance, a filmmaker on holiday in Mauritius may decide to use that country as the venue for his or her next film. Or a tourist may be so enchanted with the wine-growing region of the Western Cape Province of South Africa that he or she buys a farm.

From the above it can be seen that the total economic impact of tourism is very hard to calculate indeed, but countries would be wise to commission a thorough and intrusive analysis of their tourism industry. For instance, many developing countries have a surprisingly high percentage of foreign workers in their tourism industry whose wages end up going to their home countries, thus reducing the net benefit to the host country.

Another analysis of financial impact is concerned with the geographic target area of the supposed tourism benefits.[47] This type of analysis considers what percentage of the total expenditure of the tourist comes to the *host country* (as opposed to staying behind in the country of origin, for instance as commissions to travel agents), to a *specified region* in the host country, and to a *local destination* in particular.

The target area analysis is particularly important when intended beneficiaries of a tourism development have been identified, for instance the local inhabitants of the peripheral zone around a park or when a geographical area has been targeted for economic regeneration. The target area analysis can reveal ways in which the economic benefits to a specific region can be increased (for instance by adjusting economic activities to meet a greater range of the tourists' needs, e.g. growing food locally, or training local guides). The analysis may also reveal modifications that can be made to a country's national marketing campaign, for instance to facilitate the direct interaction between tourists and travel business inside the host country.

4.3.2. Employment Opportunities

There is no doubt that the tourism industry provides employment to people in the host country. In South Africa it is thought that nine foreign tourists provide one job. However, statements about employment should be made carefully. The most important questions regarding employment created by tourism have not been sufficiently answered. Like so many other aspects of tourism development, job creation usually occurs on an 'as needed' and *ad hoc* basis. Some of the points that should be borne in mind are:

- Tourism may take people away from other sectors, or offer only part-time jobs, thus having little effects on overall employment rates;
- The correlation between income-generating effects of tourism and employment is not a perfect one, which means that high returns from the industry do not necessarily mean proportionately more jobs;
- Tourism tends to be highly seasonal which can create an uneven income curve and a larger than normal percentage of unemployed people in the off-season, especially if people migrate from one area to another to become involved in tourism;
- Tourism has the potential to influence the range of skills available in a destination. Not all these skills may be useful in other sectors, and if the destination starts to waver in its popularity there may suddenly be an oversupply of, for instance, guides or cooks.

There is much that a responsible developer can do to mitigate the negative effects of tourism on society. They include:

- Having a policy of making use of local labour;

[47] See: Odendaal F. (1997) *Ecotourism Trial Runs as a Tool for Responsible Development.* Yale University Bulletin Series, No.99.

- Being open to possibilities of co-investing with local entrepreneurs;
- Exploring possibilities of community involvement in the business, for instance giving preference to local guides or encouraging side-industries;
- Doing a skills and needs analysis of the community so as to target unemployed sectors (in many areas this will be the women) and make use of local labour;
- Investing in training for employees and/or accepting in-service trainees.

4.3.3. Development of Entrepreneurial Activity

It is known that tourism can stimulate entrepreneurial activity. For instance, when a destination starts that relies mostly on off-road vehicle (ORV) activity, a local entrepreneur may decide to open a mechanics shop for servicing vehicles. Or, local people may start a diving shop to service the needs of tourists.

4.3.4. Economic Costs of Tourism

Impacts on the Labour Force

Developing countries are often overoptimistic about the benefits that tourism can bring to their economies. It is important that the relative economic benefit that can be gained by investing in tourism is in fact larger than by investing in another industry. The coming of tourism to the island of St Lucia in the Caribbean resulted in banana plantation workers opting for tourism, which resulted in a loss of labour and productivity to the latter industry. Tourism also caused food imports to rise and caused a strain on balance of payments.

Inflation and Availability of Essential Resources

A large influx of tourists can cause the price of commodities such as food and accommodation to rise disproportionately to the earnings of the local population.[48] Land can also become so expensive that only foreigners can afford to buy it. Tourists have more money than local people who are often strapped for cash. Particularly in new destinations it is not uncommon for local people to sell food to tourists that would have ended up on their own plates. A group of as few as ten tourists can easily exhaust the supplies of a small village.

Over-reliance on Tourism

Small countries in the developing world tend towards reliance on a single primary product. They therefore tend to be badly affected by changes in commodity prices. Tourism appears to provide an ideal opportunity to diversify, but soon economic dependency may shift to the tourism sector. When tourism trends cause a downward swing in the popularity of the destination, the effect can be devastating. The industry is known to be fickle and one or two happenings may colour the tourist's view of the destination in terms of safety or desirability. It is also true that large client bases, like the United States, tend to have a 'flavour of the month' aspect to their outward tourism activities, with new destinations being opened regularly and the favourites sagging after a number of years.

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[48] Cater, E. *Ecotourism in the Third World – Problems and Prospects for Sustainability.* In: France, L. *Sustainable Tourism*, Earthscan Publications Ltd.

Mitigating Negative Economic Impacts

In the developing world particularly, tourism should be seen as a development tool and not as a closed sector end in itself. Therefore it should be integrated as far as possible into other economic planning and development initiatives.

4.4. Social and Cultural Impacts

The social and cultural impacts of tourism can be vast, and unfortunately many of them are negative. They include:

- An intrusion of western culture into the host population. The tendency is often for local people to try to emulate western consumerism. In new destinations, local populations are often not aware that many tourists work hard most of the year and then take time off for leisure. Instead, the tourists appear to have a lifestyle that is only enviable and the temptation to mimic them in terms of dress or personal assets such as watches, sunglasses, etc, is great;
- Value systems may be eroded, particularly in poor areas where tourists can be seen as an opportunity to make a fast buck. This may lead to theft and prostitution, and sometimes violent crimes;
- Local customs are often not respected by tourists who may be unaware or insensitive to them. It is critically important that the government and other role players make tourists aware of such issues;
- Valuable cultural artefacts are often bought by tourists, and shipwrecks are regularly plundered (see Box 3).

Box 3. Preserving submerged cultural resources[49]

The marine sub-tidal environment often contains submerged cultural resources. Archaeological research has shown that shipwrecks often cluster together in proximity to features such as reefs and rocky outcrops that represent significant maritime hazards. Along the coast of East Africa it is common to find shipwrecks representing numerous cultures and spanning hundreds or even thousands of years in a relatively contained area. These valuable assets not only have intrinsic value to culture and history, but important economic value. In many countries, large numbers of tourists are drawn by maritime museums and the chance to scuba dive on shipwrecks.

Shipwrecks therefore can add considerable value to tourism in the countries flanked and surrounded by the Indian Ocean. Unlike many ecological resources, they cannot recover from damage caused by development and measures should be put in place to protect them. Many areas like the coast of France and Florida have experienced substantial pilfering of their resources. Today, many countries are starting to implement strict regulations regarding treasure hunting, thereby encouraging unscrupulous divers to find new areas. To date the Western Indian Ocean has been less subjected to the impacts of underwater tourism and treasure hunting. It is vitally important that tourism development should proceed with the implementation of preservationist cultural resource management plans. Such plans should be based on professional assessment of the historical importance and broad human interests in these resources rather than narrow private interests in commercial profit. Management plans need to make provision not only for the studying of artefacts and for protecting them *in situ*, but also for the removal and curation of artefacts identified as especially vulnerable to destruction through natural processes or human activity if left in place.

The answer to social and cultural impacts lie not only in planning and management, but also in the education of both the tourists and the resident population. Also, it is advisable that a social audit be done for a particular destination at the beginning and during various stages of tourism development.

[49] Text by: David Conlin and Stephen Lubkemann (see acknowledgements for institutional affiliations).

CHAPTER 5

COASTAL TOURISM AND ENVIRONMENTAL ASSESSMENT

Summary

Chapter 5 describes the Environmental Assessment (EA) process, how it is applied to tourism development projects, and its purpose in mitigating negative environmental effects, maximising benefits and analysing other effects such as cumulative impacts. An historical overview of EA is provided, describing the evolution of the EA process during the last two decades and its transformation to include, in addition to project-specific EA, Strategic Environmental Assessment (SEA) of policies, programs and planning, and Risk Assessment. The chapter provides an overview of the current status of EA in East African countries and the Western Indian Ocean Island states as well as the requirements of the World Bank, a major donor agency.

The costs and benefits of undertaking EA are outlined and the advantages of conducting EA in relation to these. Effective EA depends upon provision of institutional and legal mechanisms and clear procedural guidelines. In addition, the need for a lead agent to take responsibility for the implementation of EA and its role are highlighted. EA is a participatory process and the various stakeholder groups involved in the process are discussed. A development project comprises a number of stepwise events (the project cycle) leading from the project concept to its completion. This chapter outlines the role of EA as an integral part of the project cycle and how it is used to evaluate each phase of the project cycle. One of the greatest constraints to effective EA lies in the integration of EA with the project cycle and the chapter outlines practical tools to achieve integration through an analysis of the planning and design process. This highlights the iterative nature of planning and design and the use of bar (gantt) charts to incorporate EA in the process to achieve timely interchange of information between EA professionals and the planning and design teams.

This is followed by a description of the EA process itself showing the various steps in the process and levels of assessment required depending on the nature and scale of the development project. This involves a decision process in which the project is screened to categorise the project according to one of three options. These are: (i) environmental impact assessment (EIA) required, (ii) impact assessment <u>not</u> required, or (iii) need for impact assessment unclear (further analysis required in the form of a preliminary, or initial, assessment to determine whether full impact assessment is required or not). Where full assessment is required, the procedures to be followed and issues that need to be considered are outlined. Practical considerations pertaining to the implementation of the project such as the environmental management plan as well as monitoring, auditing and decommissioning are discussed. The chapter concludes with an overview of the constraints and resistance to EA and methods to overcome these.

5.1. Introduction

Environmental Assessment (EA) is a ***management tool*** which is now being widely used to ensure that development options are environmentally, socially and economically sustainable.[50] EA includes a broad range of activities such as social impact assessment (SIA), environmental impact assessment (EIA) and risk assessment. For further information on EA, readers should refer to the guideline document of UNEP 1996 as well as country-specific documents and other sources listed in the bibliography.

The main purpose of EA is to identify ways of improving development proposals through the following aspects:

- Prediction and evaluation of both beneficial and adverse impacts;
- Recommendations for preventing and mitigating negative impacts and enhancing positive aspects;
- Identification of alternatives;
- Recommendations for managing, monitoring and auditing project implementation;
- Ensuring accountable and transparent decision-making;
- Providing for stakeholder and specialist participation in decision making.

EA is a *process* that can be used to enhance and augment project planning. It is essential that EA is incorporated into project development from its earliest stages so that it can influence the final outcome of a project. EA should guide decision-making rather than impede development options. Application of EA should follow a logical sequence with the primary aim being an assessment of the range and scope of viable options or alternatives. Where just one option is available, EA can provide guidance in determining the optimal location and design of a project. In certain cases, EA can suggest the "no go" alternative (depending on EA regulations per country), where this is the most suitable and appropriate option. If development is to go ahead within an acceptable framework, a thorough environmental assessment will recommend mitigating measures for negative impacts; as well as stipulations for monitoring and auditing the progress of the development project.

Coastal zones provide sought-after areas for tourism, and the sector is recognised as having the potential to create serious negative impacts. Besides impacts associated with the construction of hotels and recreational facilities, tourism also places demands on infrastructure, public facilities, and the socio-economic and cultural functioning of the affected society.

In areas of rapid tourism growth, the lack of assessment by decision-makers and planners will be not only detrimental to the environment but could also be economically disastrous. Failure to accommodate environmental constraints, for example where dwellings are built on floodplains, may lead to loss of property during river floods. At a broader level, lack of planning and uncontrolled development of coastal resort towns may lead to loss of tourism-related revenue, as pollution, overcrowding and loss of natural areas result in declining popularity among tourists.

[50] EA is also referred to in different countries by other terms such as Integrated Environmental Management (IEM) or Environmental Impact Assessment (EIA). In this text, the term EIA is used to describe a specific stage in the EA process. This stage is undertaken where screening (or classification) of the proposal identifies the likelihood of significant impacts.

By contrast, the use of appropriate management tools provides the opportunity to achieve sustainable development; combining conservation of natural and cultural heritage with recreation derives socio-economic benefits. Proper environmental planning ensures that the natural and cultural heritage that attracts tourists is maintained by restricting development to less sensitive sites, promoting development that takes into account environmental constraints, and restricting the extent of development to levels that do not overwhelm local infrastructure and resources.

Environmental Assessment of coastal tourism development projects should, among other issues, include the following aspects:

- The viability of the project, through an assessment of problems, conflicts and resource limitations. Viability of the project may depend on whether there is adequate clean water resources available, sufficient demand for the services provided, and potential for conflicting sector activities that may have a negative influence on the development;
- Potentially harmful effects of the development on the social and biophysical environment of the site and surrounding area. For example, discharge of inadequately treated sewage wastewater may contaminate bathing beaches or disrupt sensitive ecological systems such as coral reefs.

The application of EA at the earliest stage of a project proposal can facilitate and enhance the implementation of development objectives. However, an EA should not be the sole deciding factor for determining whether or not the project should proceed. Its role is to provide clear and concise information to enable relevant authorities to make informed judgements. An environmental assessment can also provide information towards a management system that seeks to:

- Mitigate negative effects;
- Maximise benefits;
- Analyse strategic, cumulative and residual effects.

5.1.1. Historical Overview of EA

Impact assessment originated in 1969 with the enactment of the National Environmental Protection Act (NEPA) in the United States. Since then, it has been adopted by many other countries and undergone numerous distinct evolutionary phases (see Box 1).

5.1.2. EA in Developed and Developing Countries

The suitability of EA as applied in *developed* countries to the planning and assessment of actions in *developing* countries has been questioned by experts and practitioners of EA, as well as by local communities. It is generally agreed that impact assessments in developing countries should incorporate appropriate approaches that place greater emphasis on:

- Suitable technology;
- Less complicated but suitable methodologies;
- Identification of mitigation and management measures;
- Flexible and adaptive techniques to accommodate situations where baseline information is lacking and where implementation of project objectives is problematic;

- Multiple project objectives which allow for possible trade-offs.[51]

Box 1. The Evolution of Environmental Assessment[52]

Date and Phase	Trends and Innovations
1. Prior to 1970 Before EA	Project review based on engineering and economic studies, e.g. cost-benefit analysis; limited consideration of environmental consequences.
2. 1970 – 1975 Methodological development	EA introduced in some developed countries; initially focused on identifying, predicting and mitigating bio-physical effects; opportunity for public involvement in major reviews.
3. 1975 – 1980 Social dimensions included	Multi-dimensional EA, incorporating social impact assessment (SIA) and risk analysis; public consultation integral part of development planning and assessment; increased emphasis on issues of justification and alternatives in project review.
4. 1980 – 1985 Process and procedural redirection	Efforts to integrate project EA with policy planning and follow up phases; research and development focusing on effects of monitoring, on EA audit and process evaluation; and on mediation and dispute resolution approaches; adoption of EA by international aid and lending agencies and by some developing countries.
5. 1985 – 1990 Sustainability paradigm	Scientific and institutional frameworks for EA begin to be re-thought in response to sustainability ideas and imperatives; search begins for ways to address regional and global environmental changes and cumulative impacts; growing international co-operation on EA research and training.
6. 1990 – present	Strategic Environmental Assessment (SEA) of policies, programmes and plans introduced in some developed countries; international convention on trans-boundary EA, UNCED places new demands on EA for expanded concepts, methods and procedures to promote sustainability.

5.1.3. Strategic Environmental Assessment

In general, EA of tourism development is applied most commonly at a specific project level such as a resort development. However, EA is becoming increasingly important in the development of policy, programmes and planning, and is then referred to as a Strategic Environmental Assessment (SEA). An SEA encompasses regional and sector planning.

Regional SEA adopts a spatial approach to geographically defined areas. The application of SEA in coastal areas includes the development of an Integrated Coastal Zone Management (ICZM) Plan. In a regional SEA, coastal tourism (hotels, resort complexes, etc) represents just one component that may also include transport (e.g. ports and harbours, rail and road networks), mariculture, forestry and other activities. Regional SEA is appropriate in areas such as the coastal zone that are characterised by multiple activities.

Sectoral SEA is more common than regional SEA because large scale loans are frequently directed at sector activity investment (e.g. tourism master plans). Sector SEA is usually less appropriate for the coastal zone because:

[51] Adapted from: *A Guide to Impact Assessment in Coastal Environments*, by J. Sorensen and N. West 1992. Coastal Resources Center, The University of Rhode Island.
[52] From: *A Directory of Impact Assessment Guidelines*, by Roe *et. al.* 1995. IIED.

- Sector activities are frequently of cross-regional or national significance;
- The coastal zone is characterised by multiple sector activities that may span an entire region.

Nonetheless, sector SEA is useful where specific activities are confined to an area, as is the case with coastal tourism.

A significant feature of SEA is that it addresses cumulative and cross-sector impacts, which cannot be adequately achieved at the level of project-specific EAs alone. In the absence of SEA, the cumulative impacts of individual development projects within a region will likely remain unknown, even where a project EA is undertaken. Cumulative impacts may only be recognised after environmental systems have already been substantially degraded. For example, the sewage wastes of one hotel complex may represent an insignificant loading on the municipal sewerage system. However, the cumulative effects of rapid tourism development may overwhelm the capacity for effective sewage treatment, resulting in sub-standard discharges to coastal waters and coastal ecosystem degradation.

In addition, a number of project-specific EAs within a region may not be cost effective if a regional SEA has not been undertaken prior to individual development proposals. Therefore, it is advisable that EA should incorporate regional and sector objectives. SEA should be conducted early in the development history of a region to provide the framework that enables project-level EA to be more comprehensive, effective and cheaper.

Recently, the Western Heads area near the town of Knysna in the southern Cape region of South Africa was subject to a land-use (structure) plan incorporating SEA principles.[53] This was initiated in response to the growing number of applications for subdivision of land for tourism resort development, and recognising that the area includes a large stretch of pristine coastline, coastal cliffs, coastal dune belts and indigenous coastal *fynbos* vegetation that are extremely sensitive to development pressures. The structure plan provides the planning framework that will ensure the conservation of these and other attributes (e.g. archaeological heritage) since the area is recognised as a prime tourism destination but with limited capacity for intensive development.

5.1.4. Risk Assessment[54]

The technique of risk assessment is used in a variety of professions and sectors. For example, aeronautical engineers conduct risk assessments of airliners to determine the likelihood of structural or engine failures occurring in flight. The use of risk assessment as an approach to examining environmental problems is becoming increasingly widespread, for example, in determining risks posed by genetically modified organisms, chemicals, etc. Definitions used in risk assessment are important because of the wide range of applications of this approach, and the different meanings attributed to specific terms.

Hazard is properly defined as "a property or situation that in particular circumstances could lead to harm." ***Risk*** is more difficult to define. When used in the context of risk assessment, the meaning is generally taken to be "the combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the

[53] Chittenden Nicks Partnership: Urban Planning and Environmental Design.
[54] Reference: Internet website (www.tiger.eea.eu.int)

consequences of the occurrence." The difference between hazard and risk is illustrated by the following example: corrosive acid is hazardous to human health, but only represents a risk if people are exposed to it. The degree of risk depends on the specific circumstances. There is less risk associated with acid that has been diluted before people are exposed to it, although the hazardous property of the chemical remains.

There has been a trend in environmental policy and regulation towards risk assessment, rather than hazard assessment. This is in recognition that for many environmental issues, zero risk is unobtainable or not necessary for human or environmental protection, and that a certain degree of risk is "acceptable" once the benefits of certain situations, activities, processes, etc, have been considered.

Risk assessment is the procedure whereby risks posed by inherent hazards are estimated either quantitatively or qualitatively. It is estimated by incorporating a measure of the likelihood of the hazard actually causing harm, with a measure of the severity of the harm in terms of consequences to humans or the environment.

Environmental risk assessments are conducted to examine the effects resulting from technology that threaten ecosystems, animals and humans. It includes human health risk assessments, ecological or ecotoxicology risk assessments, and specific industrial applications of risk assessments that examine end-points in people, biota or ecosystems.

Risk management is the decision-making process through which choices are made between a range of options that achieve a "desired outcome". This may be specified by legislation in the form of environmental standards, determined by a formalised risk-cost-benefit analysis, or defined by, for example, industrial "good practise". It should result in risks being reduced to an acceptable level within the constraints of the available resources.

There are many different ways of managing risks, including elimination, transfer, retention and reduction. Risk reduction activities reduce the risk to an acceptable level, derived after taking into account a selection of factors such as government policy, industry norms, and economic, social and cultural factors.

5.1.5. Review of EA in East Africa and the Western Indian Ocean Islands

This section briefly describes approaches to environmental assessment in countries represented in SEACAM. Information is based on readily available literature, which appears lacking for many African countries. One reason for this is in fact the absence of any formal or published EA procedures.

The application of EA appears to be most effective in ***South Africa***, relative to other developing East African countries. Environmental assessment is undertaken according to the Integrated Environmental Management (IEM) procedure of the Department of Environment Affairs and Tourism (DEA&T). The first version was published in 1989 by the Council for the Environment and was replaced in 1992 by a set of six guideline documents published by the DEA&T.[55] These documents were

[55] These documents are: *1. The Integrated Environmental Management Procedure, 2. Guidelines for Scoping, 3. Guidelines for Report Requirements, 4. Guidelines for Review, 5. Checklist of Environmental Characteristics, and 6. Glossary of Terms used in Integrated Environmental Management.*

updated in 1997, and specify identified activities that require an EIA to be undertaken in terms of the Environmental Conservation Act 73 of 1989. A discussion document about a national strategy for IEM is currently being circulated (1998). The intention of this document is to extend "... the scope of IEM to deal with the full range of activities that can cause environmental impacts."[56] These activities include spatial policies and programmes; land-use plans; existing activities; and activities for a zoning plan or scheme.

In ***Tanzania***, the National Environment Management Council (NEMC) is the regulatory and supervisory agency in environmental management. The issuing of a development permit/licence is subject to provision of environmental approval by the National Environment Management Council (NEMC) whereby EA[57] is stipulated as the "environmental permitting prerequisite." EIA covers the full range of activities usually covered in EA or IEM. NEMC have issued a comprehensive document outlining EIA procedures which details requirements in terms of:

- Administrative procedures;
- EIA principles;
- Report writing;
- Activities requiring EIA and environmental checklists.

The Tanzania National Parks Board (TANAPA) have also produced a document, *Environmental Impact Assessment Procedure* for investors wishing to undertake development within National Parks. The guidelines, even though brief, provide an environmental checklist, a list of activities and environments requiring EA.[58]

In ***Zanzibar***, there are three main institutions responsible for approving projects. ZIPA and ZFEZA are responsible for private sector projects, and the Ministry of Planning is responsible for public sector and aid projects. In addition, several ministries including the Commission for Tourism, directly approve smaller projects within their sector. The Commission for Lands and Environment (COLE) of the Department of Environment has produced a guideline document entitled *Procedures for Environmental Impact Assessment of Development Projects in Zanzibar* along similar lines to the Tanzania NEMC document.

In ***Kenya***, EA[59] will be administered by the proposed National Environment Management Authority (NEMA). Currently, the National Environment Secretariat (NES) at the Ministry of Environmental Conservation advises the government on issues of EA. The proposed EA guidelines are outlined in *Environmental Impact Assessment (EIA)(Guidelines and Administrative Procedures)* of the National Environment Action Plan (NEAP) and the Environment Management and Co-ordination Bill which has yet to be approved by Cabinet. The document outlines the procedural requirements and reviews the legislative and administrative structures relevant to EA. A sector checklist for wildlife management and tourism is given in an appendix and provides details on project activities requiring EA, sources of impacts, applicable guidelines and standards, and practical mitigation measures. In addition,

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[56] See: p9 of; Discussion Document: *A National Strategy for Integrated Environmental Management in South Africa*, by R. Heydenrych and P. Claassen April 1998. Department of Environmental Affairs and Tourism (DEA&T).

[57] Referred to in Tanzania as EIA.

[58] Other useful documents include: (I) *An Introductory Guide to EIA in Tanzania*, by NEMC/IIED 1996, (ii) *The Performance of EIA in Tanzania: An Assessment*, by R. Mwalyosi and R. Hughes, 1998 and, (iii) *Environmental Assessment in Tanzania: A Needs Assessment for Training*, by IRA/IIED, 1995.

[59] Referred to in Kenya as EIA.

the Kenya Wildlife Service (KWS) has produced comprehensive guidelines entitled, *Environmental Impact Assessment (EIA) - Guidelines and Administrative Procedures*, for activities in areas within and surrounding National Parks and Reserves. The document is comprehensive, covering aspects such as:

- Procedures for national and KWS policy objectives;
- Administration of EIA;
- Scoping for specific environmental systems including sector activities for tourism and ecotourism;
- Guidelines and standards;
- Checklists of environmental characteristics and sources of information.

In ***Mozambique***, the Ministry for Co-ordination of Environmental Affairs (MICOA) is responsible for the implementation of political tools for environmental assessment of development. The Environmental Law, approved in 1997 and the Environmental Impact Regulations, approved in 1998, require that an EIA is submitted for coastal projects prior to approval. Sector-specific directives for EIAs are in the process of being formulated, but are presently still in the draft stages. A National Tourism Policy is now in place that recommends a sustainable and environmentally sensitive approach to tourism development. This was prepared as a Master Plan for Tourism to be approved by the Council of Ministers. Consequently, there is a growing trend towards increased consultation between tourism authorities and environmental authorities prior to projects being approved. The majority of development proposals submitting EIA reports to the Ministry of Environment for approval are coastal projects in the tourism sector.

In the ***Seychelles***, the Environmental Protection Act was enacted in 1994 and provides the means to harmonise the balance between development and the environment using a regulatory framework. In an effort to achieve sustainable development, the Environmental Protection Act made provision for the Environmental Impact Regulations, gazetted in 1996. These regulations require that every proposal for development be assessed to minimise its environmental impacts. The concept of Environmental Impact Assessment (EIA) is not new in the Seychelles and has *de facto* been implemented since 1974 through input by the Environment sector to the Planning Authority (i.e. informal, *ad-hoc*, in-house EIA). This is now formally referred to as Class II EIA. Procedures for simplified Environmental Analysis (in-house) EIA, Class II, have been upgraded in regard to the scrutiny of development planning applications. These take the form of environmental mitigating conditions attached to the Planning Approval Documents. In this way, delays in approval are minimised, avoiding the necessity of involving additional parallel institutions for monitoring and enforcement.

However, under the auspices of the Environmental Protection Act and its Regulations, more formal (Class I) EIA procedures have been introduced requiring full EIA. This represents assessment requiring studies by local or external experts and consultants, and public scrutiny of EIA reports. This is a pragmatic adaptation of the EIA process, in which existing institutions are used in the interests of efficiency, budgetary constraints and limited technical skills resources. Selection between the two classes is determined at the discretion of the Ministry of Environment and based on the size of the project and its locality.

In ***Mauritius***, the Environment Protection Act (EPA) 1991, as subsequently amended in 1993, provides for the protection and management of the environmental assets of

Mauritius. Part IV of the EPA relates to the requirements for an environmental impact assessment (EIA) and makes provision for the application for an EIA licence in respect of undertakings listed in the First Schedule. Proponents applying for an EIA licence are required to submit to the Director of Environment an environmental impact report. After a preliminary review the EIA is open for public inspection. This requires notification in the Government Gazette and national press and a prescribed period for response.

The EIA report is circulated to the ministries or agencies concerned with EIA who submit their views in writing. Concurrently, the EIA Division of the Department of Environment organises a joint inter-ministerial site visit. The proponent may be requested to carry out further studies or to submit additional information. The Director may also set up a Technical Advisory Committee to advise him on the EIA or on any aspects of the undertaking.

Taking into consideration any public comments received as well as the views of the relevant ministries, agencies consulted, etc, a review of the EIA is carried out and referred to the EIA Committee for examination. The EIA Committee makes recommendations to the Minister who, after making his decision, instructs the Director accordingly. The recommendations are not binding on the Minister who may approve or reject the EIA (see Figure 1 for an outline of the EIA procedure).

The Minister may, as and when necessary, revoke an EIA licence or amend the conditions of the EIA licence or give the proponent directives on the method of execution and phasing of the undertaking, mitigative measures to be incorporated, further research investigation and monitoring to be undertaken or require the proponent to submit at such interval as he may determine, reports on the impacts of the undertaking on the environment.

The Director may at any time after the issue of an EIA licence, order a holder to submit a fresh EIA in respect of his undertaking within such time as he may specify, if in his opinion the undertaking is, or is likely to be, a source of pollution to the environment, or there is a substantial change or modification in the undertaking.

The decision of the Minister on the EIA is subject to appeal to the Environment Appeal Tribunal which is chaired by a barrister and comprises two assessors. The Minister may declare an undertaking by a public department, which in his opinion is urgently needed in the national interest or for the economic development of Mauritius, to be an exempt undertaking.

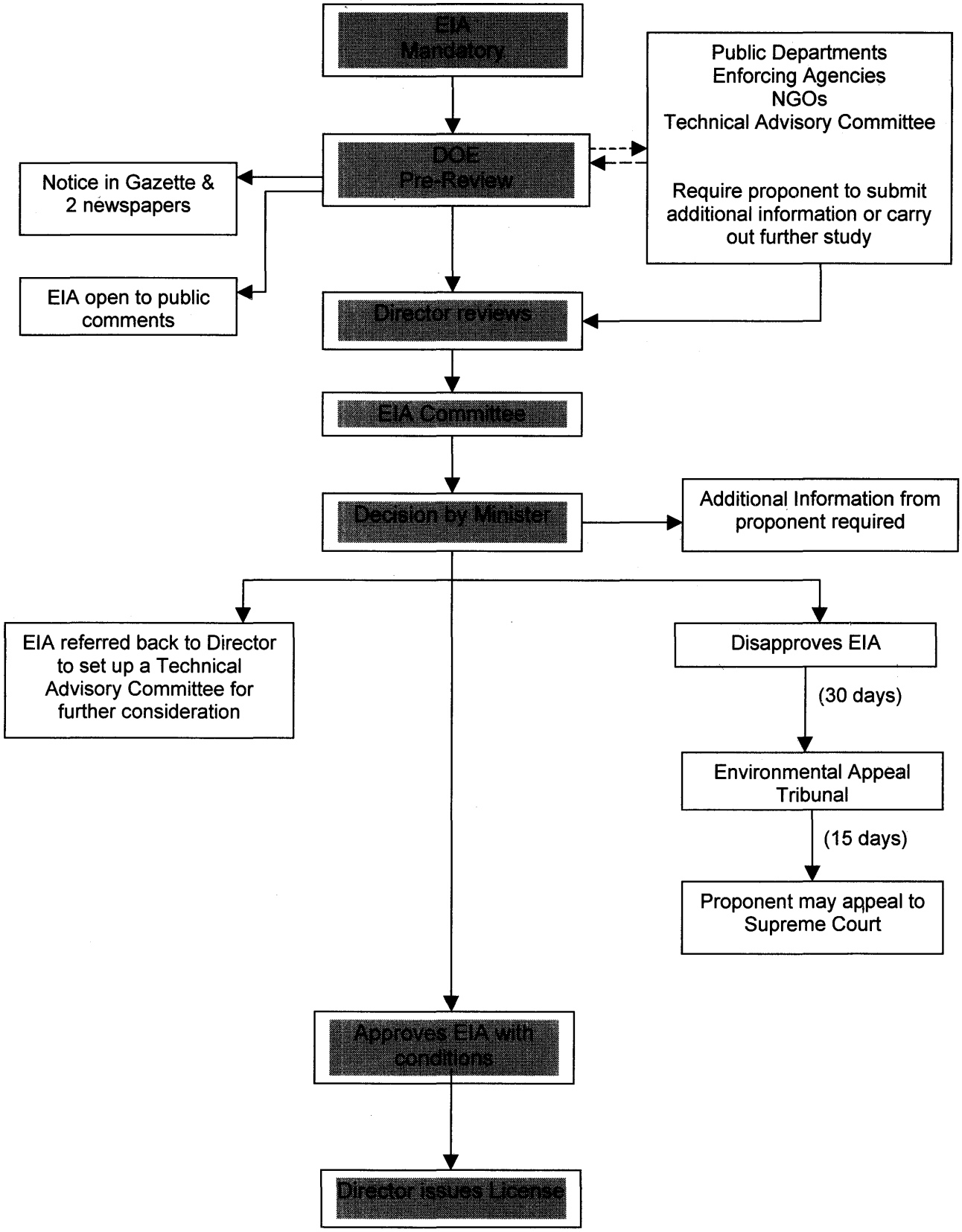

Figure 1. Procedure for EIA in Mauritius.

In ***Madagascar***, an operational structure for EIA has been set up within the framework of its Environmental Action Plan (PAE). The PAE is at present in its second phase, Environmental Program 2 (PE2), in which one of the priorities is to harmonise the compatibility of investments with the environment. The National Environmental Office (ONE) is responsible for the co-ordination of the activities related to its realisation and to National Environmental Policies.

Thus, following Article 10 of the Charter on Environment, Madagascar formulated a decree on the Harmonising of Investments and Environment Compatibility (MECIE). This requires that an impact assessment be conducted for every development project that might endanger the environment. The National Environmental Office (ONE) is the lead agency in the application of this decree, and the Technical Assessment Committee (CTE) is the legal body responsible for reviewing environmental impact assessments. It is the responsibility of the project developer to produce the Environmental Assessment Report. So far, only one impact study has been reviewed since the issuing of the decree, although another one is in progress and the impact assessment is currently being revised (aquaculture project).

In practise, the MECIE in its present form is not applicable because: (i) it is not adapted to national realities, and (ii) ONE and the public or private institutions lack the human resources with the desired technical skills. In addition, Environmental Assessment guidelines are not very clear, and persons involved and/or concerned with environmental assessment do not understand what impact assessment comprises or why it should be conducted. This is due mainly to a lack of communication between the people and organisations involved with it.

It is also important to note that the National Association for Management of Protected Areas (ANGAP), through its Protected Areas and Ecotourism Component (CAPE), is formulating its "ecotourism sub-sector policy in protected areas". The text (still in draft form) specifies the necessity for ecotourism impact studies to be performed (to address environmental, cultural, economic aspects, etc). This sub-sector policy conforms to regulations adopted by the Madagascar Government and has been prepared by public and private partners (Ministries responsible for tourism, land, tour organisers).

In the ***Comoros***, the framework law promulgated by the President in 1994 makes provision for impact assessments in its Section 3 (Articles 11 to 14). Article 11 obliges any development project (from any individual or legal entity, public or private), to carry out an environmental assessment before permission can be granted. This includes an analysis of the state of the site and its environment, an evaluation of the foreseeable consequences of the implementation of the project and a presentation of the measures to be taken to reduce or remove the damaging effects, and also other possibilities which have not been implemented.

Up until now the decree provided for under Article 14 of the framework law on the procedures for the realisation and presentation of impact studies has not yet been enacted. However, the General Office for the Environment (GOE) has established a process to implement this. The first article of this project provides for the obligatory submission of environmental impact assessments for all development projects (a list of projects is provided in **Annex 1**).

The assessment must be carried out by qualified persons or institutions chosen by the proponent and approved by the GOE. On receipt of the study, the GOE informs the public and receives comments. An inter-ministerial organ examines the decision

taken by the GOE and takes the final decision. Although no guidelines for EA procedures are defined, an indication of what is expected is given in Annex 2 of the projected decree.

Due to the fact that the decree concerning the regulations for the realisation, presentation and validation of EA studies has not yet been promulgated, the status of EA in the Comoros is currently weak. It has discouraged developers from embarking on the procedure and in addition, government departments authorised to approve development projects are insufficiently aware of the obligation in Article 11 concerning impact assessment. Also, none of the relevant texts provide adequate detail on the level at which the environmental assessment should be studied or the technical and financial thresholds required for projects.

In ***Réunion***, the law n° 85-729 dated July 18, 1985 specifies (Article L300-1 of the Town Planning Code) that "planning actions or operations are there to implement an accommodation policy, to organise the maintenance, the expansion and the reception of economic activities, to help the development of leisure and tourism, to safeguard or to develop the build up or the non-build up heritage and the wilderness."

Article L123-1 of the Town Planning Code stipulates the necessity of harmonising Land Occupation Planning (POS) with Installation of Territory Guidelines (DTA) trends. The latter have been defined in Law n° 95-115 dated February 4, 1995 dealing with trends of installations and development of the territory. The Regional Installation Plan (SAR) has the same effects as a DTA, therefore the POS must be in harmony with the latter.

The framework of SAR, a document specific to Overseas Territories, is defined in the law dated August 2, 1984. SAR "states the fundamental trends in terms of development of the territory and protection of the environment." SAR on the island of Reunion was approved by decree during the State Council meeting of November 6, 1995 after having been approved by the Council of Region at the meeting of March 24, 1995, after a long elaboration process in which the local communities and most of the local institutions took an active role.

There are two Projects of General Interest (PIG) in Réunion, their mechanism was conceived to allow the State to make good national interests' rights, before the intervention of the local communities which are in charge of land planning. The law n° 86-2 of January 3, 1986 manages all permits of land use and it applies to all private and public persons.

There is currently no information available for ***Eritrea***.

In addition to the above, the policy of donor/development agencies, such as the World Bank, is that EA should be undertaken by the recipient as a condition of financial support for major development projects. Box 2 provides a summary of information about the World Bank's stance on EA.

Box 2. EA and the World Bank[60]

Principles of environmental sustainability are now fundamental to international development institutions such as the World Bank, and consequently the Bank has incorporated a number of management tools in its lending and advisory activities. In 1989, the World Bank adopted Operational Directive (OD) 4.00, Annex A: Environmental Assessment, subsequently amended as OD 4.01 in 1991. This is at present in a process of conversion to Operational Policy OP 4.01, which describes the EA procedure for Bank-financed schemes. Responsibility for the EA process is invested in the borrower and the role of the Bank is to advise borrowers and ensure that acceptable standards of practise are incorporated into the EA process.

Details of Ministries and other agencies that co-ordinate and/or advise on Environmental Assessment procedures are provided in **Annex 1.**

5.1.6. Costs and Benefits of EA

EA is frequently criticised for causing delays and unnecessary costs. However, experience has shown that the cost of EA (which usually accounts for less then 1 % of the overall project cost) is far outweighed by the long term benefits of the process. It is more cost-effective to identify problems and revise the design criteria at the project proposal stage rather than correct negative impacts after the development has become operational.

Developers should include the EA into the overall costs of the project rather than viewing it as an additional expenditure. The benefits of EA can go beyond simply assessing the social, environmental and economic impacts of a project. It can also fulfil other planning roles, such as the efficient utilisation of natural and human resources in economic development. EA can therefore serve as a mechanism for the co-ordination of interagency co-operation that facilitates good decision-making. Other advantages of EA include:

- Correction of problems at the planning stages is more cost-effective than remedial action once the project has been implemented (e.g. proper siting of dwellings in dune environments to avoid coastal erosion as opposed to expensive coastal erosion control schemes to combat the effects of poorly sited development);
- Projects that are socially, environmentally or economically unsound are much less likely to be implemented, resulting in cost savings and environmental protection;
- Identification of inappropriate projects that can result in environmental damage (especially when tourism is heavily dependent upon the environmental attributes);
- Encouragement of suitable tourism development projects that achieve their objectives with minimal environmental disturbance, bringing credit to the developers and the country;
- Assists with the collection of data that can contribute towards more effective management as well as further research and education.

[60] From: *The Impact of Environmental Assessment: A Review of World Bank Experience.* The World Bank.

The benefits of applying EA in the planning and development of tourism projects cannot be overstated in view of the very direct consequences of poor development on the long term sustainability of the sector - often referred to as *"killing the goose that lays the golden egg".*

5.2. Towards Effective EA

5.2.1. Institutional Involvement in EA

Clear and explicit procedural guidelines, including institutional and legal provisions, are prerequisites for effective EA. "Strong political commitment is also vital to ensure that the [EA] process is resourced, developed and respected by the government, private sector and public alike."[61]

5.2.2. Lead Agent

Depending on legal and institutional requirements of each country, it is useful to establish the lead agent or a department of environmental management. This lead agent should be empowered to take responsibility for aspects of EA such as:

- Policy, strategy and legislation;
- Co-ordination;
- Enforcement;
- Information and reporting;
- Participation and appeals;
- Monitoring and review.[62]

5.2.3. Participants in an EA Process

As large a number of relevant individuals and groups as possible should be encouraged to participate in an EA process. Usually, people with a general stake in an EA are referred to as "*stakeholders*". All those who are interested in or affected by a specific activity addressed by the EA are referred to as *"interested and affected parties"* (I&APs). These include:

- ***Project proponent*** - the developer who is responsible for initiating and funding the impact assessment;
- ***Investors*** - may be loan and aid organisations such as The World Bank, Sida, USAID, etc. They may also be the project proponents. Investors will need to know that the project is viable and will provide returns on the investment;
- ***Consultants*** - individuals and/or firms with the professional capability to undertake the EA. These include those responsible for managing an EA process, process facilitators, specialist study consultants and review consultants;
- ***Government agencies, regional and local authorities*** (including conservation authorities and municipal officials) - the decision-makers who are responsible for environmental management functions. They will need to review the implications of the project in terms of their sector interests;

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[61] See: p3 of; *An Introductory Guide to EIA in Tanzania* by, the Institute of Resource Assessment 1996.
[62] Adapted from: Guideline Document: *EIA Regulations - Implementation of Sections 21, 22 and 26 of the Environmental Conservation Act.* April 1998, Department of Environmental Affairs and Tourism (DEA&T).

- ***Non-governmental organisations (NGOs)*** - societies, local interest groups such as environmental, cultural, and religious clubs who may have concerns about specific aspects of the project. For example, a local wildlife society may express concern regarding the loss of habitat of a rare or endangered animal due to the clearance of indigenous vegetation for a hotel complex;
- ***Local communities*** - who may be affected by the development project and may therefore be concerned about the impacts on their way of life as well as the resources, services and infrastructure upon which they are dependent. They probably represent the most important I&AP group. Lack of consultation with local communities often leads to conflict because of no sense of ownership, resulting in project failure or under-performance. Communities have specific local knowledge of an area that may be critical to the success of a project and should never be underestimated;
- ***Other sector operators*** - those whose interest may be affected in some way by the development. Tourism developments may provide new opportunities for other sectors that supply to the tourism industry e.g. mariculture. It is also possible that the development of the tourism sector could have negative consequences for other sectors.

The proponent of a development is normally responsible for conducting the EA. The proponent may be a private sector investor (small, medium or large project) or a government agency (regional and sector plans, and in some cases medium or large-scale projects). The project proponent or initiator is responsible for employing the services of independent consultants who will undertake the co-ordination of the EA. The size of the team and the particular skills required by them will be determined by the diversity of issues that need to be addressed which will vary from one project to another. For medium to large scale projects (e.g. golf lodge, marina canal complex) it is advisable to appoint a lead consultant responsible for co-ordinating and managing the EA, as well as identifying and appointing specialist consultants for particular aspects.

The team of consultants must be competent to undertake the EA. This should be reflected in their project management skills, technical capabilities and proven experience (these may include for example specialists in wastewater treatment, hydrologists, dune vegetation specialists, etc). Preference should be given to appointing consultants affiliated to relevant professional bodies since this invokes some measure of accountability. Projects can also benefit from the use of an independent facilitator whose role is to ensure that the concerns of I&APs (such as the public) are properly addressed. An external review panel including authorities, specialists, members of the public and local community representatives offers another means of monitoring the process.

5.3. The Project Cycle

A development project involves a number of stepwise events that lead from the project concept through to its completion and operation. EA is an integral part of the entire process (called the project cycle) from its initial planning stages, the feasibility and design phases, through to construction and operational management. EA may also extend to the decommissioning phase. Evaluation of each phase of the project cycle is useful for:

- Inter-linking phases of the project;
- Re-iterating aims and objectives;

- Identifying issues as they arise;
- Enhancing positive aspects, identifying negative aspects and recommending how these may be managed;
- Assessing conflicts, opportunities, as well as linking strategically into other policies, programmes and projects.

A generic project cycle showing the nature and timing of input from environmental assessment is illustrated in Figure 2. The project cycle may vary in different countries, and may also be adapted to suit particular project planning requirements. The precise interaction between EA and the project cycle will vary between projects since no two projects are the same. The most important feature is that the project cycle should not consist of independent phases but instead each phase of the cycle should contribute to an interactive process that enhances the overall project. The practical constraints to this as well as methods of overcoming these difficulties and achieving full integration of EA with the project cycle are dealt with in some detail in the following section.

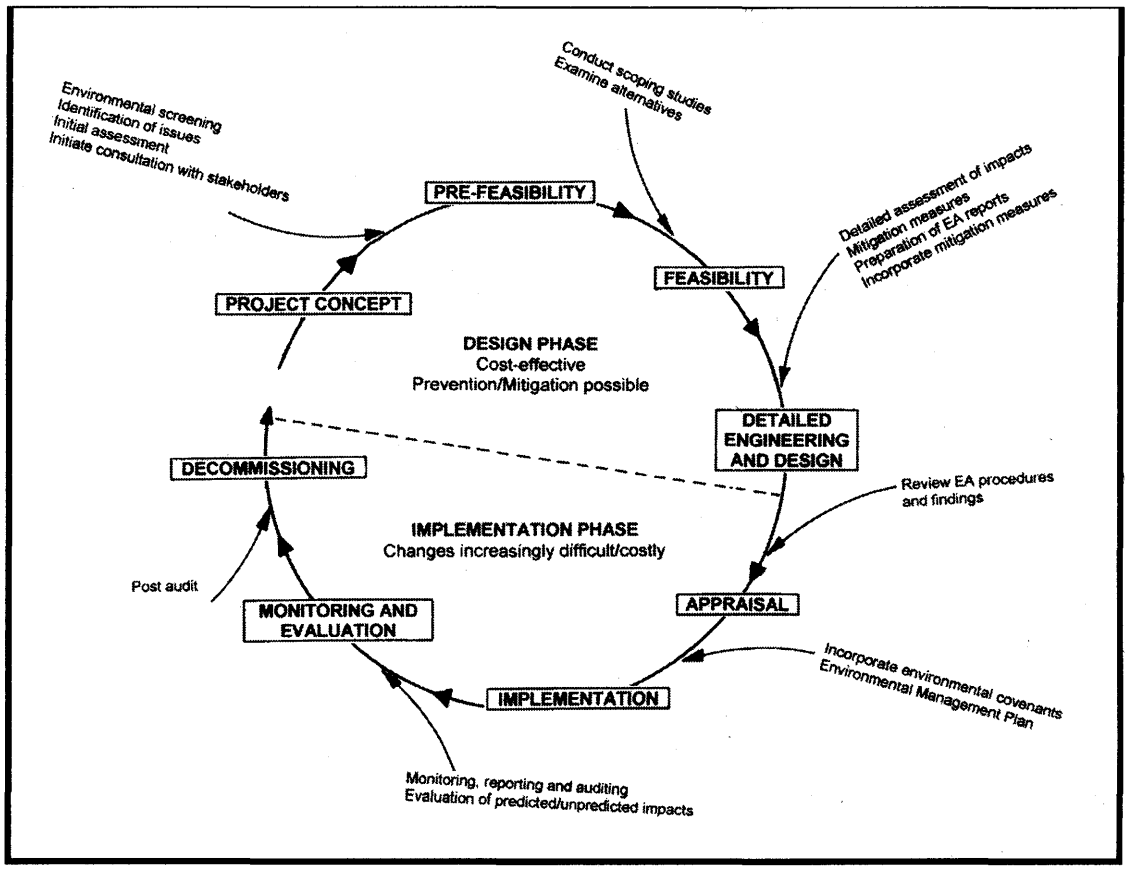


Figure 2. The Project cycle.[63]

5.4. Making EA Effective - Practical Methods of Integrating EA with Project Planning and Design[64]

The importance of integrating EA procedures with the project development cycle is emphasised in many texts on the subject; however, very few describe how this can

[63] Modified from: Environmental Assessment Sourcebook. Volume I: Policies, Procedures, and Cross-Sectoral Issues. World Bank Technical Paper Number 139. Environment Department, The World Bank.
[64] Adapted from: *Decision Scoping: Making EA learn how the design process works*, by A.L. Brown and R.C. Hill. Project Appraisal, Vol. 10, pp223-232, 1995.

be achieved in practise. Since the inception of EA procedures, lack of integration of EA into the project cycle has been recognised as a fundamental weakness that has led to EA fulfilling a mainly passive advisory role for both the proponent and the decision-maker.

The major problem is the absence of a mechanism that forces interaction between the EA team and the project planning and design team, or ensures that EA outcomes are implemented. Consequently, the EA team usually works independently of the project proponent and the planning and design team and only interact once the environmental impact statement has been completed. As a consequence, greater emphasis tends to be placed on EA *being done*, rather than anything *being done by it*. A mechanism is required that will ensure that environmentally-determined differences are achieved in projects as a result of design changes brought about by active involvement of EA in the design process. This will not take place of its own accord and cannot be left to chance.

The EA procedure itself creates resistance towards the transition of EA from an independent process to a dynamic, co-operative design tool. Currently, procedural systems tend to be dominated by requirements to produce a stand-alone document for decision-makers rather than to achieve dynamic interaction between EA and project and planning design. This arises because little attention is paid to the role, information needs and/or requirements of the planning/design professionals (engineers, architects, planners, etc) responsible for the project. This weakness is illustrated conceptually in Figure 3. This problem stems from the assumption that the project design will be put on hold during the whole of the EA process.

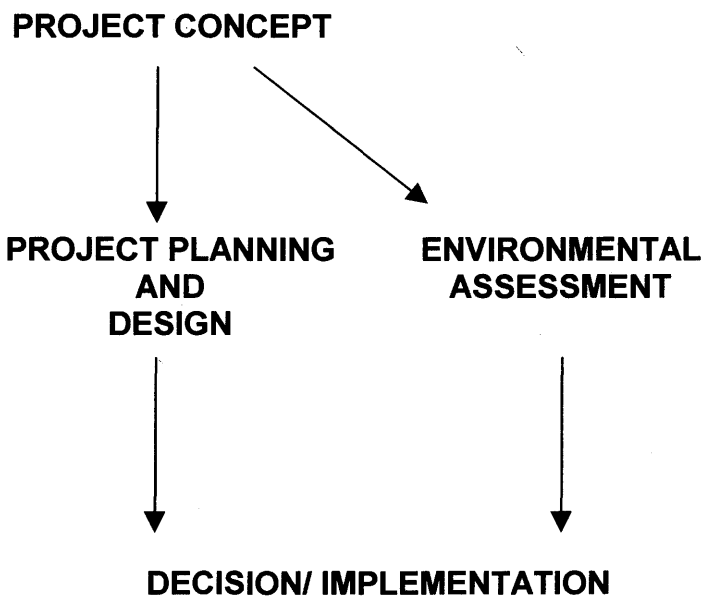


Figure 3. Schematic of parallel and independent relationship between project design and EA underlying most EA procedures in practise.

In reality, project design undergoes a continuous state of evolution between conception and final implementation and there is rarely any "final proposal" that can be subjected to EA (although it is commonly assumed that there is -*and* that it will remain static for the duration of the EA). Importantly, it is during this state of evolution that environmental input via the EA is most critical because substantial design changes based on environmental criteria can only be accommodated by

incorporating important information at the appropriate stage of the planning and design cycle. By contrast, by the time the outcomes of the stand-alone EA report (the environmental impact statement) are known, it is frequently too late.

This section indicates ways in which the lack of connection between the two activities (project planning and design, and the EA) can be pre-empted to ensure that environmental constraints are incorporated effectively into project design. Suggested practical arrangements include:

- Pre-EA consultative meetings;
- Regular conferences and meetings between the design teams and the environmental assessment teams;
- Staged reporting of the environmental activities using for example, initial environmental effects (IEE) reports and staged assessments where broad environmental overviews of alternatives are followed by more detailed assessment of a chosen alternative.

Implicit in earlier statements is the fact that appropriate timing of the information flow between environmental assessment and the design process is one of the pre-requisites to integration of planning and design with EA. As stated earlier, environmental information is often made available too late to have a significant bearing on the design process:

"*... a change that might well have been received and initiated on the basis of a 10 minute telephone call to the project manager earlier in the feasibility study may be vigorously opposed at the end of the design stage or in the construction stage, even if supported by field studies and thick reports.*"

The solution lies in EA evolving from a report into a process fully integrated with project planning. Figure 2, Section 5.3 shows the conceptual configuration of EA to achieve integration with the project cycle. Although the principle of this model is sound, as a practical arrangement it is too simplistic. In order to overcome this, the constraints to practical integration require further elucidation:

The model shows the various components of the project cycle as discrete compartments, but in practise this is rarely the case. Even if these stages can be identified, it is important to recognise that the critical time for EA to provide input to planning and design is *within* these stages, rather than *between* them. The difficulty in making these simple integrative models represents the major obstacle to the transformation of EA to a process that contributes effectively in project planning and design.

Decision scoping is a process that provides one solution to achieving the interchange of essential information between environmental specialists and project designers at an appropriate time. Before describing this process, it is first necessary to understand the nature of planning and design, and the tools required in managing the process.

Planning and design are not linear activities and the process of design is shown conceptually in Figure 4. The most important feature is the series of iterations that take place whereby successive concepts are tested against project objectives and constraints until judgements (decisions) can be made about fixing some element(s) of the design.

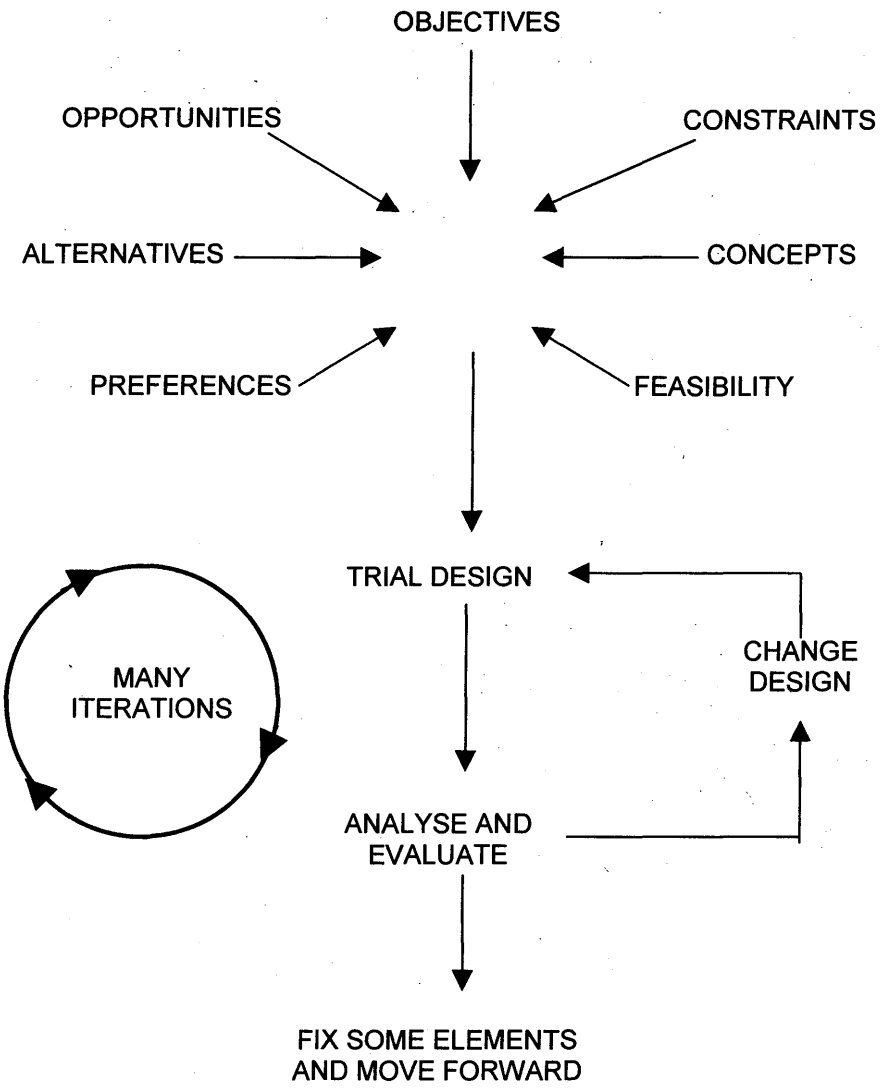


Figure 4. The nature of the planning and design process.

The decision-making occurs as a series of small steps gradually building momentum and importance. As this proceeds *options for change in design become foreclosed.* Flexibility at each stage only exists until the various decision-points of that particular stage are reached. Beyond this, various considerations grow in magnitude to contribute towards an ever-increasing obstacle to change or revision. These considerations are real and include:

- Project momentum;
- Budgets;
- Deadlines;
- Interdependencies;
- Personal commitment of the designer/planner.

Once the early design phase is complete, even the smallest changes will have major ramifications for the project and are likely to be vigorously resisted. Designers reach decision points using the information that is available to them at the time and from a

perspective of EA input, no decision points should be reached without the design team having had full access to the environmental information pertaining to a given design feature.

It is important to recognise that the scheduling of decision-points for the different components of a project are known in advance by the project planners and designers. In project management, activities and tasks that lead from planning through design to implementation are scheduled by means of Gantt (bar) charts, which provide a visual representation that assists in the logical progression of the project. Project planners also use network analysis (including critical path analysis and precedence networks) to identify which tasks must be completed and by which date in order for the project to be completed on schedule.

When constructing these charts or analyses, it is a matter of course for project managers to make provision for technical studies required in the decision-making. There is no reason why environmental investigations (as required by EA) should not be incorporated just as effectively as the more traditional technical studies of design and construction activities. Thus, prior knowledge of the nature and timing of the decisions that have to be made in the planning and design of a project is the fundamental starting point for an efficient and effective EA, particularly if the EA is to be perceived as a pro-active design component in the overall planning and design scheme.

Decision scoping starts with a schedule of all the planning and design activities, and decisions that will need to be made throughout the project cycle. It must also identify exactly what information on environmental constraints and opportunities will be relevant to each activity and decision point(s).

From this it becomes apparent that the timing and nature of the EA process should be determined by reference to the decision-points identified by the bar charts or network analyses drawn up by the project planner. Although the project planning team may produce a draft set of decision points and a time-frame, the decision scoping should be undertaken through full consultation between the managers of the design team and the EA team. They must identify the nature of the information required before each decision point and the time needed by the specialists to undertake the studies and present the information. In this way, the following possibilities can be accommodated:

- The EA manager will likely pose environmentally based questions to the project planner which will result in additional stages requiring specialist environmental input, and new decision points not anticipated by the project planner being included in the planning process;
- The project manager may be under the impression that a certain choice is straightforward (for example on engineering grounds), and unaware that that an apparently simple choice translates to major differences in environmental effects;
- The EA manager may propose essential studies for which the time-frame is unacceptable to the project manager who will need to convey to the EA manager that greater resources must be devoted to the study to bring it in line with an acceptable overall time frame.

This indicates as much of a need for a requirement-stream from the decision-maker to the analyst as there is for an information-stream from the analyst to the decision-

maker. This two way flow of information will ensure that EA and project planning activities will have their content and timing adjusted to suit planning needs.

Where decision scoping has been undertaken at the earliest stages of project planning, key decision points in the planning/design process can be readily determined and the timing and nature of sub-components of the EA identified to ensure appropriate flows of environmental information into project planning and design.

The following example highlights the influence of decision scoping in effecting integration of EA with project planning and design. Figure 5 is an example of a project schedule for a resort development where the EA *was conducted as a stand-alone activity* and in which the EA report was produced at the end of month 6. For the purposes of illustration and simplicity, only one component of the overall project is outlined, namely sewage waste disposal.

In this example, no interaction occurred between the planning and design of the development and the EA. This is characteristic of a project in which the EA is regarded only as a legislative requirement that needed to be overcome in order to allow the construction of the project to go ahead.

PROJECT STAGES	MONTH											
	1	2	3	4	5	6	7	8	9	10	11	12
Environmental Assessment												
Negotiations and Land Acquisitions												
System manufacture												
System delivery												
Construction - Stage A												
Construction - Stage B												
Testing & Commissioning												

Figure 5. Project schedule showing the classic relationship between the timing of EA and project activities.

It should be noted that although no construction activities may have taken place before the EA was completed, key, binding decisions would be made well beforehand and without input from the EA team.

By contrast, Figure 6 shows the same example but where decision scoping has been undertaken at the project conception stage. Key decision points in the planning-design process can be readily identified (as shown by the asterisks); consequently it is possible to structure the EA process so that the necessary information can be incorporated into each sub-component of the planning and design. This process ensures that environmental information concerning opportunities and constraints are available before any of the design elements are fixed.

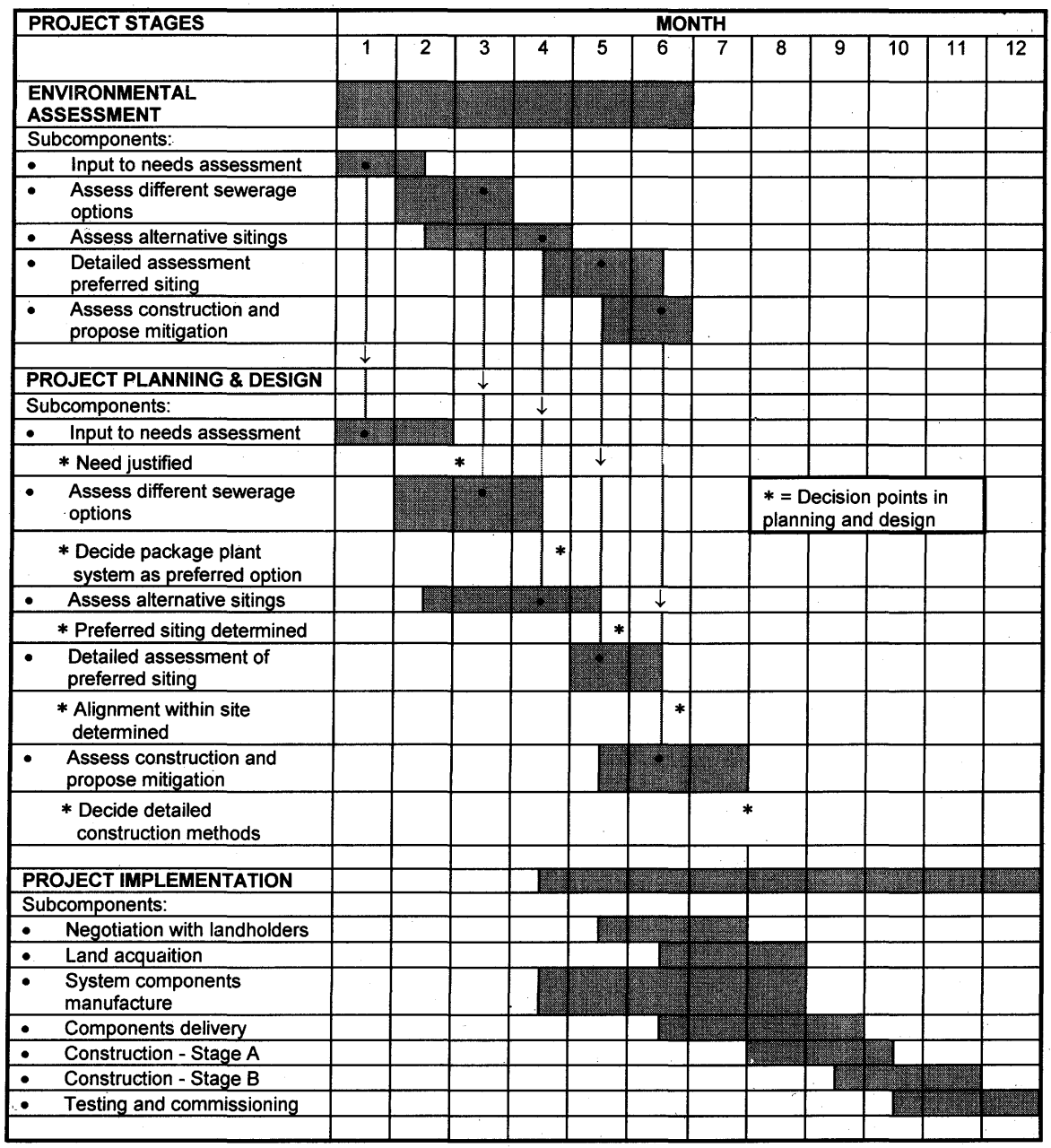


Figure 6. Project schedule in which integration of EA with project planning and design is achieved through the use of decision scoping.

The process of decision scoping can provide the mechanism to involve the planning and environmental professionals in a pro-active process in which the EA team are required to provide specific answers to specific questions. All too often, environmental specialists are provided with terms of reference that are too generic such as "prepare a report on sewage treatment". Reports emanating from such studies frequently fail to provide adequate guidance to the designer because they are too general.

Decision scoping leads to more specific terms of reference such as:

"in three months time we need to know what water quality discharge standards are applicable to the receiving waters adjacent to the development site, what sewage

treatment systems will be appropriate for the scale of the development and discharge standards, and given the environmental sensitivity of the area, where suitable locations occur for the siting of the treatment system."

In conclusion, decision scoping is critical to the development of terms of reference for the EA specialists that will lead to an efficient and effective EA. Early networking sessions provide the much needed opportunities for environmental specialists and project planners to discuss information requirements and determine the questions that must be addressed by the EA and the time frame in which studies must be conducted.

5.5. The EA Process

The EA sequence of events comprises a numbers of steps that should aim to establish a framework of environmental conditions within which organisations will be permitted to operate. Guiding factors of the EA approach should rely on "... co-regulation and market-based instruments to ensure that environmental impact management goals are achieved."[65] It is worth noting that each of the EA documents currently available shows some variation in the process, however, they all have some common elements that can be interpreted similarly. Where EA guidelines have been developed for specific countries, it is recommended that these procedures be followed. The steps in a typical EA process are given below and also are outlined in Figure 7.

[65] See: p21 of; Discussion Document: *A National Strategy for Integrated Environmental Management in South Africa*, by R. Heydenrych and P. Claassen, April 1998. Department of Environmental Affairs and Tourism (DEA&T).

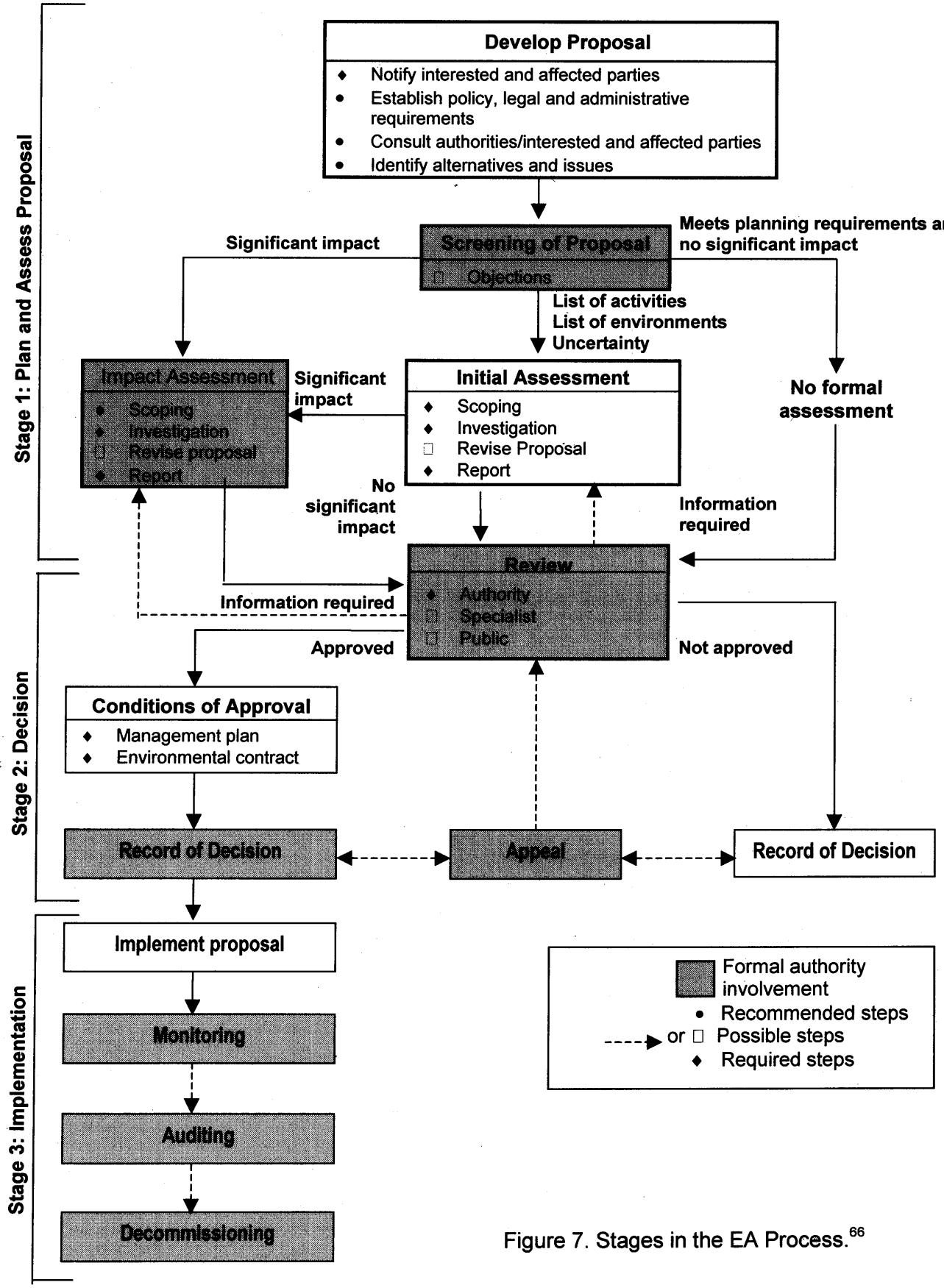


Figure 7. Stages in the EA Process.[66]

[66] Modified from: *The Integrated Environmental Management Procedure*, Department of Environmental Affairs (South Africa) 1992.

5.5.1. Steps in the EA Process

Typical steps in an EA process are listed below. These steps are not necessarily sequential, but often run in parallel to each other and are also iterative (see also Figure 7). Some of these steps incorporate other sub-components.

- Develop proposal;
- Screening (Classification);
- Preliminary (initial) assessment;
- Impact Assessment (EIA study/investigation);
- Review;
- Monitoring;
- Audit;
- Decommissioning.

The nature of individual projects differs and not all projects require the full extent of EA. It is useful to view the process as having two levels of assessment; a first level of assessment (required by all projects) and a second level of assessment (requiring full impact assessment if identified during the first level assessment).

5.5.2. First Level of Assessment

All projects will require *description of the proposed development* (including *alternatives)* and *screening.* Some projects may also require *initial* (or *preliminary assessment*) depending on the outcome of *screening.* The purpose of these stages is as follows:

Project proposal is a description of proposed development and alternatives. The basic objective is to provide sufficient information to allow the successive steps in the EA process to proceed. The description outlines the development activity (e.g. marina canal estate) including the need and purpose for it. Alternatives show the different configurations that may be desirable and these may include or omit certain features e.g. small boat harbour). The proposal should establish the policy and legislative framework applicable to the project and should outline the EA requirements. The project proponent should register the project proposal with the relevant authorities who should be informed of the intention to undertake a development. The project proponent should at this stage notify and consult with all I&APs.

Screening determines whether or not a full impact assessment (also known as the EIA study/investigation but from here onwards as the impact assessment) is required. This is done by the project proponent in conjunction with their consultants, in consultation with the relevant authorities. Screening should determine whether there is a likelihood of significant impacts arising from the project. The report recording the results of the screening process should be submitted to the agency responsible for decision-making. This should be done in accordance with an evaluation of the proposed project against criteria such as:

1. **Scale of the project:** The scale of a project can be a major determining factor of impacts. Nonetheless, sensitivity should be displayed towards the supporting natural and social environment, irrespective of the size of a project. The size of a hotel for example, will influence the need to upgrade roads to and from the development, or the manner in which sewage waste will be disposed of properly;

2. **Location:** The area affected by the project could be environmentally sensitive and valuable (such as supporting endangered wildlife, being agriculturally productive, having mineral deposits or having potential for mariculture). It could also be subject to high risk events such as flooding, monsoons and tornadoes;
3. **Magnitude and scale of impact:** Impacts could be restricted to the development site (e.g. loss of on-site indigenous forest) or be more far-reaching (e.g. pollution run-off, erosion of cultural values). Either option could result in cumulative impacts;
4. **Impact duration:** The impacts should be assessed in terms of their potential duration, such as whether they are confined to the construction phase and recovery is possible, or whether the impact will be far more long-lasting;
5. **I&AP and stakeholder consultation:** This should involve as many of the people who are potentially affected by the proposed project as possible. They must be encouraged to participate in phases such as the reviewing of the project at various stages.

The Checklist of Environmental Characteristics given in **Annex 2** assists in identifying significant impacts. However, it is recommended that significance be separated out and defined.

The outcome of screening classifies the project proposal into one of three categories:

- ***Impact assessment required***: significant impacts clearly identified;
- ***Impact assessment <u>not</u> required:*** proposal meets all policy and planning requirements, and has no unmanageable effects;
- ***Need for impact assessment unclear:*** the proposal requires further analysis in the form of a preliminary (or initial) assessment.

Preliminary (or initial) assessment is undertaken when:

- It is unclear whether significant impacts will result from the development activity;
- No significant impacts are identified but the project falls into the List of Activities (**Annex 3**), or the List of Environments (**Annex 4**).

A preliminary assessment is bypassed where significant impacts are identified during the screening process and the decision to undertake an impact assessment is made. Specialists or experts should undertake the preliminary assessment, which should provide sufficient details to assess whether significant impacts are likely to occur. The data should be compiled into a report that may be based on existing data but new information should be incorporated where necessary. The report will direct the project proposal to a decision of "impact assessment <u>not</u> required" or "impact assessment required" and should be submitted to the relevant authority and preferably to I&APs as well. They may make a decision based on the report or may wish to subject the report to independent review. In many cases, however, the preliminary assessment leads into an impact assessment.

5.5.3. Second Level of Assessment

Where an impact assessment is required, the EA process enters the second level of assessment. This comprises the ***impact assessment*** (encompassing ***scoping*** and the ***impact assessment investigation***), ***review***, ***monitoring*** and ***audit***. If a preliminary assessment was done, this may lead to a continuation of the scoping

process into the impact assessment. Alternatively, scoping will be initiated during the early stages of the impact assessment. These components are as follows:

Scoping is used to determine the extent and approach of the impact assessment investigation (i.e. the terms of reference). Its purpose is to focus the subsequent study on the key issues required for decision-making so that only the significant issues and reasonable alternatives are examined. These are identified by the project proponent and their consultant(s) in conjunction with the relevant authorities, I&APs and stakeholders. A public participation programme is thus an important part of scoping and it is advisable to appoint an independent facilitator to conduct this in order to ensure transparency and inclusion of the concerns of all I&APs. The scoping report must be reviewed by the responsible authority.

The ***impact assessment investigation*** is a study which attempts to predict which impacts are most likely to occur and their significance. It entails commissioning impact assessment specialists and these may comprise the consultant team responsible for co-ordinating and managing the study, as well as other consultants to address specific issues where specialist expertise is required. The investigation is guided by the scoping exercise and will attempt to identify and report on:

- The positive and negative impacts of the development upon the natural environment, society (including political and cultural institutions) and economic characteristics of the area (e.g. generation of employment opportunities or loss of sensitive coastal forest on the development site);
- Possible alternatives such as site and design, operating processes (e.g. on-site package sewage treatment, or connection with municipal treatment plant), and the "development" or "no development" option;
- The magnitude and significance of impacts (e.g. permanent loss of 5 hectares of sensitive coastal forest, or generation of high turbidity in coastal zone during dredging operations but limited to construction phase);
- Measures that can be employed to prevent or mitigate negative impacts and to optimise benefits (e.g. increased trampling of coastal zone by visitors to development, but confined to pre-established trails, and in the context of overall protection and management of the area as a private nature reserve);
- Monitoring and auditing components (e.g. routine sampling of sewage waste discharge into the coastal zone and periodic assessment of discharge levels against accepted standards).

5.5.4. Aspects to be Considered in an Impact Assessment

The impact assessment should address all phases of a project such as design, construction, commissioning, operation and decommissioning. It should ideally lead to an environmental control or management plan for the construction and operation phases. There must be continuity between the impact assessment report and the implementation phase. Addressing these questions requires a great deal of information which may necessitate gathering new data as well as relying on existing data. The size and nature of the project will determine the issues to be addressed by the impact assessment investigation. For medium- to large-scale development, these may include the following aspects:[67]

[67] Adapted from ESCAP 1995: *Guidelines on Environmentally Sound Development of Coastal Tourism.* United Nations.

(i) Description of the development activity:

- Rationale for the project such as policy objectives for national and regional development plans, or tourism master plans;
- Competence of the developer to fulfil the above objectives, both technically and financially;
- Direct benefits of the development (employment opportunities, training, services), financial return to local/national economy and protection of the natural environment;
- Location and extent of the project, and secondary considerations such as conflicts or other related development projects;
- Description of the project buildings and associated issues such as number, size, architectural style and occupancy capacity;
- Additional infrastructure including water and power supply, solid and liquid waste disposal, roads and jetties;
- Labour and resource issues such as whether these should locally supplied or imported;
- Number and duration of project phases during implementation that should include details of the construction and operational phases.

(ii) Description of existing and proposed social, environmental and economic attributes and activities:

- Present land-uses in the area, e.g. forestry, agriculture, wilderness, nature reserves;
- Location and size of human settlements in the area;
- Social and cultural considerations;
- Physical and natural environment; geology, geomorphology, soils, weather, climate, landscapes, water resources, vegetation, fauna, scenic and aesthetic aspects;
- Cultural landmarks, local and national historical sites, etc.

(iii) Prediction and evaluation of changes to the environment that may be primary, secondary or cumulative:

- Existing environmental conditions described in (ii) above that will be affected positively or negatively by the development;
- Impacts which may lead to conflict or optimisation of benefits;
- Capacity, institutional, legislative and policy requirements;
- Impacts upon social and cultural conditions;
- Extent to which natural resources will be impacted.

(iv) Actions to prevent or mitigate harmful impacts:

- Identification of alternatives that can be employed to reduce or eliminate harmful impacts;
- Identification of measures which enable development objectives to be achieved without compromising project feasibility;
- Prediction of unacceptable impacts where no suitable alternatives can be identified;
- Recommendation of the "no development" option where no suitable alternatives can be found;

- Negotiated compensation for local communities who may be unavoidably displaced by the development;
- Recommendations for the "no net loss" principle where natural resources will be affected.

(v) Sustainability:

- Description and evaluation of any irreversible loss or damage to the existing state (including the natural environment, aesthetic value, and cultural sites);
- Comparative analysis of harmful and beneficial impacts in the short, medium and long term project cycle;
- Residual impact evaluation.

(vi) Findings and recommendation should include:

- Comprehensive environmental data;
- Unavailable or unreliable information must be noted, especially if this is critical to decision-making;
- Recommendations for how additional information could be gathered with better time and money resources;
- Recommendations for a course of action, arising from the findings;
- Procedures for managing and monitoring biophysical and social environmental impacts;
- Recommendations about an overall precautionary approach.

Annex 5 provides an example of a Terms of Reference for a 5-star hotel beach resort project proposed for Anse Intendance, on the island of Mahe, Seychelles.

5.5.5. The Impact Assessment Report

The information provided by the impact assessment investigation is presented in a report, often referred to as the Environmental Impact Statement (EIS). The main objective of the report is to influence the decision-making process by linking the impact investigation outcomes to recommendations for the implementation phase. It is important that the information be presented in a clear and concise format, in language easily understood by both non-specialists and technical people. Wherever possible, the report should make use of summaries, maps, diagrams and other imaginative visual aids to assist communication. A recommended format for an impact assessment report for South Africa is shown in **Annex 6**.

5.5.6. Review

The review is an essential part of an EA process and its objectives are to provide an impartial evaluation of the development proposal as well as to evaluate the quality of the impact assessment report and ensure that it has adhered to the terms of reference. The report may be prepared as a draft document for review purposes. The review is conducted by the relevant authorities who may decide whether or not to allow the proposal to proceed. This is generally referred to as the "decision stage". Authorities should be accountable to the record of decision by allowing public access to records. Provision is made in the process for specialists and the public to review the report where this is identified as a requirement in the scoping stage or stipulated by the authority. Specialist review is recommended where:

- The proposal controversial;
- The proposal is highly technical;
- The authority lacks the expertise to conduct the review;
- There is a conflict of interest between the proponent and assessor/decision-making authority.

Where public review is undertaken, it is important that documents are readily accessible, and that adequate notice and time-frame for the review is given. One positive aspect of public review is that it enhances public opinion and stimulates awareness of environmental issues such that subsequent impact assessments benefit from informed input.

5.5.7. Implementation and Monitoring

Project approval may be subject to a range of conditions ("conditions of approval") that may stipulate requirements regarding the formulation of an Environmental Management Plan (EMP), and include procedures for monitoring the progress and effects of the project. The EMP is derived from the outcomes of the impact assessment report and takes the form of guidelines for the construction and operational phases of the project aimed at minimising environmental damage. An environmental officer should be appointed to oversee environmental management during the implementation phase. The environmental officer's job is to ensure that the EMP guidelines are adhered to. The construction phase of the project usually represents the greatest risk for environmental damage and from a practical perspective, it is essential that the contents of the EMP be reiterated in the contractors' documents. Either the consultant responsible for drawing up the EMP or the environmental officer should ensure that this is done. This should make provision for issuing fines to contractors not adhering to these instructions. An example of the type of instructions given to contractors is as follows:

- All indigenous trees on-site will be retained in the final development and the contractor will be held responsible for any damage caused thereto. The location of protected trees is shown on the accompanying plan;
- The contractor is responsible for erecting temporary fencing around all trees indicated by the map at a distance of 5 metres from the base. This should be undertaken before any construction activities are initiated. Appropriate warning signs should be clearly visible;
- A monetary fine will be imposed for each tree damaged by the contractor, as assessed by the Environmental Control Officer.

Procedures for monitoring the progress and effects of the project are outlined in the conditions of approval or the EMP. Environmental monitoring is undertaken during the construction and operation phase and should be based on requirements identified in the impact assessment report. Monitoring should be undertaken as a fundamental part of the Environmental Management Plan.

The monitoring programme should provide clear guidelines detailing what should be monitored, how it should be done and the means of financing. Monitoring assesses the impacts of development actions on the environment and ensures that preventative and/or mitigating actions are carried out properly. For example, for a marina canal development, the impact assessment may highlight risks associated with increased turbidity resulting from dredging activities during the creation of a small boat harbour. Turbidity standards may be adopted from water quality literature or developed through an assessment of the existing state. Environmental monitoring protocols may specify that the turbidity in the water column adjacent to the harbour may not exceed a certain level (e.g. not > 10 % of maximum pre-construction level).

Predictions of impacts are also assessed through monitoring. Information from monitoring should be used to feed back into the project cycle. In practise, the

monitoring phase is often neglected because of project cost constraints, usually to the detriment of the project.

5.5.8. Project Audit[68]

Periodic assessment of the project implementation procedures and environmental impacts should be undertaken in order to modify and revise project design and operation where required. In the example given in the preceding section, the Environmental Control Officer may instruct the contractor to cease operations and implement additional control measures if the established turbidity standards are regularly exceeded. Auditing also enables regulatory agencies to assess the compliance and performance of environmental monitoring with the environmental management plan. The effectiveness of the audit depends upon the availability of good quality monitoring data. This stage may require the appointment of external auditors.

5.5.9. Decommissioning

Most projects are designed with a finite economic lifetime: Decommissioning represents the final phase of a project, in which the built environment is either demolished and/or re-developed. Decommissioning is usually more important in projects based on non-renewable resources such as mining where extensive rehabilitation is required. However, even in tourism-related projects, decommissioning will ultimately be undertaken where tourism trends or new technology render older projects redundant or no longer commercially viable. In essence, the decommissioning phase manages the removal (demolition) of the built environment and rehabilitation of the site to (ideally) its previous state, or demolition and construction of new facilities.

The decommissioning phase has just as great a potential for environmental damage as the construction phase and requires environmental control to minimise environmental impacts associated with demolition activities as well as ensuring that proper rehabilitation is undertaken.

5.6. Constraints and Resistance to EA

To date, environmental assessment has been implemented to a lesser or greater degree in the majority of East African countries. With the exception of a study on EIA in Tanzania[69], there have been no formal studies of the effectiveness of EA in these countries. The following constraints are frequently identified:

- Lack of understanding and awareness of environmental issues by decision-makers and planners (particularly government departments), as well as abuse of power and corruption;
- Excessive bureaucracy and lack of co-operation between government sectors;
- Reluctance of private sector and some government agencies to adopt EA, because EA may be perceived as an impediment to progress;
- EA procedures of donor agencies that are inappropriate to the demands and circumstances of the recipient country;

[68] See also: Section 6.4.3, ISO 14000 certification.
[69] *The Performance of EIA in Tanzania: An Assessment*, by R. Mwalyosi and R. Hughes 1998. IRA/IIED.

- Inadequate legislation and/or the ability to enforce it. Also, the lack of administrative capacity to develop and promulgate legislation. There are indications that this capacity is beginning to emerge in some countries, notably South Africa, Seychelles, Mauritius and Tanzania;
- Disregard of EA process. Examples include: projects undertaking EA too late in the project cycle, lack of stakeholder participation and failure to implement recommendations made in the impact assessment report (compliance);
- Insufficient people with the educational background or skills to support effective implementation of EIA;
- EA participants are often foreigners and are therefore seen as "meddling" by local people.

5.7. Towards More Effective EA

The following measures could be implemented to overcome constraints:[70]

- Implement regular seminars/workshops to promote awareness of environmental issues and the benefits of EA among decision-makers, planners and politicians;
- Strengthen the legal, institutional and policy framework and rationalise government department responsibility for EA;
- Convene regular meetings of related sector departments with lead agencies and project proponents in order to promote EA procedures and methodologies;
- Develop guideline documents to supplement official and legal documents;
- Provide training programmes on EA to develop skills among staff of government departments/agencies responsible for monitoring EA process and reviewing impact assessment reports, as well as NGOs and community groups;
- Develop databases and information relevant to EA.

[70] Adapted from ESCAP 1995: *Guidelines on Environmentally Sound Development of Coastal Tourism.* United Nations.

CHAPTER 6

TECHNICAL GUIDELINES AND QUALITY STANDARDS

Summary

This chapter contains practical guidelines for tourism development based on principles of sustainable development and is aimed at the management of major issues such as site planning, conservation of sensitive areas, construction site management, sustainable construction, power supply and energy conservation, water supply, waste disposal and recreational activities.

Most tourism planners are concerned with development at the local level; however, it is important to view this in the context of national and regional objectives, and this is discussed in an overview of tourism development policy and physical planning. The need to incorporate EA procedures in the formulation of planning framework is emphasised. Principles of development planning in the coastal zone are outlined and include;

- *Protect sensitive areas;*
- *Discourage ribbon development;*
- *Concentrate development in nodes;*
- *Locate development inland where possible.*

Considerations that should be taken into account when siting buildings and facilities are listed. The guidelines for siting are aimed at protecting landscapes, avoiding hazardous areas, and avoiding disruption of natural processes or activities that cause environmental degradation. The use of setbacks and buffer zones to avoid development of sensitive or hazardous areas is described. The guidelines describe sensitive areas where special care should be exercised during development. Sensitive areas identified by the guidelines include;

- *Rivers, estuaries, floodplains, coastal lakes and wetlands;*
- *Rocky shores, beaches and dune systems;*
- *Cliffs and steep slopes;*
- *Small coastal islands.*
- *Shipwrecks, architecture and other culturally sensitive areas*

Guidelines for landscape and building design are also provided. Issues dealt with under this heading include;

- *Protection of visual amenity of the landscape;*
- *Promotion of cluster development (deals also with planning standards);*
- *Promotion of aesthetically pleasing development;*
- *Use of natural vegetation;*
- *Protection of sensitive areas.*

Environmental management procedures that should be adopted during the construction of tourism facilities in order to minimise environmental damage are outlined and emphasise actions for rehabilitation.

The remainder of Chapter 6 centres on four key issues of any development project, namely; sustainable construction, power supply and energy efficiency, water supply and waste management. Guidelines for sustainable construction outline the need for environmental responsibility in terms of the supply of building materials, the opportunities and benefits of using local materials, as well as the potential of recycling and reuse of materials in construction. The section on power supply and energy conservation outlines available alternative forms of renewable energy and their application, particularly in remote areas. The section also deals with means of achieving greater energy efficiency in order to reduce overall energy demand.

The following section emphasises the need for catchment water resource planning to balance the needs of all users which includes local communities and the natural environment as well as tourism developments. Potential sources of water are described including on and off-site sources as well as the quality standards that should be applied. The section on waste management describes the treatment of sewage waste and the disposal of solid waste. Treatment processes for sewage waste are described ranging from full treatment for large projects and municipalities, to septic tank treatment for smaller projects. Techniques for post-treatment disposal of sewage wastes are also discussed. Quality standards for water bodies into which effluents are discharged are also provided. The chapter also deals with solid waste management and includes details of separation, storage and disposal. Options for large and small projects depending on locality are provided, ranging from collection by authorities to land-fill and incineration. Air/noise pollution is covered briefly and guidelines for maximum allowable air emissions and noise levels are provided.

The chapter concludes with guidelines for tourism activities and deals specifically with the following;

- *Boating;*
- *Fishing/exploitation of marine resources;*
- *Scuba/snorkel diving;*
- *Footpaths, trails and off-road vehicles (ORVs).*

This section deals with planning of tourism activities through the application of carrying capacity studies and the use of zoning, as well as providing means by which to mitigate the effects of tourist behaviour and presence. In addition, other useful information is provided in the form of tourism declarations, tourism codes of conduct, and certification and accreditation programmes.

6.1. Introduction

The coastal zone is vulnerable to development, and the degradation of land forms and environmental processes through inappropriate tourism development can easily destroy the present and future benefits that society can derive from coastal resources. Development based on conservation priorities is in the best interests of tourism since it serves to protect the natural, cultural and historical assets that attract people to the region.

These guidelines are therefore aimed at promoting development that is:

- In harmony with the natural environment of the coastal zone;
- At an appropriate scale with the surroundings;

- Adapted to the local climate and other environmental constraints;
- Beneficial to local communities and sympathetic to cultural values.

Thus, buildings and supporting infrastructure should be viewed in the context of the environmental setting and should not seek to dominate it. Similarly, waste processing and emissions must be managed to ensure that vital ecosystem functions are not degraded. The purpose of this chapter is to provide guidelines to reduce, manage and control the adverse effects of tourism related development and associated infrastructure by outlining the technical issues that need to be taken intc consideration.

The guidelines presented in this chapter are drawn from two main source documents with some additional material. These sources are: *A Policy for Coastal Zone Management in the Republic of South Africa, Part 2: Guidelines for Coastal Land Use*, Council for the Environment, 1991 (sections on land-use planning, development considerations and tourism activities); and *Guidelines on Environmentally Sound Development of Coastal Tourism, Economic and Social Commission for Asia and the Pacific* (ESCAP), United Nations, 1995 (sections on water supply and, pollution and waste management). Other useful sources included, *Planning for Coastline Change - Guidelines for Construction Setbacks*, by G. Cambers, 1997; *Sustainable Building Sourcebook;* and, *The Pollution Prevention and Abatement Handbook*, by A. Sonani and S. Aggarwal (eds.) 1998. Other sources of information used as well as further reading are provided in the reference section at the end of the chapter.

The information contained within these guidelines should be used with caution as it may not include all the rules that should be adhered to in all situations. In addition to using these guidelines, it is important to ensure that:

- Existing guidelines and legislation are consulted thoroughly and adhered to;
- Expert advice is sought where necessary (authorities, consultants, etc);
- Local characteristics and conditions are fully assessed.

A checklist for tourism development is provided in **Annex 7**. This is specifically aimed at highlighting important issues that require consideration when undertaking tourism developments and activities, and provides a quick guide to the relevant sections contained in Chapter 6.

6.2. Tourism Policy, Land-use and Development

6.2.1. National and Regional (Policy) Objectives and Land-use (Structure) Planning

6.2.1.1. Formulate Tourism Development Plans

Tourism planners are mainly concerned with development at the local level; however, it is important that national and regional objectives are clearly understood. These objectives are determined by tourism development policy that comprises a set of statements that relate to the various aspects of tourism development. Government should take the lead in formulating tourism policy and should aim to balance economic, environmental and social concerns. Policy evolves from a survey and analysis of present tourism development patterns and infrastructure, tourist attractions and activities, and the tourist market. Socio-economic and environmental factors, as well as other sector activities, are also important considerations. National

and regional objectives should take precedence over individual, group or sector interests, but should provide the framework within which private and other sector interests can operate. Some of the basic issues that need to be addressed in policy formulation are as follows: [71]

- **The basis for tourism development.** This may include economics (income generation, employment opportunities, increasing foreign exchange and government revenues, as well as stimulating growth in other sectors), social (cross-cultural exchange, education and recreational opportunities) and conservation (environmental and cultural heritage);
- **The form of tourism to be developed** (international and/or domestic market, quality or mass tourism e.g. environmental experience or beach tourism). Many destinations are now opting for quality tourism; however, there may be opportunities to integrate both;
- **"Market-led" or "Product-led"**, i.e. developing forms of tourism that will attract a broad market regardless of the impact of the development, or developing and targeting forms of tourism that are compatible with environment and society;
- **The extent of tourism development:** Should it be allowed to become the dominant economic sector of the region, or limited to a medium level. A region may opt to develop different levels of tourism in different areas and at different times based on environmental, socio-cultural and infrastructure development considerations;
- **Growth rate of tourism.** This will depend on the potential for growth; however, where this is fast it may be desirable to control growth for various reasons (e.g. to allow local communities to adjust and be afforded the opportunity to participate, balance tourism with infrastructure development, provide adequate time for skills training in local communities, and facilitate effective integration of tourism into other economic sectors);
- Respective roles of **government and the private sector** in developing and managing tourism;
- **Environmental protection, cultural conservation and sustainable development;**
- The general **location and staging of development.**

6.2.1.2. Develop Regional Structure Plans

National and regional structure plans provide the physical framework for land-use planning and are the responsibility of governmental authorities. Their task it is to divide up and allocate the coastal zone for a range of land uses (including tourism) according to policy and development objectives. Structure planning should be undertaken according to the principles of Strategic Environmental Assessment and based on principles of sustainable development (see Chapter 5).

The essential difference between national and regional structure plans lies in the scale and detail of the planning. The former identifies development *regions* whereas the latter identifies development *areas*. The coastal zone is usually characterised by multi-sectoral activities often of a conflicting nature, and this requires that structure planning makes provision for a diversity of opportunities, ranging from pristine wilderness areas to urban and industrial environments. It has as its ultimate objective, the reconciliation of conservation with development needs. Factors determining the conservation worthiness of a site or area are shown in Box 1.

[71] Adapted from: *National and Regional Tourism Planning: Methodologies and Case Studies.* World Tourism Organisation, 1997.

Box 1. Factors determining the conservation worthiness of a site/area[72]

- Species diversity and the occurrence of threatened/endangered species;
- Degree of endemism;
- Ecosystems under represented in protected areas;
- Plant and animal communities, the conservation of which is vital to the maintenance of ecological processes;
- Landscapes and scenic attraction;
- Archaeological sites;
- Buildings of historical, architectural or vernacular importance; and
- Economic value in the natural state (i.e. potential to stimulate ,tourism).

The physical planning framework should be based on development objectives incorporating an analysis of existing characteristics and attributes. Planning needs will vary from one country to another and between regions; however, the basic concepts and principles are generally applicable. Factors typically included in a land-use planning analysis include;

- **Institutional, legislative and policy framework** (e.g. Tourism Master Plan, Integrated Coastal Zone Management (ICZM) Plan, etc);
- Other sector plans;
- **Urban, commercial, agricultural and industrial land-use/activities and potential**;
- **Existing and planned infrastructure**, including transport networks (e.g. roads, railways, ports, harbours, ferry routes, informal boat landing areas), water reticulation, sewerage, power supply;
- **Social and socio-economic fabric**;
- **Landforms** (e.g. coastal cliffs, coastal islands), landscapes and visual amenity (panoramic vistas);
- **Topography, geomorphology and soils**;
- Natural, cultural and historical **heritage sites** (e.g. nature reserves, architecture, religious sites, archaeological sites)(see Box 2);
- **Ecosystems** (e.g. rivers, estuaries, forests, grasslands, intertidal shores, dune systems, coral reefs);
- **Fauna and flora** (e.g. rare or endangered, endemic);
- **Climate**.

The above list is by no means exhaustive and local characteristics will dictate the precise features that should be considered.

[72] Modified from: *A Policy for Coastal Zone Management in the Republic of South Africa; Part 2: Guidelines for Coastal Land Use*. Council for the Environment, 1991.

Box 2. Assessing and managing coastal cultural resources[73]

A minimally competent assessment of cultural resources and the possible effect of development on them involves a number of discrete elements:

1. A background history of the region which places the site or sites in relationship to other historical events and processes in the area. A delineation of the boundaries of the site both in physical terms (areal extent) and in historical terms (periods of use, abandonment, reuse, etc);

2. An archaeological characterisation of the site in terms of the function(s) of the site, cultures to which it belonged and the cultures with which it interacted;

3. An archaeological characterisation of the type of physical remains (artefacts and architecture) found at the site, their present state of preservation, their degree of fragility and the possible impacts of the proposed development on them;

4. A plan for the mitigation of the deleterious effects of development on the site listing options, costs and risks. If the site must be removed via excavation, plans for the conservation, perpetual curation, and documentation of artefacts together with plans for the dissemination of the information derived from the excavation must also be produced;

5. An assessment of the potential uniqueness of the site and the role it played, and may still play, in histories and cultural identities at various levels: local, national, regional, and international. Cultural resources in particular often play an important role in how people see themselves: religiously, politically or socially, producing a variety of deeply felt vested interests in the fate of these resources. The ways in which resources are culturally valued should be examined at all of these levels. All potential interested parties should be involved in the determination of a research, development, and management program for these resources and in determining the impact of human activity on these resources. An area such as Mozambique Island or Mombassa may thus contain shipwrecks important to local history, Kenyan history, and the histories of the Swahili and Indian Ocean worlds as well as of the expansion of a variety of European nations. As a consequence, all of these groups may have a symbolic stake in the fate of such resources, and this interest in cultural resources should also translate into natural resources. Shipwrecks, as part of world heritage, and objects of potential salvage are subject to a series of laws and guidelines that set them in a separate category than that of natural resources. The assessment of these resources and of the impact of development on them should include an analysis of the legal framework(s) of which the resources may be a part. It may well be the case that legal protection for wrecks could also translate into legal protection for natural resources and vice-versa;

6. The assessment of resource management and public education capacity with respect to the cultural resources in question and the development of a realistic management and education plan grounded in local economic and administrative realities and structures. In general, archaeological sites display a high degree of variability in a number of different characteristics and this variability has led archaeologists to observe that "there is no right way to excavate an archaeological site but a hundred wrong ways". Basic assessment and mitigation of the effects of development on coastal cultural resources (including submerged cultural resources) should be a central element of all development plans and should be prepared to draw upon the expertise of local archaeologists and historical preservation officers. In the event that local experts are unavailable, professional expertise in the area (maritime archaeology) should be sought externally both for purposes of assessment in the short-term and the development of local capacity in the long-term. In the selection of external expertise, scientific and ethical standards in the field of maritime archaeology should be verified. These include

[73] Text by: David Conlin and Stephen Lubkemann (see acknowledgements for institutional affiliations).

foremost training in scientific methods of submerged cultural resource assessment, excavation and conservation, a commitment to local education and capacity building, and the ethical commitment to the scientific study of these resources as an end in and of itself. The accepted ethical standard for sound scientific archaeological research excludes research designs premised on and funded by the direct exploitation of these resources through their commercialisation (the sale of any artefacts). Both scientific credentials and commitment to this ethic are vital in order to ensure an objective assessment of cultural resources, neither criteria being sufficient in and of itself. This point is critical given the inherent contradiction between the imperatives of "for profit extraction" (time and decisions made as a function of economic efficiency; remove the greatest economic value in the least time possible), and those of "scientific/historical question driven designs" (time spent and decisions about extraction made as a function of what is best for the preservation of the resources). Ethical archaeological research conservation is committed to the ethic of maximising "reversibility" which, in essence, argues that no treatment of an artefact or of a collection should be done which cannot be undone later. Pursuit of "minimal impact" research designs should thus seek the maximum preservation of *in situ* sites and of intact collections.

Since each shipwreck and historical/archaeological site displays some degree of variability in terms of its ability to withstand and absorb visitors, each site needs to be examined in relation to both regional objectives and priorities as well as its inherent characteristics (such as age, material of construction, number of portable artefacts, etc) prior to a determination of the role it can play in regional tourism.

As mentioned in Chapter 4, archaeological sites such as shipwrecks are extremely vulnerable to negative impact from unregulated tourism and unchecked development activities. Because these sites have no ability to recover from damage in the way that living communities such as coral reefs have, all negative impacts remain to be seen by resource managers. In biology, the term "indicator species" refers to species that are particularly sensitive to disturbance and which frequently offer the first indications of things such as deteriorating water and air quality. Cultural resources may be able to play this valuable role in assessing the effects of tourism on a region since they are often some of the most heavily visited and therefore heavily impacted sites in an area. As part of a regional development plan, an assessment delimiting the sites in the manner discussed above would form an important baseline against which future impacts can be measured. These impacts can thereafter be used to infer other impacts and to assess the potential carrying capacity of a region's cultural and biological environment.

A final point concerning places of high tourist interest such as shipwrecks is that by acting as a powerful draw, these sites form natural "chokepoints" for the local tourist industry. Tour operators and other interested parties involved in developing and participating in the local tourist economy are drawn to these points. There they can be relatively easily licensed, educated, and regulated in a manner consistent with the regional scheme developed in accordance with previously stated ICZM policies. Education of the broader public and of those involved in the use of cultural resources (such as tourism operators) should be focused on as a critical and fundamental mechanism for the long-term preservation and use of these resources. The creation of both a sense of identity and of broadly based vested economic interest in the preservation and management of these resources is perhaps the most vital and effective step in ensuring their long-term protection from excessive pressures which can degrade them, or from "one-time consumption" use. This will guarantee their role in sustainable and more broadly beneficial long-term tourism activity and social life.

From a practical point of view, overlay mapping is a useful technique that can be employed to identify and demarcate areas sensitive to development. In its simplest form, overlay mapping is a series of single factor maps (e.g. slopes, vegetation, cultural and historic sites, landforms, etc). By overlaying these to produce a composite map, areas unsuited for development and the reasons dictating this are

easily shown. The number of maps required will be determined by the complexity of the area under investigation. The information derived from the composite map is used as the basis for zoning areas for particular activities. Notwithstanding the application of overlay mapping, it is usually not possible to avoid development of all sensitive sites, and where this is unavoidable, principles of development planning should apply (see Section 6.2.1.3. "Principles of Development Planning in the Coastal Zone").

The maps and the information they portray should include some dimension of the significance of the sensitivity. This can be done by attributing a sensitivity rating (e.g. a scale from 1 - 10). For example, the vegetation map may comprise areas of indigenous forest of high conservation value that are ascribed a value of 10 (high sensitivity), whereas grasslands disturbed by grazing may still have some intrinsic value, but warrant a rating of 3 only. A rating of 0 would indicate that the vegetation has no conservation value (e.g. areas infested by invasive vegetation).

It is important to recognise that attributing sensitivity ratings to particular features is a subjective process and the value of the procedure depends to an extent on the skills and expertise of the team conducting the overlay mapping. It is also important to evaluate the relative significance of single factor maps. For example, vegetation comprising the highest conservation value may not warrant the same level of significance as features shown on a "hazardous areas" map (showing for example, the location of floodplains, steep slopes, etc). The basic procedure for overlay mapping is illustrated in Figure 1.

During the last decade, with the advent of sophisticated computer technology, geographic information systems (GIS) have become a common tool in the field of environmental planning and the technique is readily applicable to structure planning. Geographic information pertaining to a given area can be digitised and stored by the computer. All information pertinent to an overlay analysis can be referenced to its exact geographic position. GIS provides considerable flexibility and speed in conducting the overlay analysis and allows potential impacts and areas sensitive to development to be elucidated quickly. The major drawbacks of GIS include the relatively high start-up costs, the skills required to operate it, and the time required to input information to the system. For this reason, it is more appropriate where it is regarded as a long-term investment for ongoing environmental management projects rather than a once-off procedure.

6.2.1.3. Principles of Development Planning in the Coastal Zone

Having identified (zoned) areas most suitable for development (i.e. zones of low development sensitivity), principles of development planning should be applied:

- Protect sensitive areas;
- Discourage ribbon development;
- Concentrate development in nodes;
- Locate development inland where possible.

These principles are discussed below:

(i) Protect sensitive areas

Where development adjacent to, or within, conservation priority areas is unavoidable, special attention should be given to the proposed uses and/or access to these areas. Restrictions on the type of activities permissible in these areas should be carefully formulated. Activities along the coastline particularly should be subject to thorough

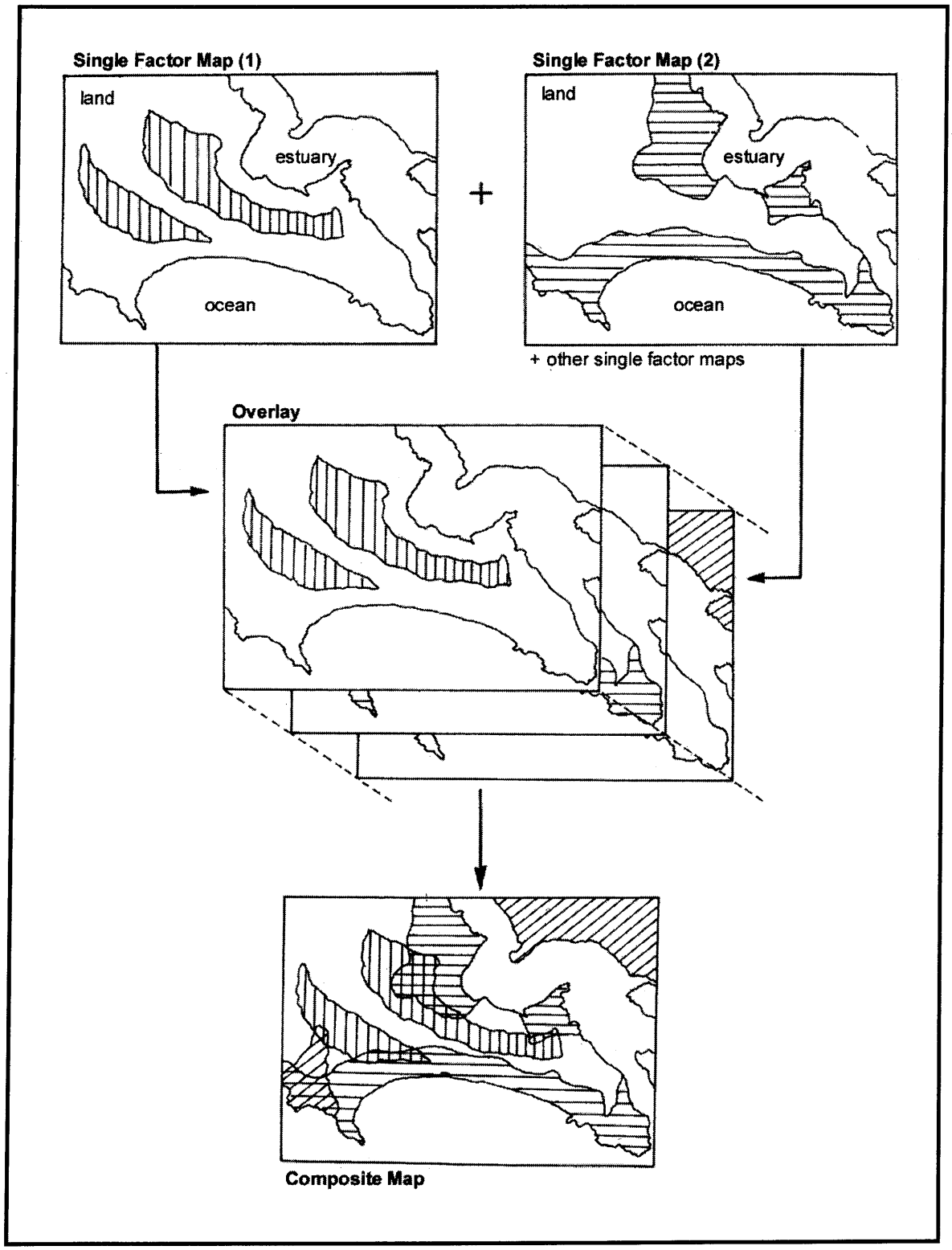


Figure 1. Basic elements of the overlay procedure.

scrutiny, and a key question that should be addressed by planners is, "what activities require access to the seashore and which do not?" Only those activities that have an undeniable need for sea access should be allowed (e.g. boat launching facilities, ferry departure points, etc). By contrast, roads and railways should be located away from the coastline to avoid damaging coastal processes and landforms, or degrading the aesthetic and recreational potential of the seashore.

(ii) Discourage ribbon development (see Box 3)

Undisturbed areas should not be developed (e.g. through residential subdivisions), until the extent to which adjacent or nearby proclaimed development (residential, industrial, commercial, etc) indicates the need for further development.

Development criteria should be established to discourage subdivisions motivated by speculative buying rather than demand. For example, township extensions and subdivisions should only be considered when:

- Approximately 80 % of the plots or sites in the adjacent or nearby proclaimed development areas have been developed (constructed);
- Approximately 60 % of the plots or sites in the proclaimed development have been developed within 5 years of proclamation (rapid growth areas);

Tax generation provides motivation for local authorities to approve undesirable subdivisions. This should be counterbalanced by reducing costs by, for example, regionalising services.

The primary and secondary impacts of entire proposed subdivisions should be carefully considered before such subdivisions are approved.

Box 3. What is ribbon development?[74]

Ribbon development refers to linear development parallel to the coastline with one or more of the following characteristics:

- Beachfront plots aligned in a continuous row (to provide each plot with a sea view);
- Continuous urban sprawl;
- An absence of compact, higher density forms of development which avoid scenic attractions and environmentally sensitive areas.

Ribbon development is often premature, uneconomic, or ineffective as far as the provision of services is concerned and can quickly degrade the landscape, i.e. the features that attracted people in the first place. Such development is often based on motives of speculative profit and not on need.

(iii) Concentrate development in nodes

Coastal planning should place emphasis on the need for compact, high density development with short lateral connections from the commercial, industrial and urban zones to the surrounding areas and their recreational amenities.

[74] Source: *A Policy for Coastal Zone Management in the Republic of South Africa; Part 2: Guidelines for Coastal Land Use*. Council for the Environment, 1991.

For each coastal node, planners should clearly define the capacity to accommodate development expansion and the carrying capacity for associated recreational activities. This is particularly important in view of the tendency of adjacent, rapidly expanding development nodes to become ribbon development. The difference between ribbon and nodal development is illustrated conceptually in Figure 2.

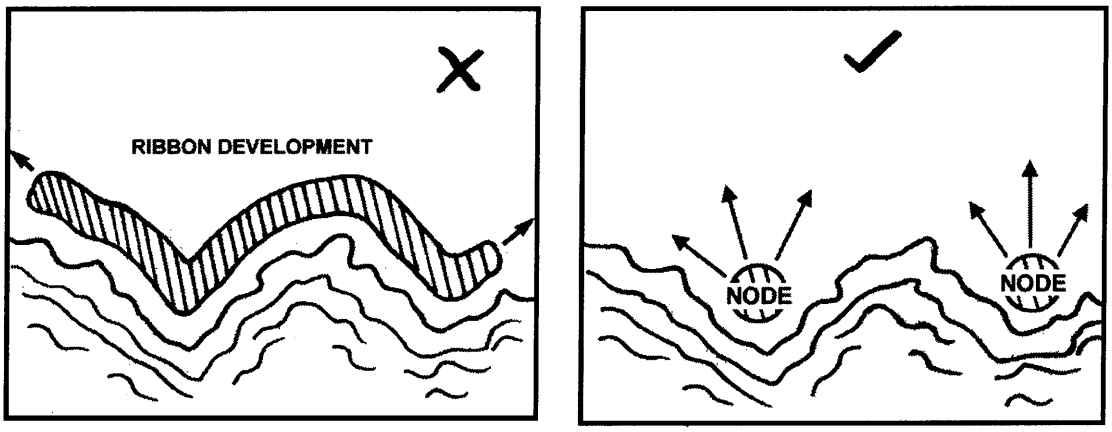


Figure 2. Coastal development should be limited to nodes and avoid ribbon development.

(iv) Locate development inland where possible

Demands for use of the coastline are numerous and varied, and frequently of a conflicting nature. Planning authorities should give priority to uses that are dependent on a coastal location. Land uses that do not require this should be situated further inland. Roads and railways do not require a coastal location, and coastal land should be reserved for water sports, boating activities, public open space and dwellings.

6.2.2. Buildings, Structures and Associated Facilities: Siting and Other Considerations

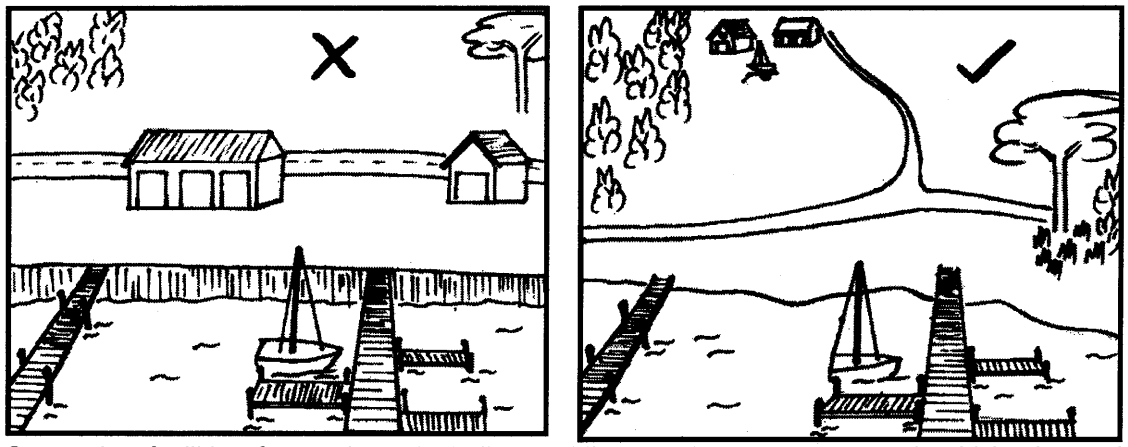
There are very real reasons for giving careful consideration to the siting of buildings, structures and associated infrastructure. These include:

- **Aesthetic considerations** ("sense of place");
- **Hazards or dangers** caused, for example, by flooding, erosion or unstable soils;
- **Disruption of natural processes and environmental degradation**. Poorly situated or designed structures cause environmental degradation and may be costly to the developer by requiring ongoing maintenance.

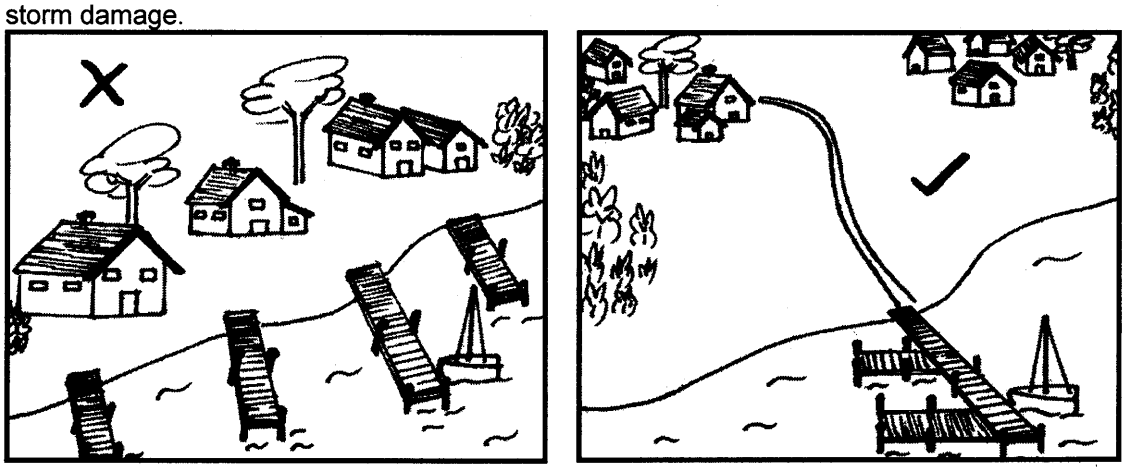
The viability and sustainability of a development project require proper planning that identifies and takes into account all relevant site-related issues to ensure that optimal sites are selected and appropriate design features are employed.

6.2.2.1. Sensitive areas

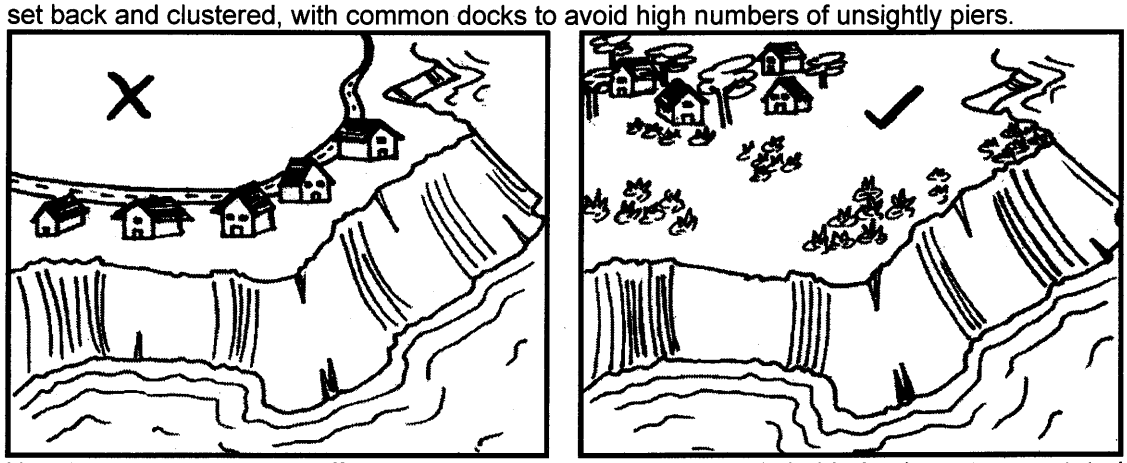
Development should avoid areas of sensitivity where disturbance may lead to disruption of natural processes. In addition, some of these areas may constitute hazards to built structures due to flooding, storm surges, etc. Where development is proposed adjacent to these areas, setbacks and buffer zones should be established (see Box 4, Examples, Figure 3).



Supporting facilities for marinas, including buildings and storage areas, should be located inland. Locating these facilities on the shoreline occupies valuable open space, pollutes surrounding waters with stormwater run-off, and greatly increases the probability of serious storm damage.



The natural quality and attractiveness of a lakefront or coastline can be destroyed by improper development. Heavy development of the immediate waterfront causes loss of vegetation, erosion and increases the danger of pollution from septic tanks. Houses should be set back and clustered, with common docks to avoid high numbers of unsightly piers.



Housing close to steep cliffs should be clustered and setback behind adequate vegetated buffer zones to protect against erosion and maintain aesthetic viewsheds.

Figure 3. Examples of the use of setbacks to protect; (i) development from natural hazards, (ii) sensitive landscapes/conservation areas, and (iii) visual amenity.

Box 4. Setbacks and buffer zones[75]

A development setback may be defined as a prescribed distance from a landscape feature such as a cliff top, water course, or line of permanent vegetation, within which all or certain types of development are prohibited.

Setbacks have several functions which include:

- Provision of buffer zones between developments and features which have the potential to impact upon, or be adversely impacted by, the development;
- Establishment of conservation areas;
- Improved access, scenic vistas, or privacy.

Specific setbacks required by East African countries to protect against coastal erosion are described in Chapter 4 (Section 4.2.5, Coastal erosion).

Special consideration should be given when planning development in, or adjacent to, the following areas:

(i) Rivers, estuaries, floodplains, coastal lakes and wetlands

(a) Control development

No development should be permitted in floodplains. These areas are at risk of periodic flooding, representing a severe hazard to built structures. Note that coastal lakes may be subject to periodic rise and fall in the lake level that can inundate dwellings and other structures. Where development in the floodplain is unavoidable or essential (e.g. bridges, jetties), approval should be subject to strict impact assessment procedures. Where development has already occurred in the floodplain, further development should be strongly resisted; *existing inappropriately located development should not be regarded as a precedent for further development.*

(b) Establish buffer strips and setbacks

Development in or adjacent to floodplains should be set back from all water courses (rivers, estuaries and coastal lakes) and provision should be made for a vegetated buffer strip separating the water courses and the development. Since the buffer strip is designed to protect developments from floods, as a general rule, the buffer strip should be situated *above* the 50 year floodline. Buffer strips should comprise natural vegetation with the ability to bind soil and withstand the erosive action of floodwaters.

Due to the risk of flooding, no dwellings should be allowed below the 50 year floodline, however it should be recognised that there may be real risks of floods exceeding these levels. The appropriate height contour for development (based on the 50 year flood level) will depend upon local conditions and should be established based on flood level measurements. Where information is lacking a precautionary approach should be adopted, and reference should be made to historical accounts of flooding, catchment size and rainfall patterns, channel morphology (steep/wide embankments) where these are available. Failing this, no development should be

[75] Source: *Planning for Coastline Change: Guidelines for Construction Setbacks in the Eastern Caribbean Islands.* CSI, 1997.

allowed below the contour defined as 10 metres vertical height above the stream/river level under normal flow regimes.
Developments located in or adjacent to tidal systems (e.g. estuaries, lagoons, embayments) such as marinas, small craft harbours, etc, should ensure that appropriate building levels are determined taking into account short and long term fluctuations in water level due to:

- **Tidal movement** (diurnal, spring/neap cycles);
- **Coastal trapped waves** (these are manifested as periodic increases or decreases in mean sea level (MSL) arising from atmospheric conditions that give rise to long period waves that travel around the coast and originating many hundreds of kilometres away);
- **Climatic effects** including high/low pressure cells and prevailing winds;
- **Rise in sea level** due to global warming (see Box 5);
- **River floods**.

It is important to bear in mind that certain of these factors can have compounding effects (e.g. floods waters superimposed upon spring high tides).

Since there is considerable variation in the tidal range along the coastlines of the East African countries and island states (from < 0.5m to 6.3m spring tidal range), it is important that site-specific conditions are thoroughly assessed. This should include localised modifications of sea tides that occur in estuaries and embayments, etc. It is essential that a coastal engineer be consulted for projects of this nature.

Figure 4 shows the tide characteristics and recommended design levels for a waterfront development on the shores of the Knysna estuary situated in the Southern Cape region of South Africa.

Box 5. Sea level rise[76]

Changes in sea level (the advance or retreat of a shoreline) are closely linked to variations in the atmosphere, oceans and lithosphere that in the past have resulted in major fluctuations of over 100 metres since the last glacial maximum 17 000 years ago. The global sea level reached a stable high some 4000 years ago and has changed very little in recorded history. Short-term instabilities caused by recent human activities now threaten to speed up this change. This has occurred in response to a rise in global temperatures due in part to greenhouse gas emissions as well as subsidence due to sedimentation (e.g. river deltas) and excessive groundwater abstraction. Nearly half of the world's population is concentrated within 60 kilometres of a coastline, and in developing countries up to two-thirds of the population is projected to live in coastal urban areas at the turn of the century. Projections by international experts suggest that the annual rate of sea level rise could increase from the current 2 mm to as much as 6 mm over coming decades, and that sea level will rise by as much as 0.66 metres by the end of the 21st century. This will have important consequences for coastal areas and particularly island states. Threats include coastal inundation and erosion, changes in salinity of the economically important coastal estuaries and lagoons, loss of wetlands and intrusion of salt water into groundwater aquifers. By identifying and evaluating threats, clear response strategies can be formulated taking physiographic and socio-economic factors into consideration. The International Panel on Climate Change (IPCC) identified three adaptive strategies at local levels: retreat, accommodate and protect. The retreat response entails abandoning existing structures that are threatened by advancing seas and relocating populations further inland. The second strategy accommodates the advancing sea by accepting future flooding and scheduling conversions to alternative economic activities. The protective strategy embodies a defensive response where economically prized structures are shielded from the advancing threat. The urgency of taking early action needs to be underscored, because some responses may take decades to become fully effective.

In South Africa, provision for global sea level change takes cognisance of an expected rise of 0.3 metres in sea level during the expected economic lifespan of most development projects (approximately 50 years). Thus, once acceptable development construction levels based on short- and medium term water-level fluctuations are ascertained, building platforms are adjusted to incorporate a further 0.3 metres in vertical height to ensure protection from inundation due to sea level rise.

[76] Source: *Sea level Rise and Coastal Subsidence: Rates and Threats*. B.U. Haq, Environment Department, The World Bank, 1994.

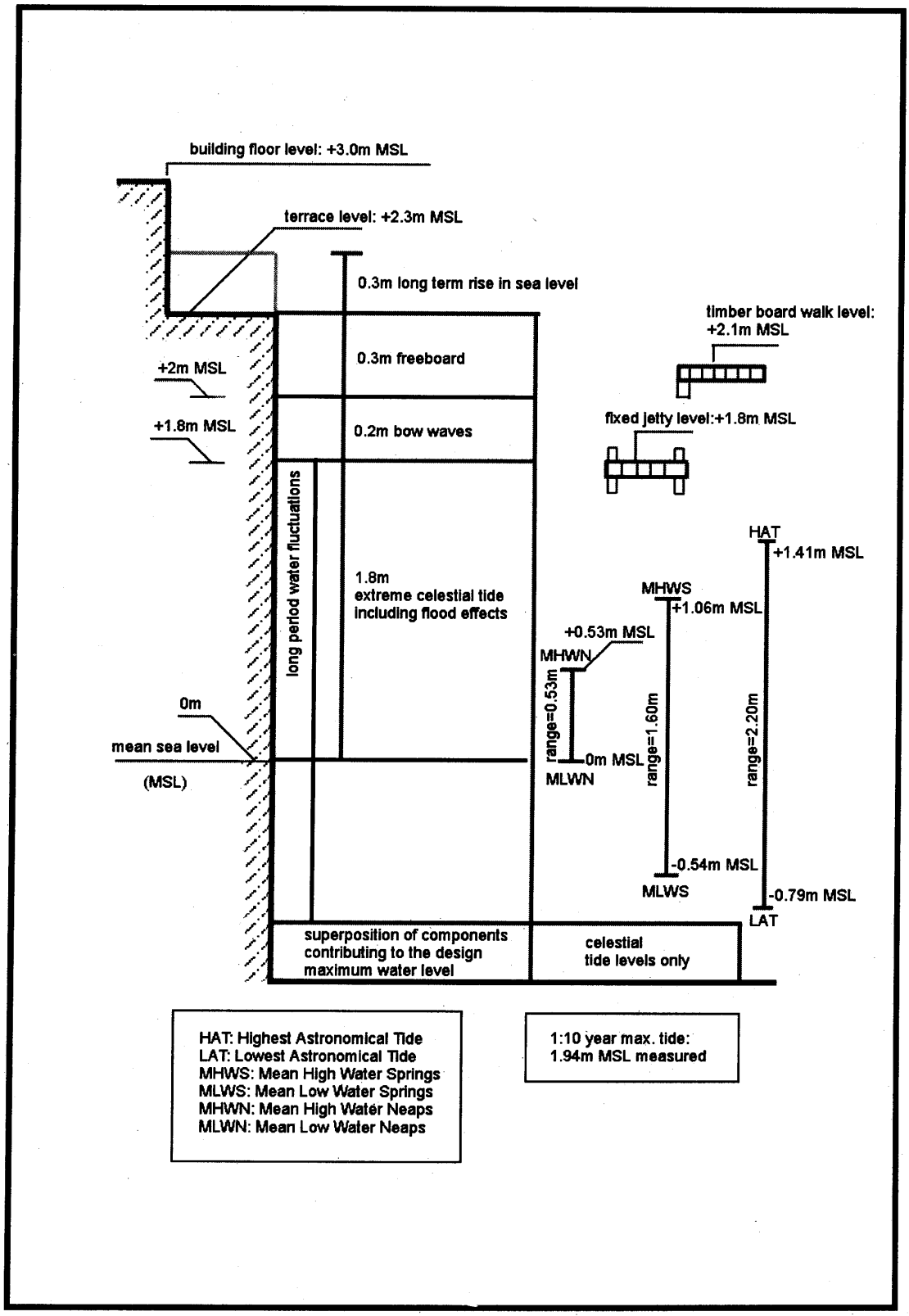


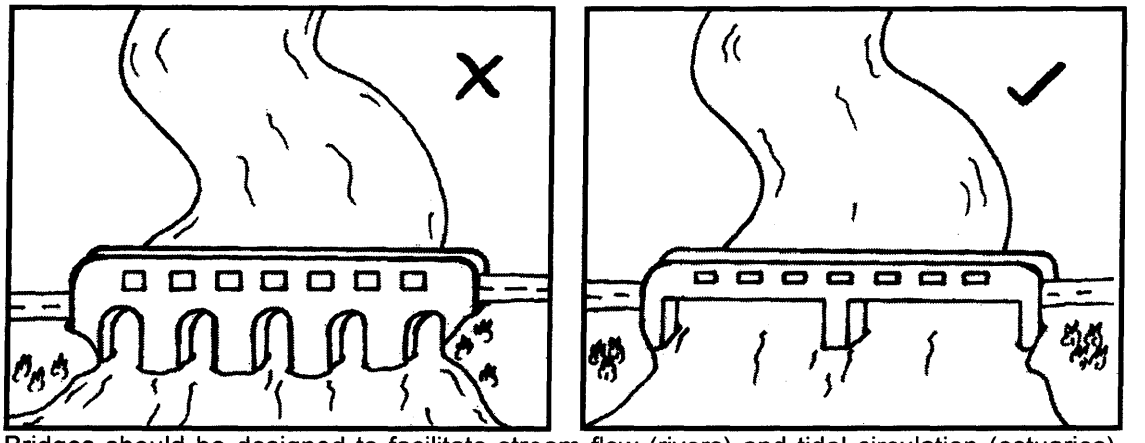
Figure 4. Tide characteristics and recommended design levels for a waterfront marina canal and small boat harbour development (Knysna Quays) on the shores of the Knysna estuary, South Africa.[77]

[77] Source: Knysna Quays Environmental Impact Assessment. Watermeyer, Prestedge and Retief, Consulting Coastal Engineers, 1995.

(c) Design structures to minimise impacts

In general, permanent structures should not be built within the floodplain unless it absolutely essential to do so. A key objective of such development should be to restrict to the absolute minimum any disturbance or impedance of river flow, tidal circulation, and sedimentary pattern. Of particular concern are road and rail routes, bridges, marinas and jetties. When planning and designing bridges, provision should be made to:

- Elevate structures over water areas;
- Locate bridge abutments outside of the river/estuary channel;
- Minimise the number of bridge supports in the channel and utilise designs which offer least resistance to water flow (e.g. Figure 5);
- Avoid deflection of currents which could lead to bank erosion;
- Avoid infilling or embankments during construction by using working platforms.

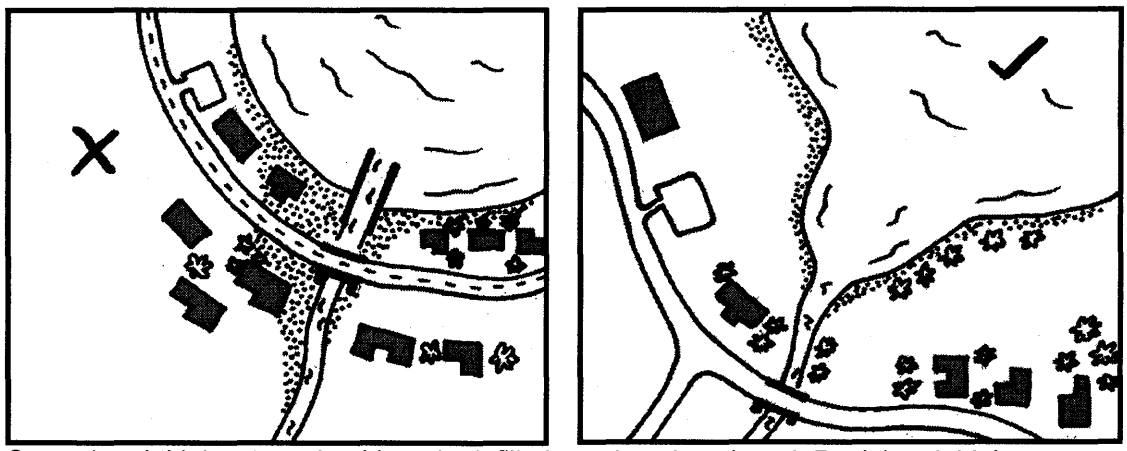


Bridges should be designed to facilitate stream flow (rivers) and tidal circulation (estuaries). Poorly designed bridges interfere with circulation and flow patterns and may lead to sedimentation, and in addition, are at risk of flood damage.

Figure 5. Permanent structures in floodplains should aim to minimise disturbance to natural processes.

Wherever possible, redundant structures including bridge supports, weirs, jetties, etc, should be removed. Care should be exercised with regard to problems that may arise from erosion scour of existing sedimentary deposits as a result of the reinstatement of previous flow regimes.

Embankments, levees and retaining walls should not be permitted in floodplains. When required as flood prevention structures, these should be located above the floodplain. No infilling or canalisation of rivers or wetlands, or any other activity that could alter or impede natural flows, should be permitted (e.g. Figure 6). Where valuable wetlands occur, development should adopt a principal of *no net loss*. Preference should be given to development alternatives that do not impact upon (reclaim) wetland areas; however, where this is not feasible, provision should be made for the restoration or rehabilitation of other degraded wetland areas equal or greater in extent to the area subject to development. This recognises the essential role of wetlands in ecosystem functioning.



Coastal and tidal waters should not be infilled or otherwise altered. Reclaimed tidal areas are prone to flooding and may result in erosion problems. Reclamation alters the flow of water, destroys coastal habitat and may lead to loss of ecosystem functioning.

Figure 6. Reclamation and canalisation of river and estuarine floodplains should not be permitted.

(d) Control activities that alter the floodplain surface

Prevent activities that alter the floodplain surface, such as excavation, paving and grading. These activities may be permitted where upgrading and/or rehabilitation of degraded areas is undertaken. Activities that result in the removal of vegetation and soil erosion should be avoided. Soil erosion control techniques and rehabilitation of disturbed areas should be undertaken immediately following construction. Methods that can be employed to reduce erosion include;

- **Gabions** (essentially these are cube-shaped wire cages constructed of chicken wire and filled with river or cobble stones). These can be used with good effect to shore up excavated slopes (e.g. road cuttings) as well as to reduce silt run-off in erosion channels;
- **Brushwood**, staked out along slopes at intervals parallel to the slope contours to stabilise soil. Erosion can be further reduced by covering the soil with a layer of wood/tree bark chippings;
- **Straw bales**, staked to the ground in the path of run-off channels to capture silt.

Erosion control measures are only effective where comparatively small areas of land have been disturbed. Where large areas are involved, it is essential to adopt a phased approach to clearing and rehabilitating vegetation.

(e) Control pollution

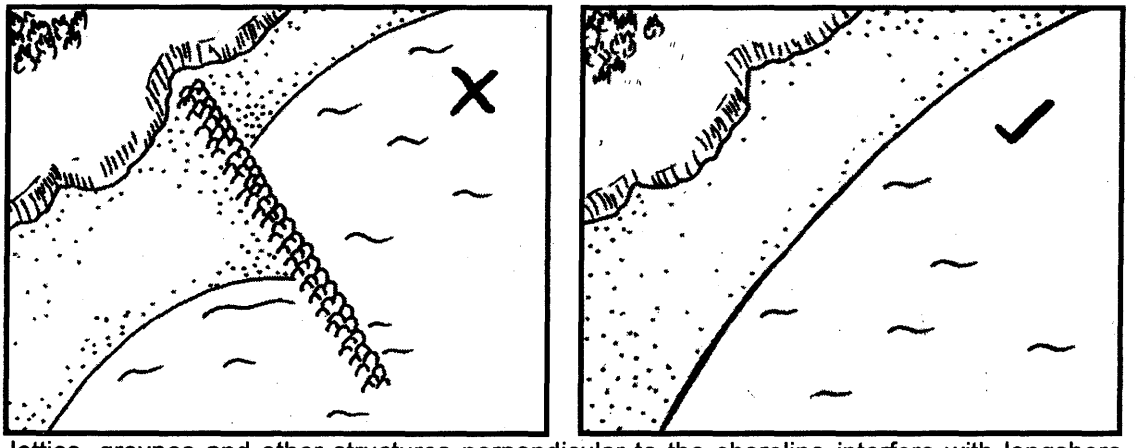
The disposal of solid or liquid waste should not be permitted in the floodplain. Direct discharge of sewage waste to the water body should take cognisance of the ability of the water body to assimilate pollutants. Standing water bodies (e.g. coastal lakes) are particularly sensitive (see also the Section 6.2.6 on waste disposal).

(ii) Rocky shores, beaches and dune systems

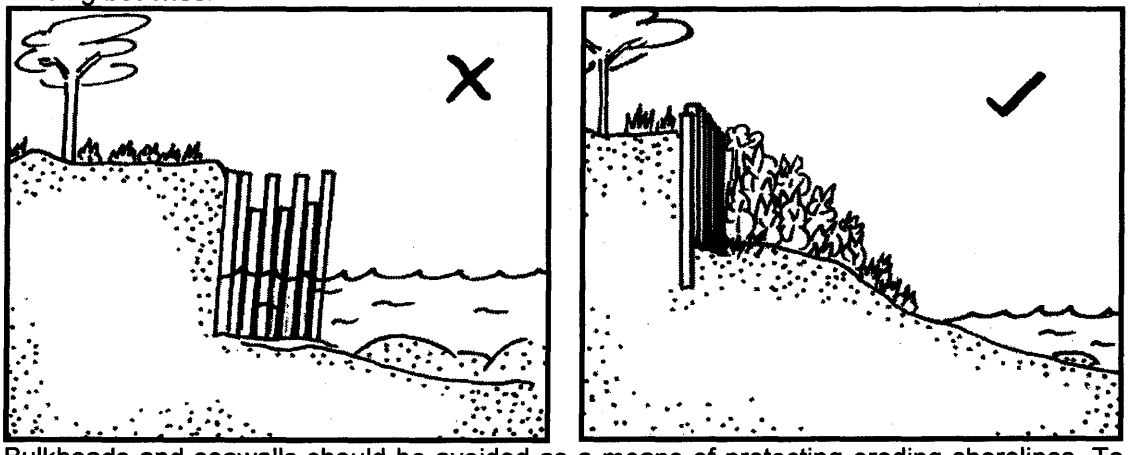
(a) Control development and access

Beaches represent part of the *littoral active zone* of shorelines and no development should take place on them. Development activities in beach areas pose clear risks of interfering with sediment transport patterns and lead to beach erosion.

Fixed structures such as harbour breakwaters, sea walls, groynes and other structures designed to stabilise beach areas from erosion should only be undertaken following full consultation with a coastal engineering specialist and the authority responsible for the seashore (Figure 7). Inappropriate design and location of these structures can have significant negative environmental impacts (see Section 4.2.5).



Jetties, groynes and other structures perpendicular to the shoreline interfere with longshore sediment transport patterns. Avoiding such structures allows natural processes to re-supply eroding beaches.



Bulkheads and seawalls should be avoided as a means of protecting eroding shorelines. To prevent the need for such structures, development should be located away from the coastline. If this is not possible, it may be possible to retain or establish a buffer strip of vegetation between the bulkhead and the water. This will assist to prevent undermining of the bulkhead and protect wildlife habitat.[78]

Figure 7. Guidelines for beach stabilising structures.

[78] Modified from: ESCAP, 1995.

In dune areas, development should be integrated with the *back dune environment* (see Figure 8) and structures should be sited in natural gaps in the vegetation in order to minimise vegetation disturbance. Where gradients are shallow, design should respect the right of property owners to have a sea view, and taller buildings should be located furthest inland.

(b) Establish setback lines and buffer strips

Setbacks and buffer zones should be established in order to separate beaches from development activities, and to ensure that development of dune areas and rocky shores is correctly sited to prevent damaging the environment and avoid risks to property.

Rocky shores provide stable platforms for development and the main factor that should be considered is the provision of a setback to avoid inundation by the sea. The setback should be established behind the 50 year flood level reached by storm surges. This setback should be determined by experts.

On dune systems, no development should be allowed on the foredune area since this is part of the *littoral active* zone (see Figure 8). This is easily destabilised and presents potential hazards for development from erosion and drifting sands. The zone is highly dynamic and at any point can erode and shrink, or accrete and expand.

Development should be restricted to back dune areas and a buffer strip should be established to provide adequate separation from the littoral active zone. The most landward extent of the littoral active zone is defined as the *erosion setback line* and this should be established in consultation with experts using data showing historical changes in beach/dune configuration. Thus, the development setback is the erosion setback line plus a vegetated buffer strip. The buffer strip should be clearly delimited during the early stages of development and the width determined by experts, taking into account local characteristics, including the force and direction of waves, vegetation type, topography, and the scale and density of the development. Buffer strips do not necessarily provide adequate habitat for the diversity of fauna and flora associated with dune ecosystems. Provision should be made to set aside protected areas where the need is identified, and this should be done in consultation with local conservation authorities.

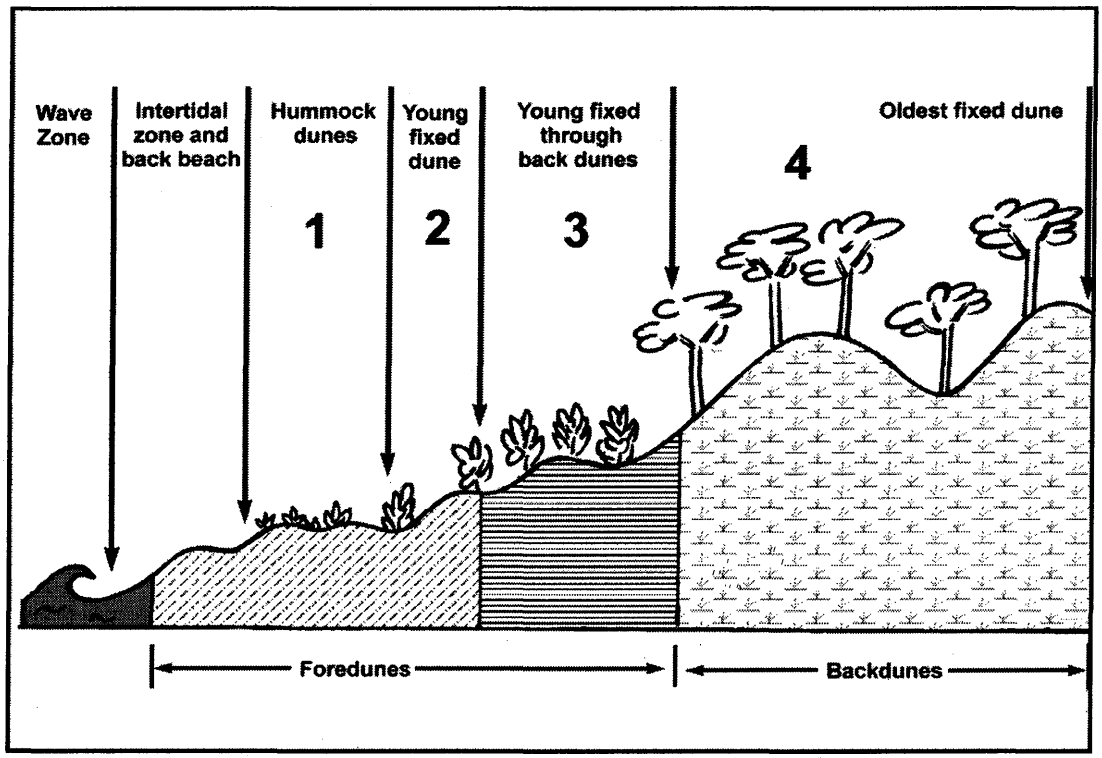


Figure 8(a). In multiple fixed dune systems, all development should be set back landwards from the youngest fixed dune trough. This limits development to back-dune areas where there is no danger of destabilising the dunes. Major development such as highways, railways, industry and high buildings should be located landward of the most landward dune trough (Zone 1 = Strand plant zone; 2 = Shrub zone; 3 = Shrub thicket zone; 4 = Thicket/forest zone).

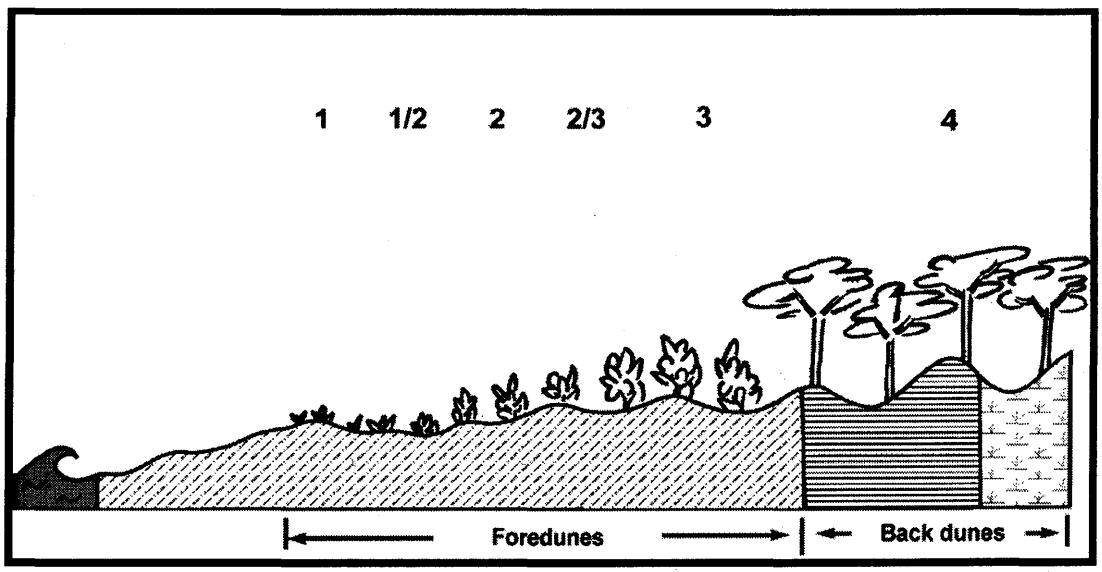


Figure 8(b). In multiple dune ridge systems (typical of growing coastlines), development should be set back behind the oldest landward ridges that are already protected by a closed woody cover. This will limit development to back-dune areas where there is no danger of destabilising the dune.

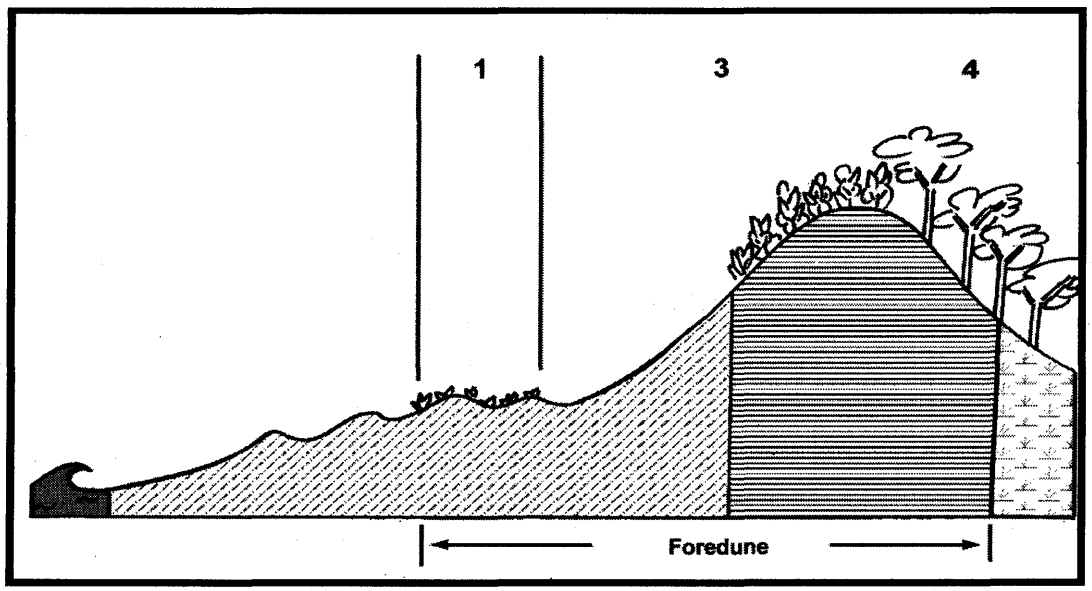


Figure 8(c). In high, steep and broad vegetated dune cordons, all development should be restricted to the landward base of the dunes. Where relatively small, vegetated dunes occur as a single ridge, all development should be restricted to the landward base of the dune. Where relatively small dunes occur as a double ridge, development should be restricted to the landward base of the second ridge.

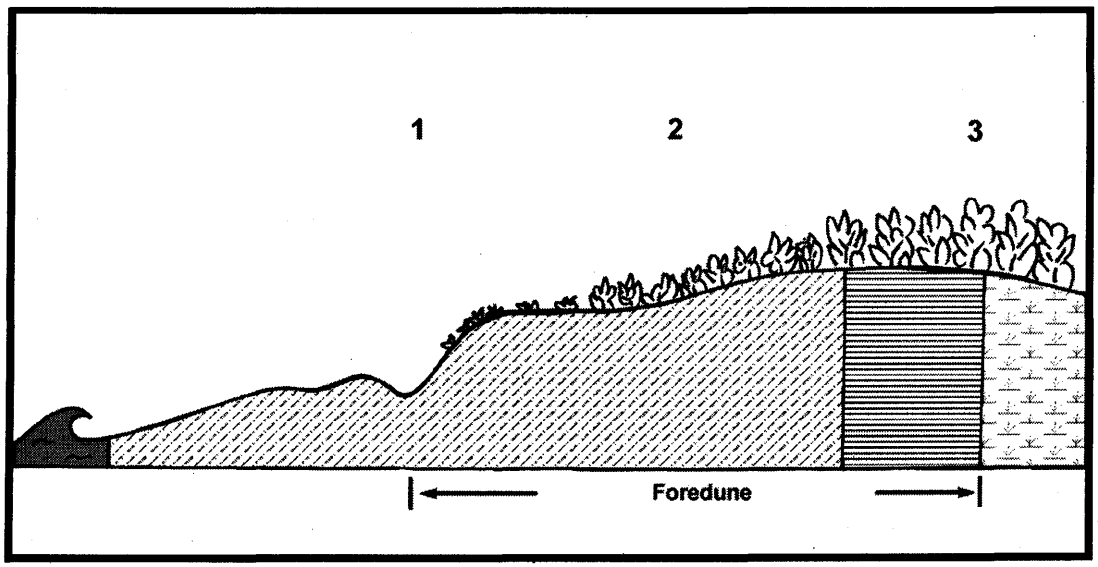


Figure 8(d). Where dunes are poorly developed or where only a gradual rise occurs landward from the backshore zone, development should be set back between 30 and 50 metres from the seaward edge of the completely vegetated sands. The exact setback will depend on the characteristics of the area and the scale of development.[79]

Key:

Erosion setback line. Littoral active zone (plant cover absent, patchy or not continuous

Zone that is easily destabilised

[79] Source: Council for the Environment, 1991.

(c) Control the siting and alignment of roads and parking facilities

The main access to the coast should be perpendicular from a main coastal route situated further inland, and should provide access at selected sites only. Railways should always be situated further inland. In general, dwellings should form the first line of development facing the sea (Figure 9).

Access to the beach across dunes should be strictly controlled and via specifically demarcated routes which are clearly sign-posted. Ideally, non-vegetated dunes should not be disturbed at all but if absolutely necessary, temporary (i.e. unsurfaced) vehicle tracks should run along the interdune slacks. Parking sites should be linked to beach areas by paths and boardwalks in order to protect dune vegetation.

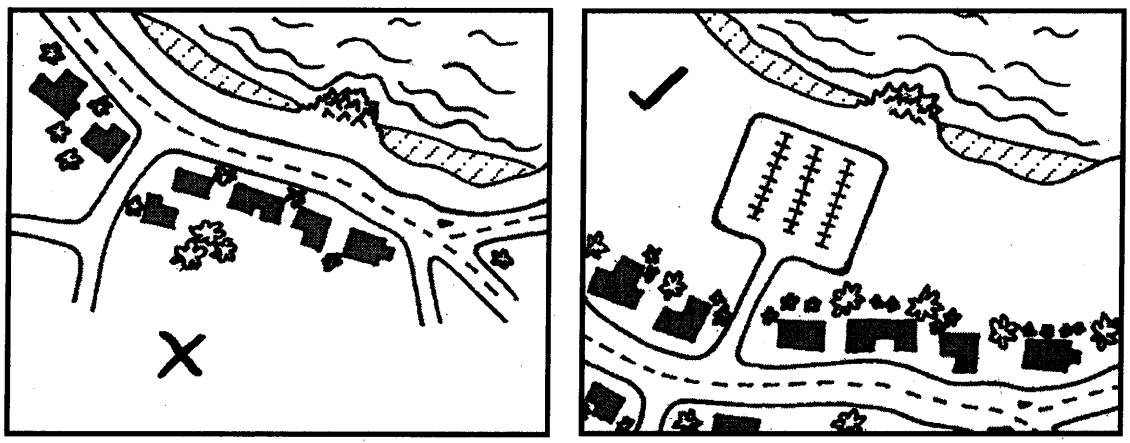


Figure 9. Setbacks and buffer zones should be established to separate beaches from development. Roads providing access to beach areas should be located tangentially to the coastline at strategic points (from main coastal routes situated further inland). Housing (rather than roads, railways, etc) should form the first line of development facing the sea.

(d) Protect dune vegetation and control dune stabilisation

Dune vegetation should not be removed or damaged, and dunes should not be flattened, excavated or otherwise re-shaped. Disturbed areas should be rehabilitated and where (but only where) dunes were previously vegetated, stabilised with indigenous vegetation. Stabilisation can be achieved by staking brushwood onto the site of disturbed dunes tangentially to the direction of the prevailing wind (care should be exercised to ensure that seeding by non-indigenous invasive vegetation does not occur). Once stabilised, a mosaic of indigenous dune vegetation should be planted to ensure rapid spread of plant cover. Note that artificial stabilisation of dunes should be avoided unless absolutely necessary. This should only be undertaken where there is a thorough understanding of local sediment movement patterns. Only indigenous, non-invasive vegetation should be used in stabilising dunes.

(iii) Coastal forests and mangroves

(a) Protect forested areas

Forests and mangroves should be given high conservation status in terms of their ecological role as habitats for animals and other plant species and in preventing erosion, trapping sediments and sequestering excess nutrients. In most countries,

forested areas are under extreme threat and shrinking rapidly due to the demand for timber products, agricultural/grazing land, mining and a variety of other reasons.

(b) Control the siting of development

Development should be restricted to forest edges or natural clearings within the forest. Under certain circumstances, low-density development may be permitted in forests where dwellings can be constructed without the need to fell trees. Access routes should be carefully sited to avoid clearing vegetation unnecessarily.

(iv) Cliffs and steep slopes

(a) Avoid development on unsuitable or unstable geological units/soils[80]

Areas containing rock outcrops, shallow bedrock (< 1.5 metres depth) or very dense pedocretes can place serious limitations on development, as they may require extensive use of blasting and/or jackhammers to provide service trenches (Pedocretes are very hard impenetrable layers in the soil profile, made up primarily of clay, sand and/or gravel, and cemented together by relatively insoluble materials such as limonite, calcite and silica. Pedocretes often limit the natural downward seepage of water).

Development of unstable geological units should be avoided as these areas are susceptible to slumping, erosion or movement. Formations falling into this category include:

- **Calcified dunes** - These are ancient dunes in which the surface and underlying sediment has been cemented together naturally by calcium carbonate;
- **Aeolianite** – Ancient dunes where the surface and underlying sediment has been cemented by various substances;
- **Shales** - Fine grained sedimentary rocks that usually produce clay soils when weathered;
- **Schists** - Regionally metamorphosed (altered by heat and pressure) rocks containing closely spaced parallel layers, so that almost any part can be split into flaky sheets;
- **Conglomerates** - Rocks composed of pebbles of varying sizes that are naturally cemented together by various substances;
- **Colluvium** – Rock debris or soil moved downwards by gravity. Colluvium deposits include scree (small loose stones), landslides and similar material, and are usually found at the base of cliffs or steep slopes;
- **Alluvium** – Loose, broken up material laid down by a river or stream on its bed or floodplain, and in lakes or estuaries. Alluvium is usually made of mud, silt, sand and/or gravel;
- **Aeolian sand** – Material (normally sand) transported and deposited by the wind;
- **Talus slopes** – The slope at the base of a cliff, or at the base of an eroding escarpment (a long steep slope at the edge of a plateau). A talus slope can also consist of a sloping heap of rock fragments accumulated at the base of a cliff.

Essential construction on these formations should be subject to a thorough investigation detailing the geotechnical aspects and rehabilitation to be undertaken. This should be conducted by a fully qualified geotechnical expert.

[80] Based on: *Guidelines for the Control and Management of Activities in Sensitive Coastal Areas, Document 2: Guidelines and Definitions*. Department of Environmental Affairs and Tourism, 1998.

Development on certain soils may also result in problems related to the instability of foundations and erosion. Clay and sandy soils fall into this category. Clay has the tendency to swell when waterlogged and can also give rise to problems with regard to the siting of septic tanks (see Section 6.2.6 on waste disposal). Development of clay areas should be subject to extreme caution, particularly where the site is located on a steep slope. Sandy soils are highly erodible, easily broken up and moved by wind and water. Development of sandy areas is particularly problematic on steep slopes (steeper than 1:6).

The following provides a basic field guide for determining the type and clay content of soil. Samples taken should be moist and free of roots. The soil should first be rolled into a spindle of about 10mm diameter:

- **Clay** can be rolled into a thread of 3-4mm thick and formed into a ring without breaking. It is smooth and elastic, with moderate to strong resistance to rolling out;
- **Loam** (a mixture of sand and clay) can be rolled into a thick thread, but will break before 3-4mm thickness is achieved. The soil ball is easy to manipulate and has a smooth, spongy feel with no obvious sandiness;
- **Sandy loam** sticks together fairly well and can be rolled into a stable ball but not a thread. Sand grains can be felt during manipulation.
- **Sand** hardly sticks together or does not stick at all, and cannot be rolled into a stable ball. Individual grains stick to one's fingers.

(b) Control development on steep slopes

Steep slopes are inherently unstable and prone to erosion and slumping. The suitability of a slope for development depends on the gradient of the slope, the geology and the nature of the soils. Development on steep slopes and very steep slopes should be avoided since problems arise in the construction of access roads, foundations and disposal of effluents (sewage, stormwater, etc). The criteria given in Table 1 are provided as a precautionary guideline. The appearance of slopes to which the criteria apply are shown in Figure 10. Site-specific conditions should be assessed by experts.

Table 1. Precautionary guideline for development on slopes.

Description	Ratio	Percentage	Development Criteria
Very steep	> 1:4	> 25 %	Unsuitable
Steep	1:6 – 1:4	16 – 25 %	Should be avoided but may be suitable subject to expert geotechnical advice
Gently sloping	1:20 – 1:6	5 – 16 %	Suitable but see other criteria (conservation, sensitivity, etc)
Flat	< 1:20	< 5 %	Suitable but see other criteria (conservation, sensitivity, etc)

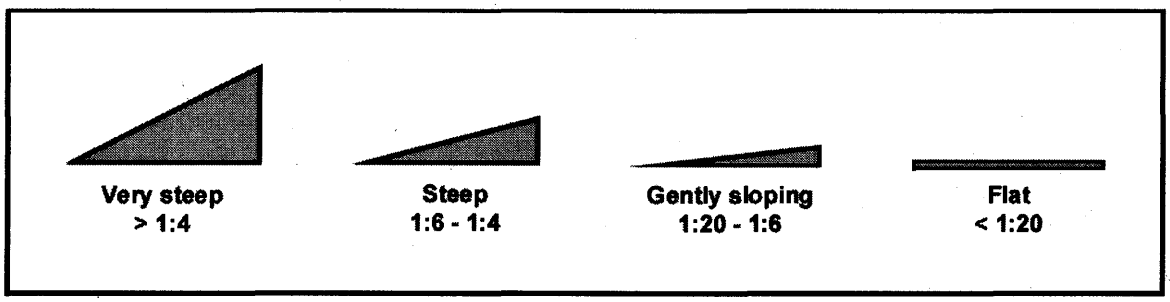


Figure 10. General appearance of slopes described in Table 1.

No development should be allowed on unstable areas. These generally include the toe and face of steep slopes and cliffs and particular attention should be given to areas where there is evidence that landslides or slope movement has occurred. This is frequently indicated by slumping (movement of loose or unstable soils down a slope by gravitational forces), scars and hummocky (low, rounded hills) ground (below cliffs). Other indicators include leaning trees and displaced fences.

(d) Establish setback lines and buffer strips

A minimum development setback should be established to provide a buffer zone of stabilising vegetation behind the crown of slopes or cliffs. In Figure 11, intrinsically unstable areas are shown by (1) and should ideally be protected from disturbance. Development should take place from the convex slope to flatter terrain areas, and on the sheltered (from wind) sides of spurs in the fore-terrain of cliffs, out of the reach of landslides (illustrated by (2) and (3)). The width of the buffer zone depends on a number of factors including the soil, geomorphology, slope, climate, water table, vegetation and nature and scale of the development. The precise location of the setback should be established in consultation with experts.

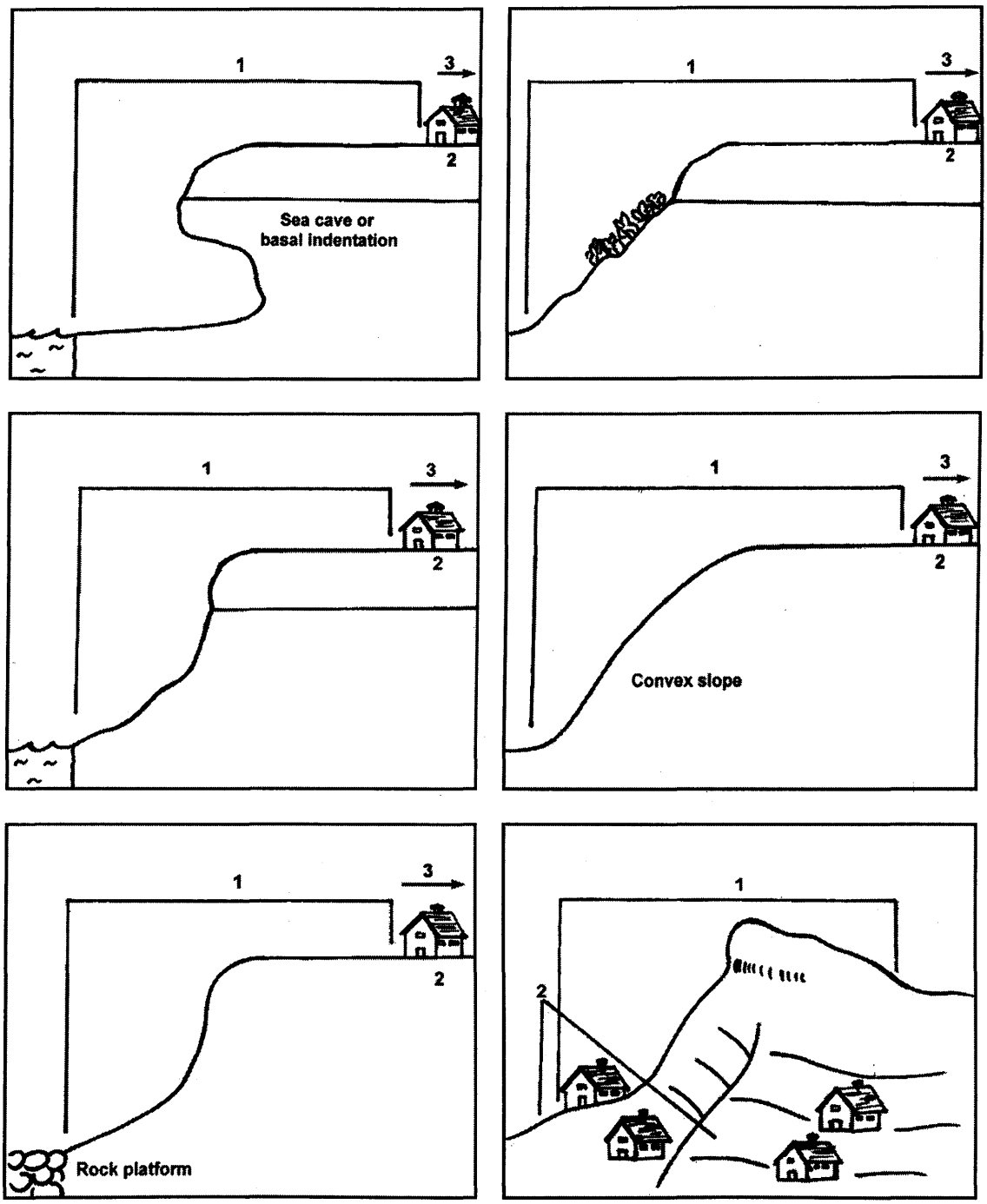


Figure 11. Recommended land-use for various cliff types.[81]

[81] From: Heydorn and Tinley, 1980, in: Council for the Environment, 1991.

(e) Protect sensitive areas

All activities that physically destabilise the toe, slope, face or crown of cliffs and steep slopes should be prevented. The following criteria should apply:

- **Developments** (houses, roads, etc) should minimise the amount of cut and fill required and undertake erosion control measures during both the construction and operational phases;
- Special attention should be given to **storm water run-off**, and culverts should be sited to maintain natural drainage patterns. Storm water outflows should be designed to reduce the erosive scouring action of effluents by using flow diffusers, etc;
- **Hard surfaces** (e.g. roofing, paved areas) should be kept to a minimum;
- Vegetation should only be disturbed or cleared where absolutely necessary and kept to a minimum;
- **Disturbed areas** should be stabilised and rehabilitated at the earliest opportunity using properly designed retaining structures and planting with indigenous, non-invasive vegetation;
- Disturbance to **stabilising vegetation** by trampling should be controlled by restricting access.

(v) Small coastal islands

(a) Control development

Many small islands are valuable conservation resources, supporting colonies of seabirds, seals and other wildlife that are often endemic to a specific island or group of islands. These communities are often unique, having arisen (or evolved) in response to the unique circumstances of the islands' location and relative isolation from other islands or mainland environments. These environments are extremely sensitive to disturbance and it is preferable to avoid development of these areas unless development is linked to actions that enhance their protection.

The potential for sustainable development of small islands is more restricted than other mainland environments since it depends upon maintaining the viability of certain necessarily limited natural resources.[82] These resources may contribute in providing essential life-support systems such as maintaining water supplies and soil fertility, and protecting individual islands from coastal erosion. Uninhabited islands are particularly sensitive, and if access by tourists is permitted, then development should be directed towards mitigating the impacts of tourists. Examples include; jetties and landing/reception areas for tourists, walking trails, ablution facilities, etc.

Development proposals should be subject to a full impact assessment. It is essential that management plans include procedures to ensure that the risks of importing alien species are minimised. Examples of species that can have devastating effects on endemic wildlife include cats and rats; however, many other species of plant and animals have the potential to become invasive once established on small islands.

6.2.2.2. Landscape and Building Design

Landscape architecture is an extremely important aspect of coastal zone development that is frequently overlooked or neglected. However, it is important to recognise that tourism developments designed in harmony with the landscape and which are aesthetically pleasing can make a positive contribution to the overall visual amenity of an area.

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[82] In: *Small Island States and Sustainable Development: Strategic Issues and Experience*, by S. Bass and B. Dalal-Clayton, IIED Environmental Planning Group, 1995.

(i) Protect visual amenity of landscapes

The landscape setting is an important feature of the design and setting of a new development and requires a different approach depending upon whether the setting is on flat or sloping terrain. In addition, architectural styles of new developments should reflect the identity of existing settlements, particularly where tourism is centred upon the historical heritage of the area.

Developments on sloping terrain presents the greatest problems for landscaping since the development can often be seen from many vantage points. The development should be sited along a contour (rather than across it), and the top of the development should be consistent with existing structures. The site should be selected to avoid disruption of natural viewsheds (see Figure 12).

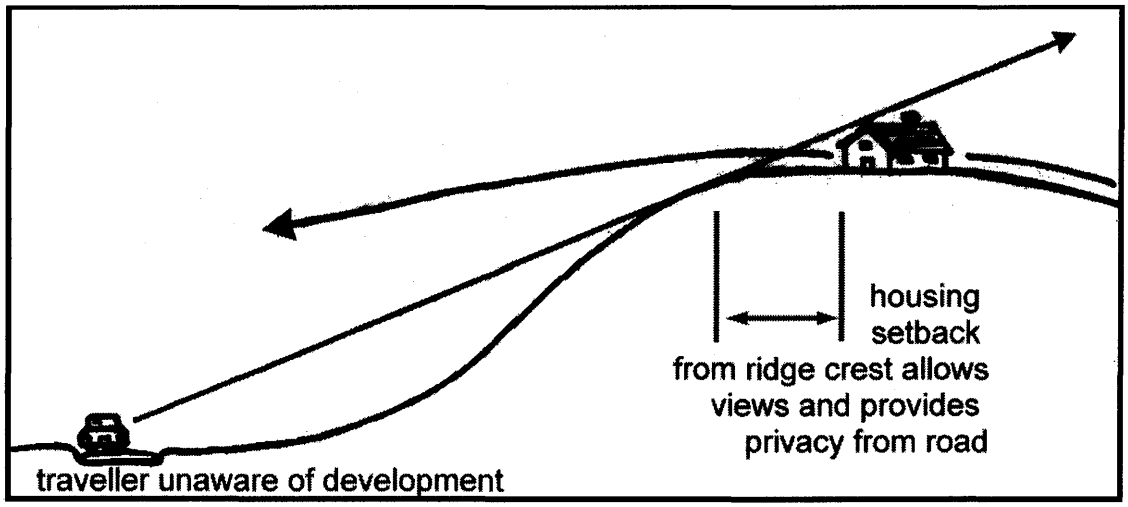
Landscaping in areas of flatter terrain is less problematic. However, new developments should not jeopardise approach and internal views of the settlement, particularly in historically significant areas. Special attention should be given to appropriate height limits to prevent new developments intruding upon low-profile settlements. Views of the coastline from neighbouring buildings should be respected.

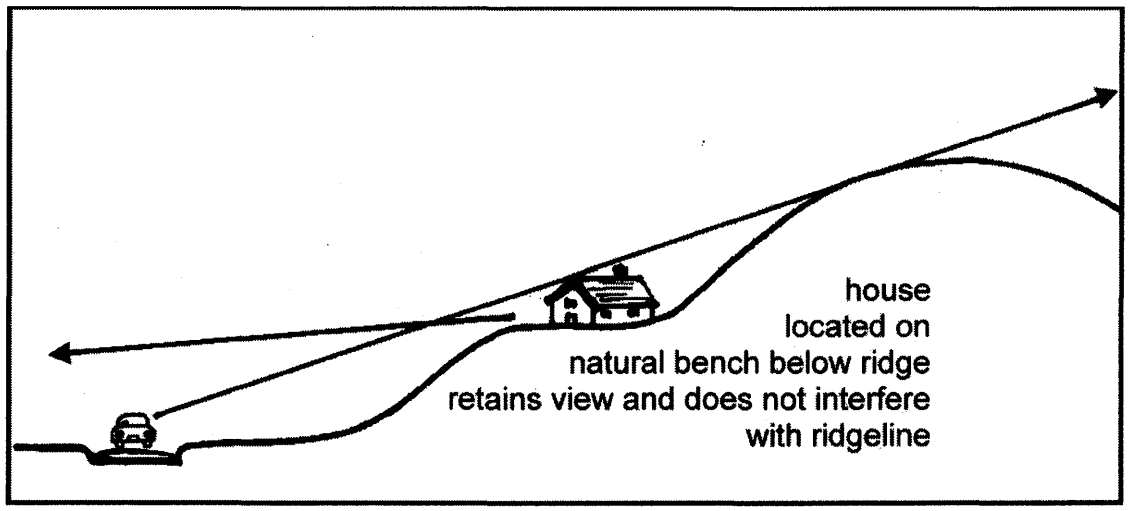
(ii) Promote cluster development

Urban and resort developments that are clustered create less visual impact than haphazard sprawling development. The compact arrangement of clustered development confers cost advantages with regard to the provision of services and infrastructure (e.g. electricity, sanitation, water, roads, etc) and also requires less land.

The development and application of planning standards can be used to ensure that the destination has the capacity, in terms of land, infrastructure, services, etc, to support visitor numbers. The standards are established through building codes and other regulations and can vary according to the image that the resort wishes to project.

Table 2 summarises the common standards that are applied to all resorts in developing accommodation, infrastructure and tourist facilities. These should be modified to suit local conditions.





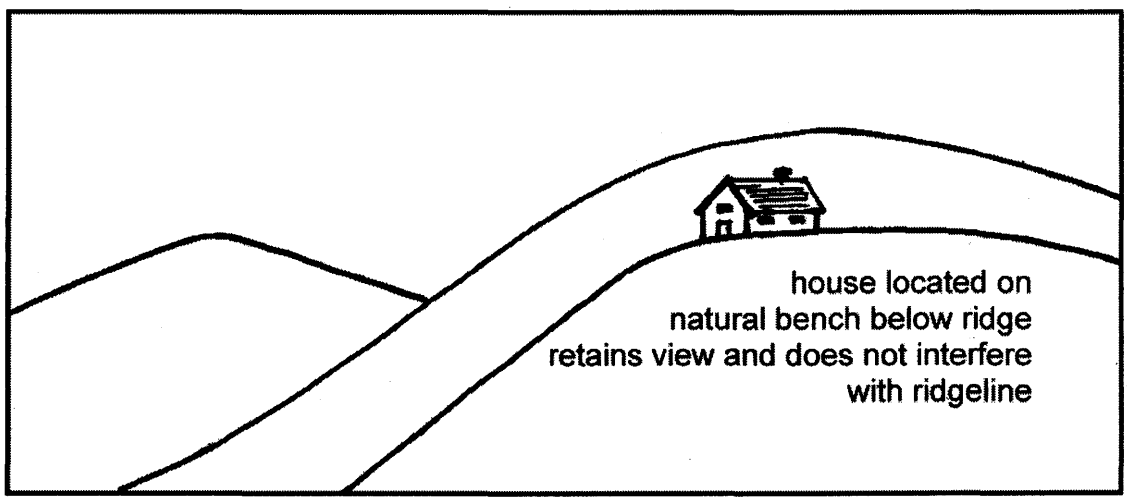


Figure 12. Landscaping: Selection of sites to avoid disruption to viewsheds.[83]

[83] Source: *Design and Siting Guidelines*. Town and Country Planning Board, Australia, 1979.

Table 2. Selected common planning standards for beach resorts.[84]

Facilities	Standard
1. Accommodations	
(a) Hotels	
Economy	$10m^2$/bed
Average	$19m^2$/bed
Luxury	$30m^2$/bed
(b) Seaside holiday villages	$15m^2$/bed
(c) Apartments in beach resorts	
Studio	$36m^2$
1-bedroomed unit	$53m^2$
2-bedroomed unit	$110m^2$
2. Infrastructure	
(a) Water (daily consumption per person)	
Mediterranean resorts	200 - 300 l/day
Tropical resorts	500 - 1000 l/day
(b) Sewage disposal (no main system)	0.3 ha/1000 persons
(c) Access road and parking	
Parking lots	1 per 2-4 bedrooms
Overall density	5 – 15 % of site
3. Tourist facilities	
(a) Swimming pool (resort hotel)	$3m^2$ of water/user
(b) Open space (seaside resort)	20 – $40m^2$/bed
(c) Shops	$0.67m^2$/bed

Table 3 (following page) provides an example of country-specific guidelines for development planning (Mauritius).

[84] Source: *Proceedings of the Workshop on Resort Planning*. World Travel Organisation, 1981, in: *ESCAP*, 1995.

Table 3. Planning guidelines for development planning in Mauritius.[85]

FOR COASTAL ZONE 1 (Land between HWM and nearest Coast Road)
1. General – Clauses* 1.1 and 1.2 • Development to integrate well into topography and landscape, and to be creative.
2. Beach and Sea – Clauses 1.3 – 1.11 2.1 Clause 1.3 – Plans 1:200 or 1:500 to show Low Water Mark (LWM), High Water Mark (HWM) and contours Above Mean Sea Level (AMSL). 2.2 Clauses 1.4 & 1.5 – No dredging, sand mining, removal of beach rocks, dumping of material in sea or on beach, construction of causeways and artificial islands. 2.3 Clauses 1.6 & 1.8 – Special permission for jetties or other sea structures. Separate EIA. 2.4 Clause 1.7 – No structure obstructing public access way along the beach. 2.5 Clauses 1.9 & 1.10 & 1.11 – Protect wetlands, mangroves, sensitive areas, existing vegetation.
3. Development height, density and character - Clauses 1.12 – 1.18 3.1 Clauses 1.12 & 1.13 • Height not greater than ground floor + 1. • Pitched roof not greater than 10m from ground level. • Lowest floor not less than 1m above HWM. 3.2 Clauses 1.14 & 1.15 • Plot coverage not greater than 20 % of site area. • Site area divided by the number of hotel rooms should not exceed 170. • Coverage calculations to be indicated on Site Plan. 3.3 Clauses 1.16, 1.17 & 1.18 • Walling not greater than 70m^2 in one plane. • Avoid repetition in walling. • Preference to be given to use of local materials.
4. Setbacks and building lines – Clauses 1.19 – 1.21 • Setback is site-specific • No building nearer than 15m from the HWM • 30m may be requested in certain cases. • Set-back of 6m from plot boundary along a main road. • Set-back of 4.5m from plot boundary along other public road. • Set-back of 2m from side and near boundaries.
5. Walls, fences and windbreakers – Clauses 1.22 & 1.23 • Wall height not greater than 1.5m. • Wall not less than 15m from HWM. • 3.5m splay of wall at junction with road. • Curve of radius 6m. • Local materials and good finish. • Plant wind breakers on exposed areas of site.

[85] Guidelines synthesised by Seenyen Associates Ltd, Civil and Environmental Engineers, Mauritius, from *"Outline Planning Scheme for the District Councils"*, published by The Town and Country Planning Board, Mauritius.

6. Sanitation – Clauses 1.24 – 1.26

6.1 Clause 1.24

- Septic tank and absorption pit arrangement possible where site conditions are suitable.
- Separate system for each residential unit.
- Seek advice from Authorities.

6.2 Clause 1.25

- Distance of septic tank not less than 30m from HWM.
- Septic tank not to be located under any structure.
- Absorption pits not less than 4m from each other; not less than 2m from boundary; and not less than 1m from any structure.
- Grease traps on kitchen wastewater outlet.

6.3 Clause 1.26

- Allow for lorry access for desludging.
- Lorry to be able to approach within 15m from septic tank.

7. Water supply and electricity – Clause 1.27

- Written commitments from Central Water Authority (CWA) and Central Electricity Board (CEB) as regards possibility of supply.

8. Roads, parking and plant – Clauses 1.28 – 1.38

8.1 Clause 1.28 – Road access to be paved.

8.2 Clause 1.29 – Identify and clear access and off-site infrastructure problems.

8.3 Clause 1.30

- Provide on-site parking space.
- Car space to be 5m x 2.5m.
- Car aisle to be not less than 6m wide.
- Sufficient turning space to allow exit in forward gear.

8.4 Clause 1.31

- 1 car space for 3 bedrooms.
- Additional car spaces for conference or functions facilities in hotel at rate of 1 per $15m^2$ of conference space.
- Additional car space for dining rooms at rate of 1 per $30m^2$ of dining space.

8.5 Clause 1.33 & 1.34

- Avoid large tarmac areas.
- Night lighting.
- Car parks not permitted along main roads.
- Car park not less than 40m from HWM.

8.6 Clause 1.36 – Taxi rank required for hotels > 60 rooms

8.7 Clause 1.37

- Provide access for service vehicles.
- Service yard not less than $100m^2$.
- Screen waste storage area.
- Easy access to all mechanical plants.
- Mechanical plant to be sited so as not to cause noise, smell, fumes, dust problems to neighbours.

8.8 Clause 1.38

- Storage of oil, diesel, petrol not less than 30m from HWM.
- Obtain approval of Fire Services.

*Refers to: Clauses listed in; "Outline Planning Scheme for the District Councils", by; The Town and Country Planning Board, Mauritius.

(iii) Promote development that is aesthetically pleasing

Roads should be viewed as visual corridors and should flow along natural land contours. Structures such as signboards, road signs, etc, should be designed and located in order to blend with the landscape. Where possible, backdrops should be used to avoid silhouette effects on the skyline. The aesthetic impact of non-essential signage (e.g. advertising billboards) should be considered before permitting their erection.

Facilities such as street lighting, seating, litter bins, etc, should be in keeping with the character of the area. Emphasis should be placed on designs that are least obtrusive. Where possible, utility lines (e.g. telephone, electricity) should be located underground to avoid visual impacts, particularly of scenic view sheds. Where appropriate, landscaping should be used to screen unsightly structures, add topographical interest and provide protection from prevailing winds.

(iv) Make use of natural vegetation

Existing indigenous vegetation should be retained and used to mask the visual impact of developments. Where scenic viewsheds are obscured by vegetation, clearing and thinning should be carried out carefully and selectively. Landscaping should make use of indigenous, rather than exotic vegetation since the former is adapted to the prevailing climatic conditions of the area. Exotic vegetation should be discouraged as it normally requires excessive fertilisation and irrigation and has the potential to be invasive.

(v) Protect sensitive areas

Roads should be aligned in such a way that they do not damage sensitive coastal landforms and features that enhance the aesthetic and recreational appeal of the coast. Roads and parking areas should bypass valuable plant and wildlife habitats, and where this is not possible, should be located adjacent to them.

6.2.2.3. Construction Site Management

The construction phase of a new development poses the greatest risk of damage to the site as a result of building activities and the use of heavy machinery. Impacts are generated by disturbances to drainage patterns, soil profiles, vegetation and wildlife habitats. Construction impacts should be carefully managed to ensure the minimum possible damage. Adequate provision should be made for the rehabilitation of impacts at the earliest opportunity. Experience clearly demonstrates that effective rehabilitation is in the best interests of the developer as well as the environment.

(i) Pre-construction

An environmental management plan should be drawn up and provide guidelines for construction activities aimed at minimising environmental damage. This should include:

- Vehicle access routes, storage areas and sensitive areas to which access is restricted. Access routes should be staked out and sensitive and/or conservation areas fenced off to prevent unnecessary disturbance. Valuable trees should be identified and protected by temporary fencing;
- Indigenous vegetation should be removed and maintained in a temporary nursery ready for re-planting;

- Topsoil from the construction site should be removed and stockpiled for reuse afterwards. Stockpiles should be located and stabilised in such a way to prevent erosion. Topsoil is a valuable resource and should not be compacted or polluted in any way.

A summary of environmental issues identified and addressed by the Environmental Management Plan of a small boat harbour/marina canal development is provided in **Annex 8.**

(ii) During construction

The following criteria should apply:

- **Rehabilitation actions** should be integrated into the construction and operational phases of the development and use available labour and equipment;
- **Disturbance of slopes** steeper than 1:5 should be avoided to prevent excessive and costly cut-and-fill;
- **Erosion control measures** should be implemented at sites where the topsoil has been disturbed, particularly on steep slopes. Where necessary, temporary measures should be undertaken to re-direct storm water run off into natural watercourses over vegetated areas;
- **Drainage patterns** of natural watercourses should be retained and the natural functioning of wetlands, marsh areas, etc, utilised to moderate fluctuations in flow rates;
- **Storm water outflows** should be moderated using flow diffusers (these essentially comprise engineered structures such as gabions or more permanent features that act as "baffles" to reduce and disperse the flow of storm water);
- **Natural vegetation buffer zones** and retention ponds should be employed to trap silt, debris and other pollutants;
- Where possible, **hard surfaces** should be kept to a minimum and preference should be given to porous paving in order to reduce the extent of storm water run-off from hard surface during periods of heavy rainfall. These measures are particularly appropriate for re-charging water into the sand formations of the coastal environment, thus reducing costs associated with engineered drainage systems;
- **Vegetation clearance and rehabilitation** should be phased where possible to reduce the extent of cleared areas at any given time. Where required, exposed areas should be stabilised before re-planting is undertaken.

(iii) Post-construction

Provision should be made for an ongoing environmental management programme to guide implementation of rehabilitation and maintenance.

6.2.3. Sustainable Construction

The nature and design of buildings have a major bearing on the sustainability of societies and there is an increasing need for the construction industry to adopt "environmental performance" as one of its leading principles. Underlying this principle is the need to address two main themes:

- Conservation of natural resources;

- Use of technology that is functional within bio-regional patterns and scales.

6.2.3.1. Use of Local Materials

In East African countries, the availability and cost of suitable manufactured construction materials can be an obstacle to the development of tourism infrastructure (e.g. hotels, resorts, lodges, etc). However, in these countries, there are frequently many alternative natural materials that can be obtained locally and which are suited to local climatic conditions. The use of such materials, which include river stones, sand, timber and reeds, has many advantages, including savings in terms of processing, storage and transportation costs.

However, it is important to recognise that exploitation of natural resources for use in the construction industry should be environmentally responsible, and practises that lead to resource depletion or environmental degradation should be avoided. In the past, mining of coral reefs and beaches for stone and sand, as well as non-sustainable forestry practises have led to severe environmental impacts including beach erosion, loss of biodiversity and soil erosion. In recent years, there has been a significant trend towards the use of *certificated* construction materials, i.e. materials based on renewable resources (see Box 6, for example), and developers should be encouraged to adopt this practise wherever possible.

6.2.3.2. Use of Recycled Materials

Increasingly, opportunities are arising whereby recycled material can be used in construction. The benefits of re-using waste materials in some form or other include the conservation of valuable land-fill space. Essentially, recycled materials fall into one of two categories:

(i) Recycled content

Many building products are currently available that are manufactured from recycled materials. For example, organic asphalt roof tiles contain recycled paper or re-manufactured wood fibres. Cellulose insulation material is manufactured from recycled newspaper.

(ii) Reuse of materials

Many useful products, including timber and fittings such as windows, doors, cabinets and appliances, can be salvaged when buildings are demolished. It makes sense to reuse these where they still have a useful life, rather than destroying or disposing of them. In addition, the technology now exists to use other waste materials such as straw bales and old tyres satisfactorily as building elements. New technology has also enabled more efficient use of resources. For example, finger-jointing of timber allows small-dimension and otherwise scrap timber to be made into useful components. This material would otherwise be discarded.

6.2.3.3. Pollution and Emission of Hazardous Substances

Caution should be exercised in the use of glues, wood treatments, paints, etc, used in construction. Many of these products are highly toxic and leaching of these chemicals may constitute public health hazards and/or degrade ecological processes. Particular attention should be given to the risk of contaminating water supplies.

The constituents and toxicity of all products should be examined before purchase, and preference given to "eco-friendly" labelled products. Alternatives that do not require the application of treatments should be sought wherever possible. For example, it is now possible to obtain poles (e.g. for use in the construction of jetties) that are manufactured from recycled plastics and which do not require treatment to withstand decay and wood-boring organisms.

For further information on sustainable building practise, including a variety of specific applications, technologies and materials, we recommend that readers refer to the wealth of literature available from the internet.[86]

Box 6. Forest Stewardship Council (FSC) Principles and Criteria

FSC is an international, non-profit, non-governmental, independent association that evaluates and accredits certifiers of natural forest management according to FSC Principles and Criteria. These are:

1. Forest management shall respect all applicable laws of the country in which they occur, and international treaties and agreements to which the country is a signatory, and comply with all FSC principles and criteria;

2. Long-term tenure and use rights to the land and forest resources shall be clearly defined, documented and legally established;

3. Legal and customary rights of indigenous people to own, use and manage their lands, territories and resources shall be recognised and respected;

4. Forest management operations shall maintain or enhance the long-term social and economic well-being of forest workers and local communities;

5. Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits;

6. Forest management shall conserve biological diversity and its associated values, water, resources, soils and unique and fragile ecosystems and landscapes, and, by doing so, maintain the ecological functions and the integrity of the forest;

7. A management plan-appropriate to the scale and intensity of the operations, shall be written, implemented, and kept up to date. The long-term objectives of management, and the means of achieving them, shall be clearly stated;

8. Monitoring shall be conducted, appropriate to the scale and intensity of forest management, to assess the condition of the forest, yields of forest products, chain-of-custody, management activities and their social and environmental impacts;

9. Primary forest, well-developed secondary forests and sites of major environmental, social or cultural significance shall be conserved. Such areas shall not be replaced by tree plantations or other land uses;

10. Plantations shall be planned and managed in accordance with Principles and Criteria 1-9, and Principle 10 and its criteria. While plantations can provide an array of social and economic benefits, and can contribute to satisfying the world's needs for forest products, they should compliment the management of, reduce pressures on, and promote the restoration and conservation of natural forests.

[86] See for example, internet website; www.greenbuilder.com, and other links to this site.

6.2.4. Power Supply and Energy Conservation[87]

Electricity used in heating, cooling and lighting buildings, together with other applications (e.g. television, cooking appliances, etc), accounts for a substantial proportion of total energy produced, mainly through the combustion of fossil fuels. Energy produced in this way contributes significantly to carbon emissions which in turn is implicated in global climate change. Traditional forms of energy are expensive and there is much that the tourism sector can do to conserve energy, reduce operational costs and contribute to environmental sustainability. In addition, on-site generation of energy may overcome difficulties associated with development of tourism in remote areas where power supply infrastructure is lacking (see Box 7).

Box 7. Generating electricity in remote areas[88]

Introduction

Many places do not have access to electricity through national grid systems, and must find alternative means to supply their needs. There are many ways of producing electricity, including petrol/diesel generators, wind generation (windmills), sunlight (photovoltaic systems), or by using energy from running water (hydro electric schemes). A combination of two or more of these systems is often used and known as a hybrid system. Small-scale schemes for generating electricity are known as remote area power supplies, or *RAPS*. Most RAPS use battery storage so that a power supply can be sustained during times when the sun is not shining, or the wind not blowing.

Photovoltaic, small-scale wind-generators and hydro electric schemes usually provide direct current (DC), whereas large-scale wind and hydro-electric generators supply alternating current (AC). The nature of storage (battery) or usage (appliance) of electricity will determine whether an inverter is required to change DC to AC. Voltage regulators are generally used in order to protect batteries. Where there are constraints to the generation of electricity as in remote areas, it is essential to conserve power supplies using innovative design of buildings, use of energy efficient appliances, and by using other forms of energy (e.g. solar water heater). For example, a generator can be linked to a bank of batteries in order to store excess power output when the demand of the appliance(s) being used is small.

System sizing

The size of a battery bank, inverter and generating systems required in a particular RAPS system is directly related to how much power is required at the output. No system loads are constant and may change according to the appliances being used and the habits of the users. Variations in power demand have daily and seasonal cycles. Power supply must therefore be able to cope with peak demand but also should not be oversized and lose efficiency and cost-effectiveness. Designers use a load profile to see how much electricity is being used on average at regular intervals throughout the day. The average daily load in kilowatt hours (kWh) may be estimated by working out the load for each appliance. By multiplying the rated power (in kW) for each appliance by the length of time (in hours) the appliance is used each day, the daily average load can be calculated as the sum of the loads for each appliance. Note that this will vary, for example, from winter to summer due to changing usage patterns. The power supply must be sized to manage the worst case scenario. However, by spreading the use of appliances throughout the day, the peak power demand should not be significantly higher than the average demand.

[87] After: *Sustainable Building Sourcebook*, internet website; www.greenbuilder.com; and *Sustainable Construction in the United States of America*, by Augenbroe, G., and Pearce, A.R. June 1998. Published on the Internet, website; www.arch.gatech.edu.

[88] Extracted from: *Remote Area Power Supply*, Prepared for the National Energy Council (NEC) and the Solar Energy Society of Southern Africa (SESSA) by the Energy Research Institute, University of Cape Town.

Electrical appliances

Not all appliances are suitable for RAPS. Appliances that operate for long periods (e.g. refridgerators) should have power ratings as low as possible. Unsuitable appliances include hot water geysers, stoves and air-conditioners. Energy efficient appliances should be used wherever possible; these are appliances that use the least amount of electricity to do a given job. Fluorescent lights, for example, are 4 times more efficient than incandescent light bulbs.

Batteries

Satisfactory operation and long battery life require that the battery used must be capable of withstanding repeated, deep discharges and prolonged periods of partial discharge. These are known as deep-cycle batteries. Battery life can be extended by ensuring the battery storage capacity is adequate (to prevent excessive charging/discharging), through regular maintenance, storage of batteries away from extreme temperatures, and by ensuring that discharges beyond 50 % capacity are minimised.

The relative costs of electricity

Some of the factors that influence the overall cost for users of RAPS include:

- Average daily energy requirement;
- Shape of the load profile;
- Seasonal variation of the load profile and average daily energy profile;
- Whether DC, 220 volts AC or three phase AC is generated;
- Distance from the national grid;
- The geographical location;
- The expected lifetime of the system;
- The costs of the equipment;
- The interest rates and inflation (i.e. the cost of money).

Whereas the cost of electricity to the consumer supplied from the national grid is normally calculated per kilowatt hour of electricity consumed, for a RAPS system it is the average cost of energy over the lifetime of the system. However, the equipment and maintenance costs must also be factored into the equation. Lifecycle cost is usually based on a 15-20 year lifetime, depending on the system.

Electricity from the national grid or from a diesel generator requires little capital outlay but operating costs are continuous. Electricity from photovoltaics, hydro systems or wind generation require more capital outlay, but thereafter the operating costs are minimal. For developments undertaken in remote areas where national grid connection is possible, it is well worth estimating the relative costs of the different options available.

Measures to improve the energy efficiency of buildings hold great potential. These include strategies such as proper siting and airtight construction, as well as installing energy-efficient equipment and appliances, and renewable energy systems (e.g. photovoltaic systems, wind and geothermal energy).

6.2.4.1. Landscaping and Energy Conservation

The use of well-planned landscaping as a tool for energy conservation in buildings is frequently overlooked, yet can achieve as much as 30 % reduction in costs associated with heating and cooling. This can be achieved, for example, by reducing the amount of solar radiation striking the building, slowing air leakage in a building by reducing wind velocity, and utilising vegetation to moderate the ambient temperature and provide evaporative cooling.

General guidelines for energy conserving landscapes include:

- Assess the potential for landscaping energy conservation prior to construction and give particular attention to existing vegetation;
- Use shading from trees as a primary means of energy conservation through landscaping;
- Use vegetation as windbreaks – the effective zone of protection can be up to 30 times the height of the trees, however is only effective within a lateral distance of 5 – 7 times the height. For example, trees of 10 metres height should be placed no more than 50 and 70 metres from the building to provide optimal effectiveness. For maximum effectiveness, the windbreak should extend to the ground;
- Shrubs alongside a building will reduce the ambient temperature as air movement through the foliage is cooled by evapotranspiration;
- Groundcover and turf also produces a cooling effect from evapotranspiration;
- Asphalt and other heat absorbent materials become considerably hotter than ground cover or reflective substances such as gravel or light-coloured rock. In addition, asphalt will continue to radiate energy after sunset. The use of heat absorbent materials near a building should be minimised or shaded where possible.

6.2.4.2. Passive[89] Solar Heating/cooling

Solar energy is a natural radiant heat source that can be harnessed through careful building design to assist in the heating and cooling of a building, thus reducing or eliminating the need for air-conditioning and/or heating. This is based upon passive solar energy processes associated with thermal energy in the form of radiation, conduction and natural convection. Building materials can reflect, transmit or absorb solar radiation. In addition, heat produced generates air circulation that can be controlled in designed spaces (Figures, 13, 14).

General passive solar guidelines include:

- Building should be elongated along an east-west axis;
- The north face (southern hemisphere) of the building should receive sunlight between the hours of 09h00 and 15h00 during the heating season;
- Interior spaces requiring most light, heating and cooling should be situated along the north face of the building;
- Open floor plans optimise passive system operation;
- Shading should be used to prevent summer sun entering the interior (sun angles/overhangs).

[89] Defined as the use of solar energy in which no mechanical means are employed.

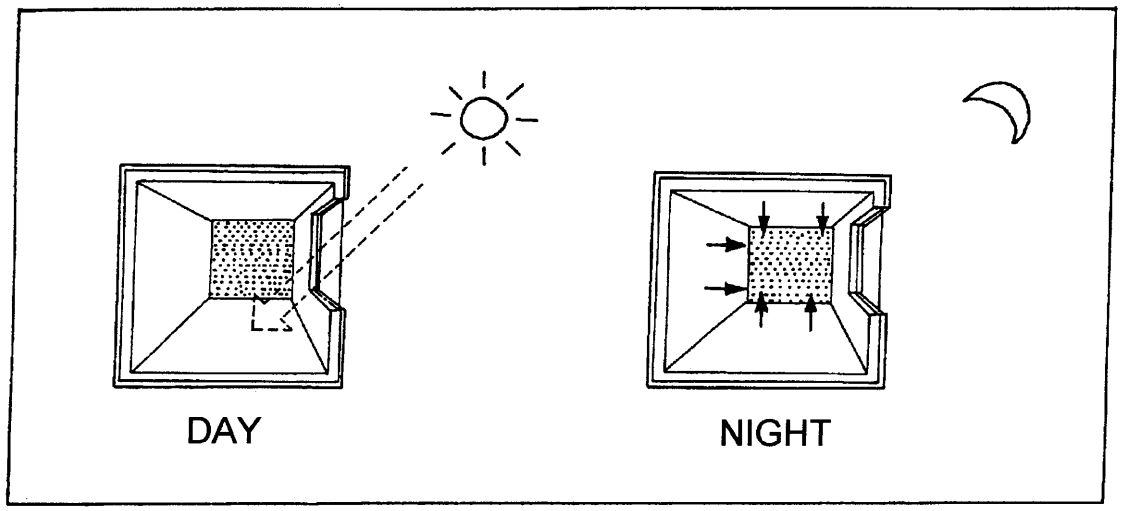


Figure 13. The use of thermal mass (heat absorbing material such as concrete, stone, water, etc) in the interior of a building to absorb sunlight energy during daytime, released again as radiation at night.[90]

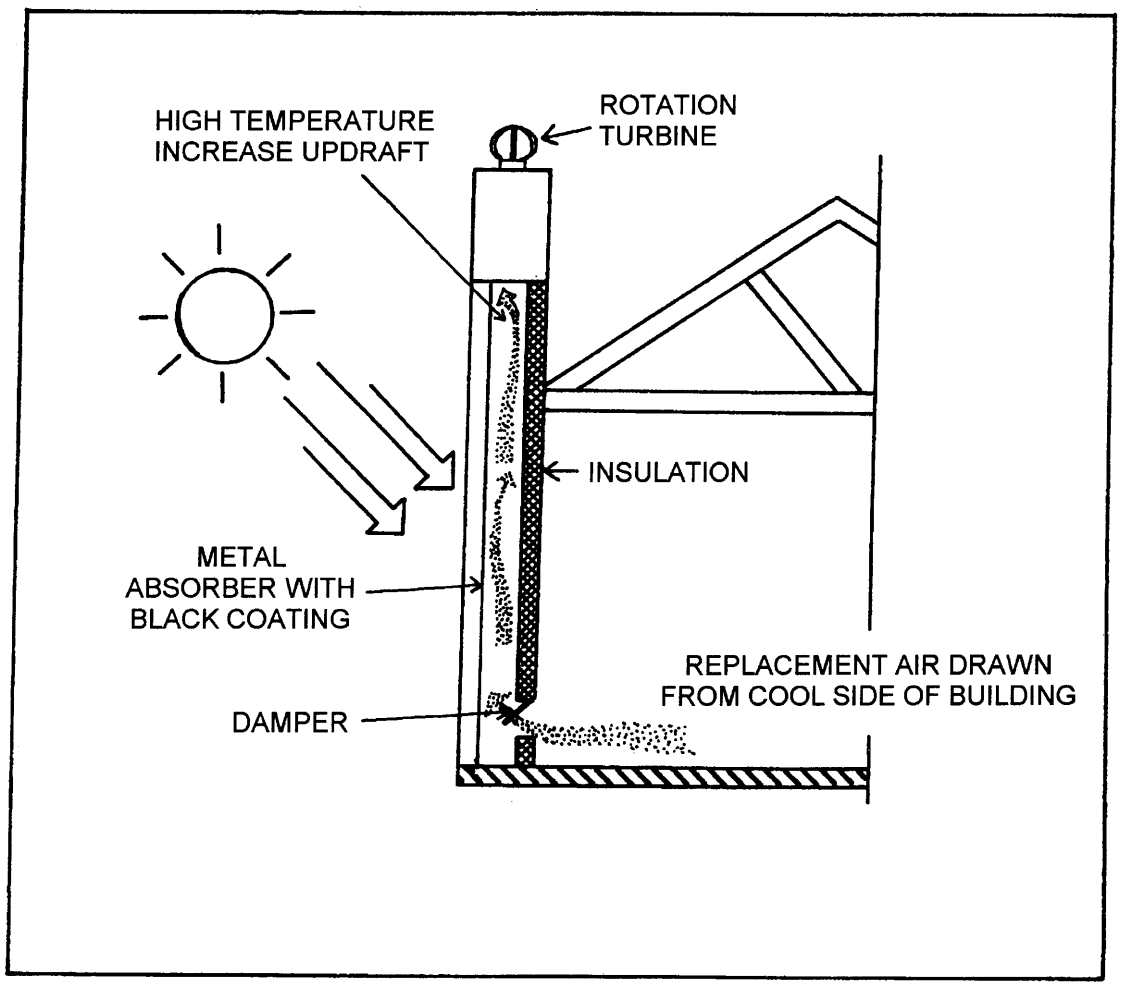


Figure 14. Thermal chimney for passive cooling.[91]

[90] After: Passive Solar Guidelines, Sustainable Building Sourcebook; www.greenbuilder.com.
[91] After: Passive Solar Guidelines, *Sustainable Building Sourcebook*; www.greenbuilder.com.

6.2.4.3. Solar Hot Water, Heating and Cooling Systems

The function of solar energy equipment is to convert energy from sunlight into heat that can be used for, (i) space heating, (ii) space cooling, and (iii) domestic hot water. These systems have high capital outlay costs but very low operating costs. In order to be effective, they should only be considered once extensive conservation strategies have been implemented. For example, in water heating applications, hot water piping should be insulated and water conservation devices (e.g. low-flow shower heads) installed. In the regional context, the main application of this technology is most likely to be directed towards providing domestic hot water. For other applications (space heating and cooling), further reference should be made to resources available from the internet (*Sustainable Building Sourcebook*; www.greenbuilder.com).

Active solar water heating systems comprise five main components;

- Collector(s) to capture solar energy;
- A circulation system to move fluids between the collectors to the storage tank;
- Storage tank;
- Backup heating system;
- Control system to regulate the overall system operation.

There are two basic systems, the direct (open loop) system and the indirect (closed loop) system.

(i) Direct (open loop) system

In this system, the water that is used as the hot water supply is circulated directly into the collectors from the storage tank, and is backed up by a hot water heater using conventional heating methods. A controller will activate a pump when the temperature in the collectors is higher than the temperature in the storage tank. The two types of direct system (draindown and re-circulating) have serious drawbacks associated with the failure of valves that can lead to breakage of the expensive solar collectors. In addition, mineral deposit build-ups can reduce the efficiency of the collectors. The re-circulating system can also lead to energy wastage by circulating heated water through the collectors during freeze conditions.

(ii) Indirect (closed loop) system

Several versions of indirect (closed loop) system are available and the type that exhibits effectiveness, reliability and low maintenance is the drainback system that typically uses distilled water as the circulating fluid flowing through the collector (other commonly used circulating fluids are: oil, anti-freeze solution, or refridgerant). The circulation fluid is separated from the domestic hot water supply by a double-walled heat exchanger to avoid contamination of the domestic water supply. Heat exchange between the circulation fluid and the domestic hot water supply takes place in the drainback tank/heat exchanger (see Figure 15).

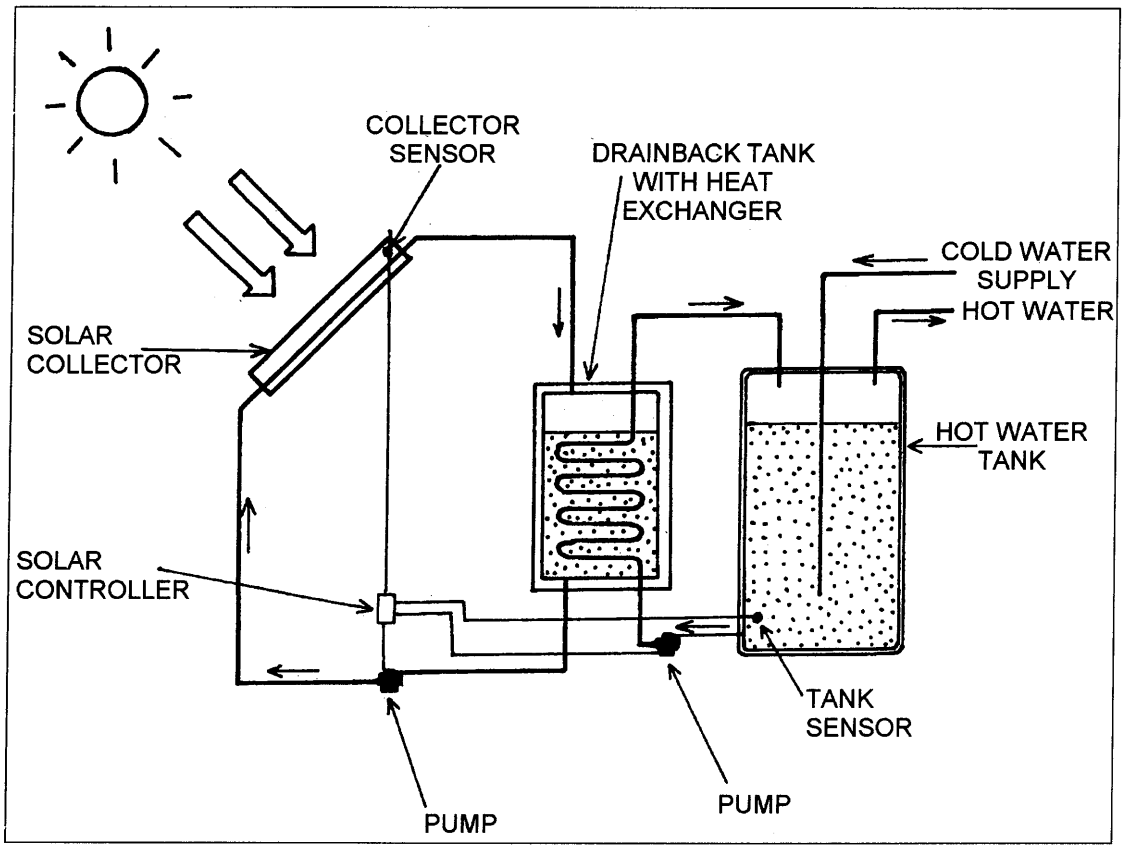


Figure 15. Drainback hot water system.[92]

This system depends upon the collectors being placed higher than the drainback tank/heat exchanger and this can be a drawback in situations where collectors need to be mounted on the ground. However, the advantage of this system is that the collectors only contain water when the pump is operating, and in the event of power failures the fluids in the collector cannot freeze and cause damage to the collector.

General guidelines for solar hot water include:

- With careful design, a solar water heating system can provide 50-80 % of the hot water requirements of a small building (seasonally variable, and depending on number of guests, etc);
- The area of solar collector required is approximately 1 – 1.5m^2 for each person;
- The volume of the storage tank required is approximately 75 – 110 litres per person;
- The collectors should receive full sunlight between 09h00 and 15h00;
- The collectors should face north and be tilted at a 30 degree angle. Slight modifications may be required depending on locality;
- The collectors and storage tank should be in close proximity to the backup system and building distribution system in order to avoid heat loss through the pipes (which should also be well-insulated);
- Mixing valves or thermal shut-off devices should be used to protect the system from excessively high temperatures.

[92] After: Solar hot water, heating and cooling systems, *Sustainable Building Sourcebook*; www.greenbuilder.com.

6.2.4.4. Photovoltaic (PV) Systems

Photovoltaic cells are semi-conductor material, typically made of silicon and used in thin wafers or ribbons. When sunlight strikes one side of the cell, it causes electrons on the other side to be activated and produce an electrical current. PV systems are now well developed and very reliable. They offer great potential where remoteness of site results in major cost of connection to the national power grid. They are particularly useful when used as part of a hybrid system in which the PV is linked to a power generator. Up until now, the primary use of PVs has been to reduce the power demand from traditional sources. The use of PVs should be included as part of an integrated approach in which an overall energy conservation strategy for the building is adopted to minimise power requirements. Although still expensive in terms of capital outlay, when hidden externalities of traditional power sources are considered (e.g. carbon emissions from combustion of fossil fuels), PVs have been found to be competitive. It is generally accepted that PVs are non-polluting, and provide "free" electrical power from the sun.

There are two approaches to using PVs. These are:

- Stand-alone systems.

The stand-alone system has no interface with national grid sources in the building in which it is used, yet does not preclude the use of both provided they are separate.

- Grid interface systems.

This system uses power from the national grid when required and supplies surplus power generated on-site back to the grid. This is termed a parallel system.

The following text focuses mainly on *stand-alone systems and partial stand-alone systems* (i.e. those PV systems used in conjunction with a generator. For more information, reference should be made to resources available from the internet (*Sustainable Building Sourcebook*; www.greenbuilder.com).

(i) Electrical energy requirements

The use of PVs requires an examination of the energy uses of the building in terms of electrical load. These include lighting, appliance and equipment operation applications. Only the most energy efficient equipment should be used and alternatives sought where necessary. For example, there is a range of energy efficient lighting available, and cooking and refridgeration (i.e. air-conditioning and food preservation) should be undertaken using gas, rather than electricity.

In order to calculate the size of PV system required for a building, the steps outlined in Box 7, "system sizing", should be undertaken in order to determine the daily average load. Different size PVs have different power outputs and the rated output wattage of the panel indicates the amount of power generated in one hour of direct sun. The daily power output can be determined by multiplying the number of nours of direct sunlight by the rated wattage. The number of hours of useable sunlight will vary both regionally and seasonally, and will likely be in the range 5-7. The calculated output (watts-hours per day) should be divided into the daily average load calculated previously in order to determine the number of panels of a given size (power output) that will be required.

Attention should also be given to PV subsystems required. These include inverters to convert DC current (as supplied by PVs) to AC current, and charge controllers to regulate voltage and prevent batteries from becoming overcharged.

(ii) Siting and mounting PV panels

PV arrays should be placed in order to receive maximal sunlight. From a regional perspective, a north-facing slope of about 45 degrees is appropriate, however the optimal solution should be determined through on-site investigation. The panels can be fixed, fixed with adjustable tilt angles, manual tracking, passive tracking or active tracking. Essentially, the ability to track the direction of the sun will maximise the amount of useful sunlight obtained (up to 60 % increase where active trackers are used).

(iii) Batteries

Batteries present the best option for storing power from PV systems, providing electricity when the sun is not shining. Deep cycle batteries capable of withstanding deep discharges are most suited to PV applications. In order to determine the size of the battery bank required, the following steps should be taken:

- Divide the average daily load by the voltage of the battery to derive the amp-hours (the most common measure of battery capacity);
- Multiply the daily amp-hours by the number of days where power in storage is required in case the sun is not shining adequately (usually 3-5 days recommended) to give total amp hours;
- Batteries should not be discharged excessively: The life of a deep-cycle battery will be optimised if the discharge does not exceed 50 %. Therefore, the total amp-hours (step 2) should be divided by 0.5 to derive the optimal battery capacity.

6.2.4.5. Other Systems

A wealth of other technologies are also available that, depending on local circumstances, could provide alternative opportunities for energy conservation and power supply. These include; gas water heating systems, energy efficient appliances, lighting and others. For further reading on this subject, consult the *Sustainable Building Sourcebook*; internet website: www.greenbuilder.com.

6.2.5. Water Supply

There are two important factors regarding the supply of fresh water: *quantity* and *quality*. The capacity to supply sufficient fresh water is often one of the most important factors limiting development growth potential. For planning purposes, water availability can therefore provide a useful indication of the development carrying capacity of an area.

Developments are dependent upon a sustainable supply of water, and it is thus important to assess the water demands of a project early in the planning stages. This should determine whether these demands can be met using either/or a combination of on-site (i.e. groundwater, rainwater) and external (e.g. municipal) sources of supply. These issues should be addressed as a central component of impact assessment.

Exploitation of groundwater resources should be planned carefully in coastal areas since over-extraction can result in contamination by salt-water intrusion, rendering the water unfit for consumption. In addition, great care should be taken to ensure that groundwater resources are not polluted by waste disposal sites and septic tanks (Figure 16). Local authorities should be consulted for advice on the technical and legal implications of groundwater extraction.

Where a project is dependent upon an external source of water, it is important that the developer investigate the capacity of the local authority to meet the demand, which should include an assessment of available water resources as well as the infrastructure required. The local authority should ensure that the needs of the tourism sector are balanced against the needs of other users, particularly local communities (Box 8).

Box 8. Water resources and tourism development in Knysna, Southern Cape, South Africa

South Africa is a semi-arid country and fresh water is one of the scarcest natural assets. The town of Knysna in the Southern Cape region is under considerable pressure from development, much of which is associated with its popularity as a tourism destination. Water supply is becoming a limiting factor to further development and predictions estimate that demand will exceed supply by the year 2030. The municipal water supply is drawn from the lower reaches of the Knysna River as well as from the Gouna River, a tributary of the Knysna River situated higher in the catchment. Water is pumped from the river to a storage dam that in turn supplies the municipal water treatment works.

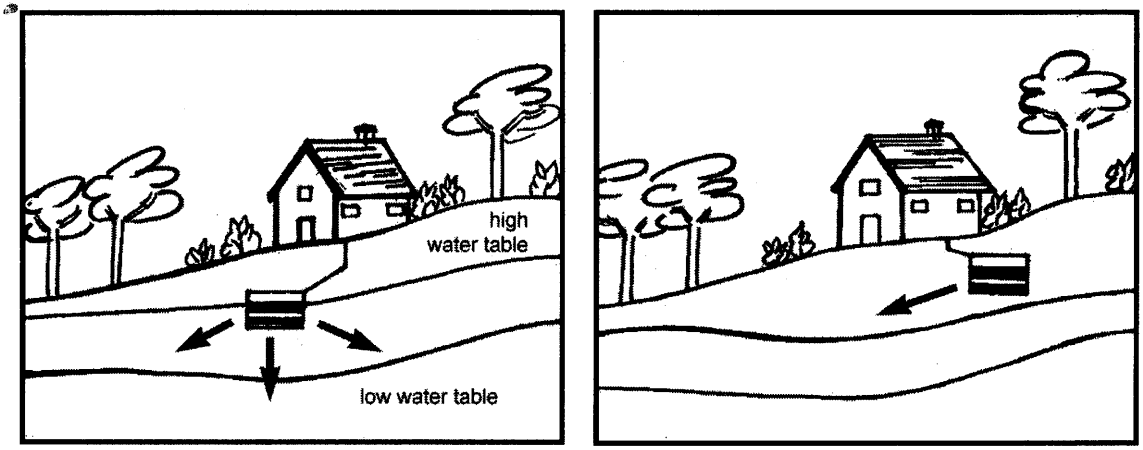
Under normal circumstances, river flow in the catchments' tributaries is low and frequently does not exceed $0.5m^3\ sec^{-1}$ across the weir that separates the river from the estuary in the lower reaches. Since periods of lowest flow coincide with the seasonal influx of tourists, this places considerable pressure on the capacity of the water supply to meet demand. The storage facility (Akkerkloof dam) is currently being upgraded to increase storage capacity in order to accommodate peak water demand by allowing a greater volume to be abstracted and stored during off-peak periods. However, it is recognised that increased abstraction of river water must be balanced against the needs of the environment, specifically the estuary that requires a baseline flow of freshwater inflow for proper functioning. The ecological water requirement of the estuary has not yet been determined.

Large tourism developments place considerable demand on water resources and water supply infrastructure, particularly developments such as golf courses that require large quantities of water for irrigation. In Knysna, when large development projects are evaluated by the local authority, a primary consideration is the capacity of local resources and infrastructure to meet the extra demand placed on the authority by the development. This may include the capacity to accommodate additional power demand and sewage waste treatment in addition to water supply. Where possible, alternative water resources are used. A golf course currently under construction will utilise recycled sewage effluent for irrigation purposes. The needs of other users also have to be considered. Due to the upgrading of townships that house historically disadvantaged communities of Knysna, provision of water supply infrastructure to these areas will greatly increase the town's overall water usage and where supply becomes a limiting factor, these communities must be given priority in terms of water allocation.

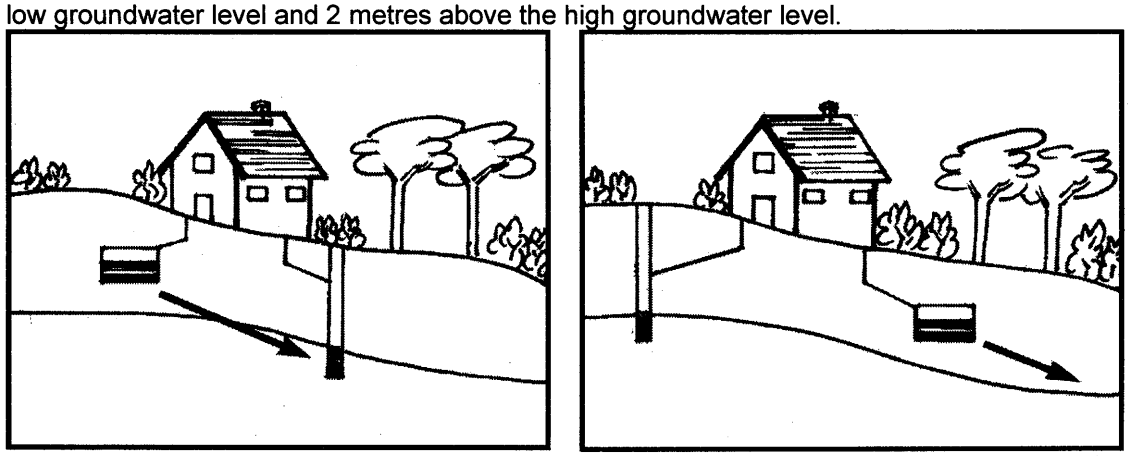
Coastal catchment water resource planning should be undertaken in advance of proposals to (i) construct additional impoundments or, (ii) increase the rate of water abstraction from rivers. Determination of base flows and flood requirements to maintain ecosystem functioning should be incorporated as fundamental requirements of water resource planning.

Developments should make every effort to implement water conservation measures. These range from low-flow shower heads and dual flush toilets to the use of indigenous vegetation requiring minimal irrigation. Even where water resources are plentiful, water conservation measures can reduce costs associated with water treatment processes. In areas with scarce water resources, careful consideration should be given to projects that require large volumes of water (e.g. golf courses), and alternatives should be considered where possible. The impact assessment should attempt to identify areas where mutual benefits are possible. For example, golf course projects may be able to meet the demand for irrigation water using treated sewage effluent and in doing so, alleviate the impact of discharging the effluent into natural systems.

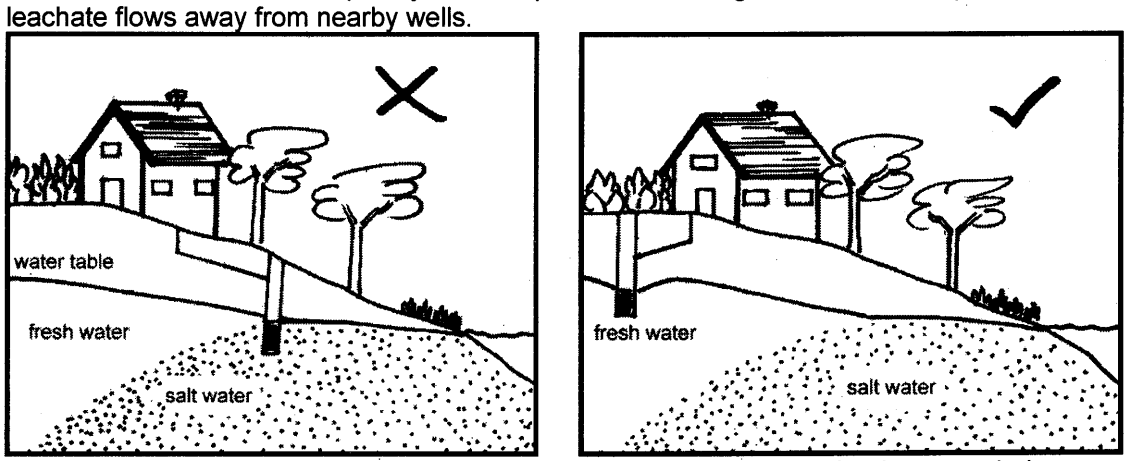
Water should conform to acceptable health standards for its intended use. Potable water, used for drinking and in food preparation or in other instances where it may be ingested, should conform to national standards and/or those recommended by the WHO "Guidelines for Drinking-Water Quality" (World Health Organisation, Geneva, 1984). The water supply should be monitored regularly to ensure that the standards are maintained. The WHO guidelines for drinking water quality are summarised in Table 4.



A septic system installed above the water table during the dry season may be in or near groundwater when the rains come, allowing sewage to contaminate drinking water supplies. Systems should be installed in areas where the land surface is at least 4.5 metres above the low groundwater level and 2 metres above the high groundwater level.



Drinking water can become contaminated by improper placement of septic systems. To ensure reasonable protection from contamination, residential water supply wells should be at least 35 - 45 metres from septic systems. If possible, leaching fields should be placed so that leachate flows away from nearby wells.



If wells are to be used for water supply, fresh groundwater may be in short supply in many coastal areas. Pumping water out of the ground sometimes causes salt water to contaminate wells. This potential problem should be studied thoroughly prior to development of a coastal site.

Figure 16. Water resources in relation to potential sources of contaminants.[93]

[93] After: ESCAP, 1995.

Table 4. WHO Drinking Water Quality guidelines.[94]

Parameter	Unit	Guideline
Microbiological Quality		
Faecal coliforms	Number/100 ml	Zero[a]
Coliform organisms	Number/100ml	Zero[a]
Inorganic Constituents		
Arsenic	mg/l	0.05
Cadmium	mg/l	0.005
Chromium	mg/l	0.05
Cyanide	mg/l	0.1
Fluoride	mg/l	1.5
Lead	mg/l	0.05
Mercury	mg/l	0.001
Nitrate	mg/(N)	10
Selenium	mg/l	0.01
Aesthetic Quality		
Aluminium	mg/l	0.2
Chloride	mg/l	250
Colour	True colour unit (TCU)	15
Copper	mg/l	1.0
Hardness	mg/l (as $CaCO_3$)	500
Iron	mg/l	0.3
Manganese	mg/l	0.3
pH		6.5 to 8.5
Sodium	mg/l	200
Solids (total dissolved)	mg/l	1000
Sulphate	mg/l	400
Taste and odour		Inoffensive to most consumers
Turbidity	NTU	5
Zinc	mg/l	5.0

[a]Treated water entering the distribution system.

Developing countries which do not have their own standards, should establish them, preferably adapted from the WHO guidelines. Target standards for selected constituents of domestic water supply in South Africa are provided in Table 5.

[94] Source: World Health Organisation, 1984.

Table 5. Target standards for selected constituents of domestic water in South Africa.[95]

Constituent	Target range
Algae	0 - 1 µg/l
Ammonia	0 - 1.0 mg/l N
Nitrate/nitrite	0 - 6 mg/l N
Sulphate	0 - 200 mg/l (as SO_4^{2-})
pH	6.0 - 9.0
TDS	0 - 450 mS/m
Dissolved Organic Carbon (DOC)	0 - 5 mg C/l
Total coliforms	0 - 5 counts/100 ml
Faecal coliforms	0 counts/100 ml

In developing national standards, it will be necessary to consider a variety of local, geographic, socio-economic, dietary, and industrial conditions. In many circumstances it will not be possible to monitor all the parameters listed above and in these cases, emphasis should be placed on microbiological quality, followed by aesthetic considerations, such as turbidity, colour, and taste and odour.

Further details on quality standards and treatment processes can be obtained from "Surface Water Treatment for Communities in Developing Countries" (Shultz & Okun)(see References).

6.2.6. Pollution and Waste Management

As with other sectors, tourism is responsible for the generation of a range of waste products, which if not managed correctly, can lead to adverse environmental impacts and threaten the sustainability and long term future of the industry. Pollution impacts and waste disposal should be monitored routinely and where signs of environmental degradation become apparent, remedial and preventative measures should be implemented to avoid irreversible damage. This section describes the nature and source of some of the common types of pollution as well as some of the technical measures used to treat wastes.

6.2.6.1. Water pollution and waste water management

(i) Water pollution

Water pollution is a major problem in most East African countries. The main cause from tourism development is sewage, comprising wastes from toilets, sinks, swimming pools, kitchens and laundries, etc. The potential for sewage waste to cause harmful effects (e.g. danger to health, environmental damage) depends upon the volume of waste, treatment processes employed and the manner in which it is disposed. The constituents of sewage that can give rise to adverse effects are as follows:

(a) Organic compounds

Even following treatment, wastewater contains organic compounds that are broken down by bacteria. The bacteria require vast quantities of dissolved oxygen to achieve

[95] Source: *South African Water Quality Guidelines*, Department of Water Affairs and Forestry, 1996.

this. Biological Oxygen Demand (BOD) provides a measure of the organic content of wastewater and indicates how much oxygen is required to break it down. Wastewater released into the environment may result in oxygen depletion of the receiving water body and kill aquatic life. This depends on the amount of waste water discharged and its organic content, but also the capacity of the receiving body to cope with it.

The adverse effects of wastewater discharge are usually most noticeable adjacent to outlets and in enclosed receiving bodies (e.g. lakes and lagoons). The most important objective of sewage waste treatment/disposal is to reduce the BOD to a minimum during the treatment process, and to dilute and disperse the remainder rapidly in areas where there is little threat to aquatic life.

(b) Nutrients

Sewage waste contains fertilising chemicals (nutrients) such as nitrates and phosphates that can disrupt the natural nutrient balance of the receiving waters through excessive fertilisation (eutrophication). This has ramifications throughout the aquatic foodweb and can upset the natural balance of aquatic communities. The most noticeable effect is the rapid proliferation of damaging, unwanted plant growths, notably green algae, which smother other natural life forms. This is particularly problematic in lagoons, shallow embayments and among coral reefs. The latter are particularly sensitive to smothering effects and easily degraded as a result. In addition, the development of phytoplankton "blooms" (microscopic planktonic plant forms) can lead to elevated turbidity and decrease the amount of light penetrating the water column.

(c) Pathogens

Sewage waste contains disease-causing organisms such as pathogenic bacteria, protozoa and viruses. The risk of contamination by pathogens is estimated by measuring the levels of faecal coliforms. These are harmless bacteria which occur naturally in the human intestine; however, a measure of their concentration provides an indication of the degree of faecal contamination and therefore the risk of disease-carrying organisms being present. It is important that measures are taken to prevent sewage waste from contaminating drinking water supplies and water areas that people come into contact with (e.g. bathing beaches).

(d) Toxic compounds

The presence of toxic compounds depends upon the disposal of chemical wastes into the sewerage system.

(ii) Treatment of sewage wastes

The processing of sewage or liquid wastes may consist of up to five levels of treatment (Figure 17), and depends upon the quality of the effluents present, the financial and technical resources available and the project site characteristics. In larger towns and cities, due to the centralisation of populations and the volume of waste produced, the primary objective should be to achieve full treatment, this being the responsibility of the municipal/city authority. However, in developing countries, even in city environments, it is common for infrastructure to be lacking or for operational aspects of sewage waste treatment to be neglected. Consequently, it may be desirable for a tourism development to take responsibility for its own sewage waste treatment. For medium to large scale hotel or resort developments, a range of

commercially available modular ("package") sewage treatment plants is now available to suit most circumstances (capacity, quality of final effluent, etc). For smaller developments, or those situated in more remote areas, primary treatment of sewage in a septic tank, followed by careful disposal of the effluent may be adequate; however, prior consideration should be given to environmental and human health issues.

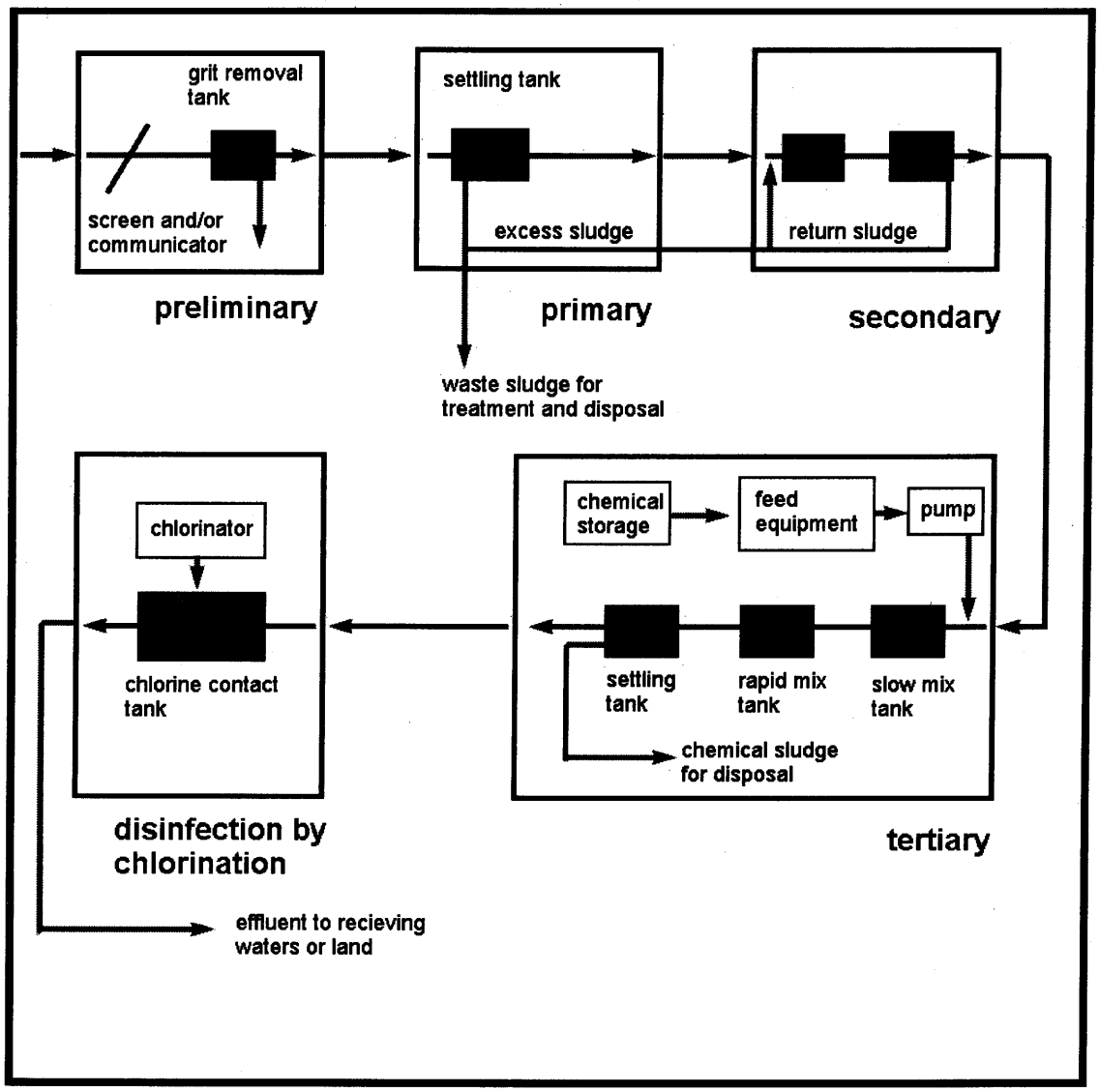


Figure 17. Full wastewater processing showing five levels of treatment.[96]

The five stages of sewage waste treatment are as follows:

(a) Pre-treatment

This stage separates out solids such as plastics, wood, grit and other debris and on its own, has been considered adequate in some ocean disposal situations. This is where a long outfall pipeline to deep waters removes the wastewater from the shoreline to a water body where dilution and dispersion take place very rapidly.

[96] After: ESCAP, 1995.

(b) Primary treatment

This phase assists in the removal of floating and settleable solid materials. It also allows for partial bacterial decomposition of organic materials. The process may remove up to 60 % of the suspended solids, from 25 - 50 % of the BOD, and also reduce pathogens. The primary treatment is most commonly conducted in the settling (septic) tanks. In most cases, this represents the end-point of sewage waste treatment and the effluent is discharged to the environment.

(c) Secondary treatment

The reduction in BOD (up to 90 %) and pathogens continues in the secondary treatment stage. This generally involves forced aeration of effluents and solids in special tanks. Different technical methods can be used to achieve this and vary according to the costs (capital, operational and maintenance), reliability, level of sophistication and efficiency.

(d) Tertiary treatment

This stage involves the addition of chemicals for the precipitation and removal of nutrients, heavy metals and other potentially harmful compounds. The sludge recovered from this process is usually of a very high quality, but requires expensive technology and trained personnel to achieve it.

(e) Disinfection

Represents the final stage where the wastewater is disinfected using chlorine. Other disinfection alternatives are also available.

(iii) Infrastructure

In many East African countries, the existing infrastructure for sewage treatment is generally inadequate and there are real constraints in establishing new, improved facilities. These include capital investment, complexity of the technology required, maintenance costs as well as sufficient numbers of skilled staff to operate facilities. Many treatment plants have been built in East Africa, however very few still function at a high level of operational efficiency.

Tourism developments, particularly large projects, should contribute to the alleviation of the situation rather than increasing the problems of already over-burdened systems. In order to prevent environmental and human health problems arising, secondary and tertiary treatment represents the optimal solution. However, the most appropriate method of sewage disposal should be considered on a project-by-project basis and should be a central feature of impact assessments. Secondary and tertiary treatment may not be feasible in many instances, however should be required where the following criteria apply:

- The development can be easily linked to existing town infrastructure, providing these treatment plants are not already operating above capacity;
- The development is of a scale that justifies the establishment of a treatment plant and has access to skilled staff to operate it, maintain it and monitor effluent quality;

- The development is located in an area where the disposal of primary treatment wastes may not be practical due to insufficient land area, pollution potential or expense or difficulty in constructing an ocean (or other) outfall.

Where septic tanks are the appropriate option, certain design criteria should be observed. The most important aspect is the total capacity and this should be estimated based on numbers of both staff and visitors. The basic components of a septic tank system are shown in Figure 18.

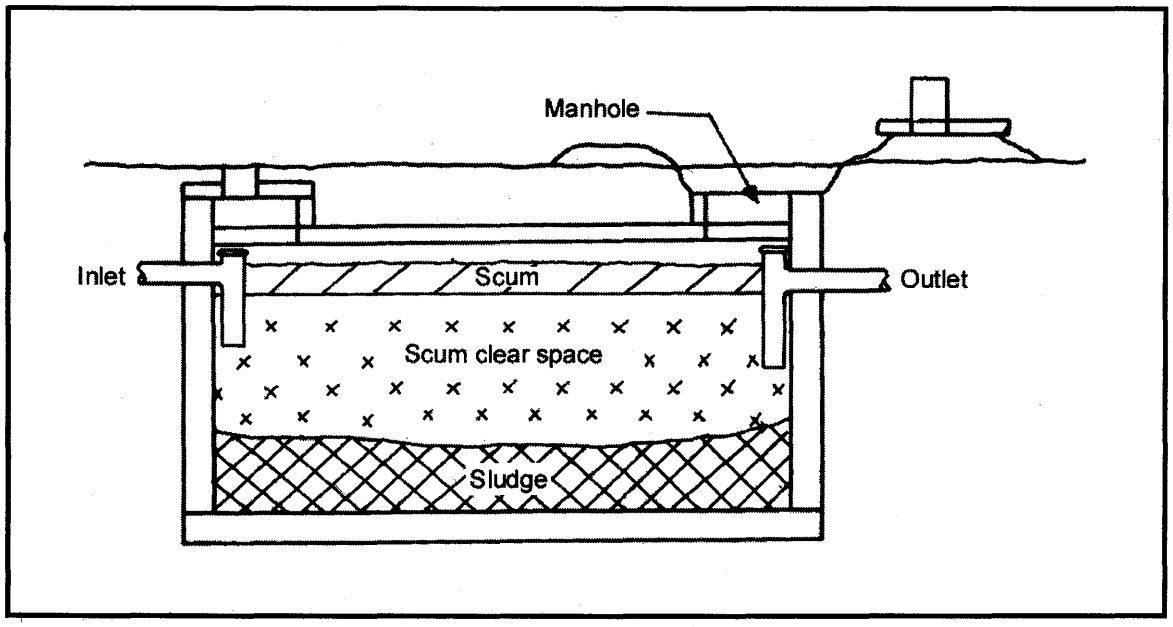


Figure 18. A septic tank system.

A septic tank[97] is part of an on-site sewage treatment system. Raw sewage enters the tank from the sewerage system of the dwelling. Since the septic tank is an enclosed, watertight system, effluent flowing into the tank is balanced by liquid flowing out. Solids remain in the tank and liquids flowing out of the outlet enter the *drainfield*, where secondary treatment takes place. The septic tank derives its name from the fact that sewage breakdown is conducted by *anaerobic* bacteria that produce methane and hydrogen sulphide gas as by-products of their activity. Septic tanks are also known as settling tanks since solids are stored in the tank until such time as bacterial decomposition reduces their volume. Solids are never completely broken down and therefore a residue remains that must be cleaned out periodically.

The bottom of the inlet pipe (see Figure 18), known as the invert, should be approximately 5 – 10cm higher than the invert of the outlet pipe. As the sewage enters the system, it drops to the bottom of the tank with a downward flow direction, moving solids to the depths of the system. The inlet arrangement is designed to prevent floating scum from blocking the inlet pipe. The bottom of the inlet baffle should extend at least 15cm below the surface of the liquid but not more than 20 % of the liquid depth. If the baffle is too shallow, the scum layer may tend to block it, whereas if it is too deep, the inflow will tend to disturb the bottom residue. Three distinct zones are distinguishable in the septic tank (Figure 18). These are:

- **Floating scum layer** – includes wastes such as soap or detergent scum, cooking fats and other floating material;

[97]Adapted from: *Get to Know Your Septic Tank*, by R. Machmeier, Internet website www.geocities.com.

- **The sludge layer** at the bottom – comprising decomposing and decomposed solids that sink to the bottom;
- **The clear zone** – the middle layer comprising mainly water but including suspended solids and bacteria with the same density as water.

It is important that the clear layer remains deep. As the floating scum and sludge layers build up, the depth of the clear zone is reduced until the retention time decreases to the extent that solids are carried out of the outflow before proper treatment has taken place. It is these solids that tend to clog the soil pores in the drainfield. The outlet should extend into the liquid approximately 40 % of its depth. Septic tank effluent in the outflow is normally cloudy and contains suspended solids and pathogens (disease-causing bacteria and viruses). For improved treatment, it is often preferable to have two septic tanks in series. Inspection pipes (possibly mounted in manhole covers) should be installed over the inlet and outlet pipes and their basic function is to provide access for removing obstructions as well as to ascertain the amount of floating scum and sludge build-up. Septic tanks should be constructed of materials that are able to withstand earth pressures and routine maintenance and cleaning. These materials should also be resistant to corrosion and general deterioration.

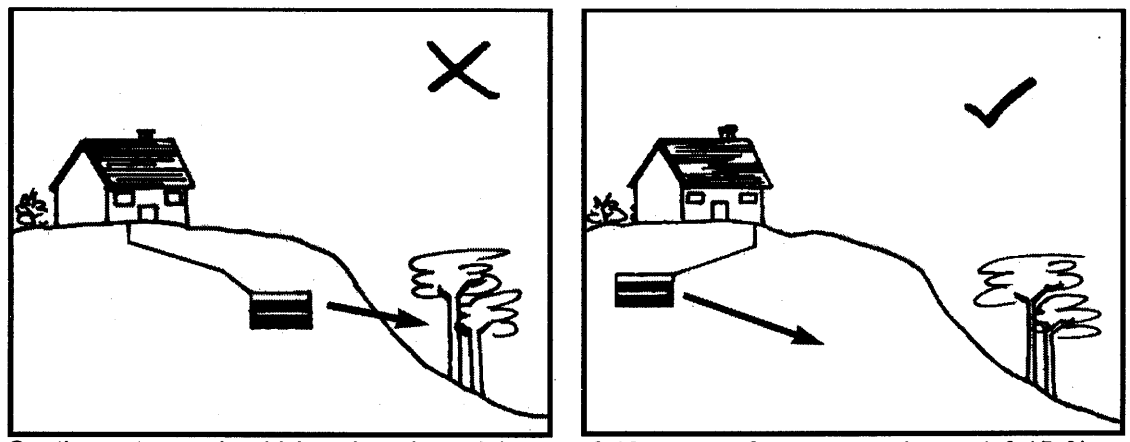
General guidelines for the design and operation of a septic tank include:

- Septic tanks should be installed above groundwater levels and in areas not liable to flooding by fresh or sea water;
- Storm water systems must be separate from the sewage treatment systems;
- Non-biodegradable waste and chemicals should never be disposed of, or used, in a septic tank system;
- The length to breadth ratio of the septic tank should be 2-3:1;
- Liquid retention time should be at least 24 hours. Thus, the size of the tank depends upon the estimated daily wastewater flow. Since two-thirds of tank volume is taken up with accumulated sludge and scum, the size of the tank at the beginning should be 3 times the daily estimate of waste waters;
- The tanks should be located away from poorly drained areas;
- The septic tank should be de-sludged when it is one-third full. Normally this would be at intervals of 2-5 years;
- The septic tank must be located away from objects such as wells, streams, embankments and cuttings. The minimum distances that should be applied are shown in Table 6.

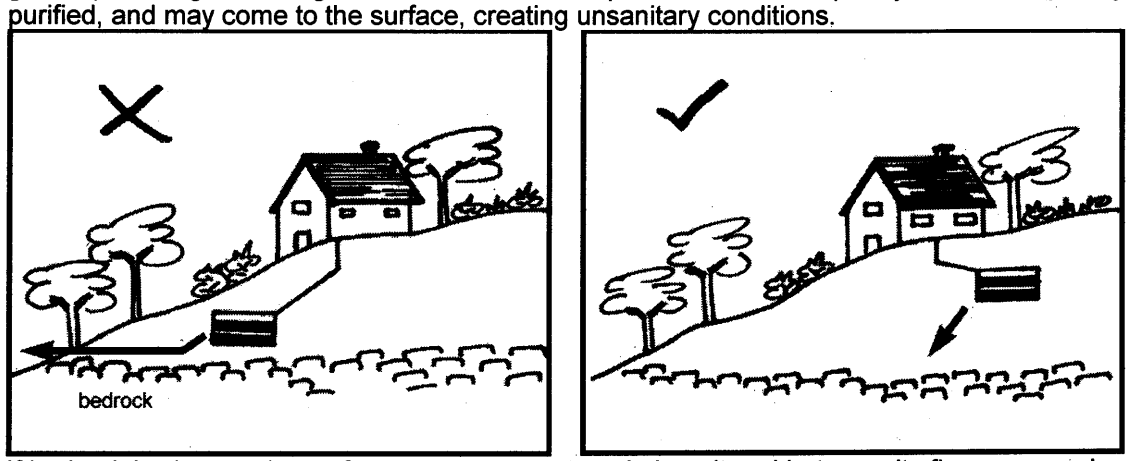
Table 6. Location of septic tanks: Minimum distances that should be used when siting septic tanks adjacent to specified objects.[98]

Object	Distance (m)	Notes
Buildings	2	
Property boundaries	2	
Wells	30	
Streams	10	Increase to at least 60m if the tank is in a water supply watershed.
Cuts/embankments	10	Increase to at least 60m if the tank is in a water supply watershed.
Pools	3	
Water pipes	3	
Paths	2	
Large trees	3	

Figure 19 (below) provides a graphical illustration of some of the major issues regarding the design and placement of septic tanks.

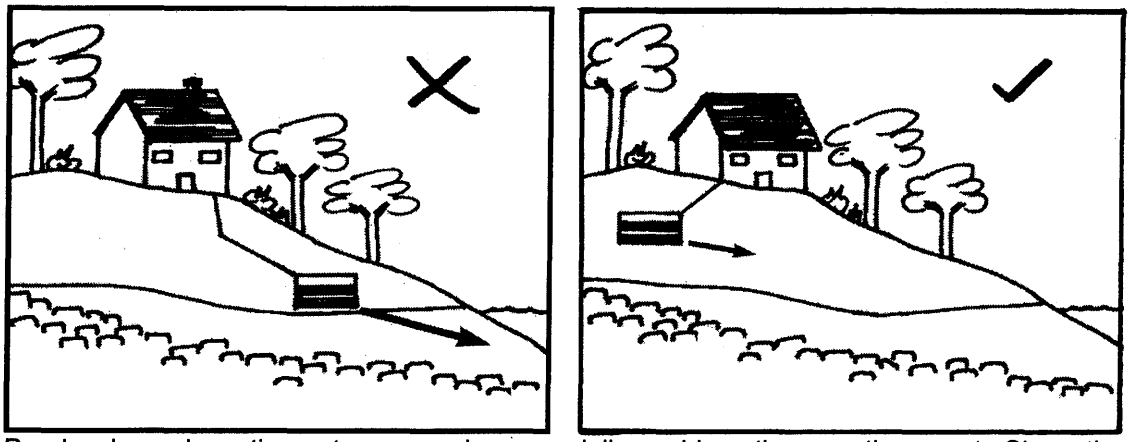


Septic systems should be placed a minimum of 10 metres from steep slopes (of 15 % or greater). Sewage entering the soil close to a slope will move too quickly to be adequately purified, and may come to the surface, creating unsanitary conditions.

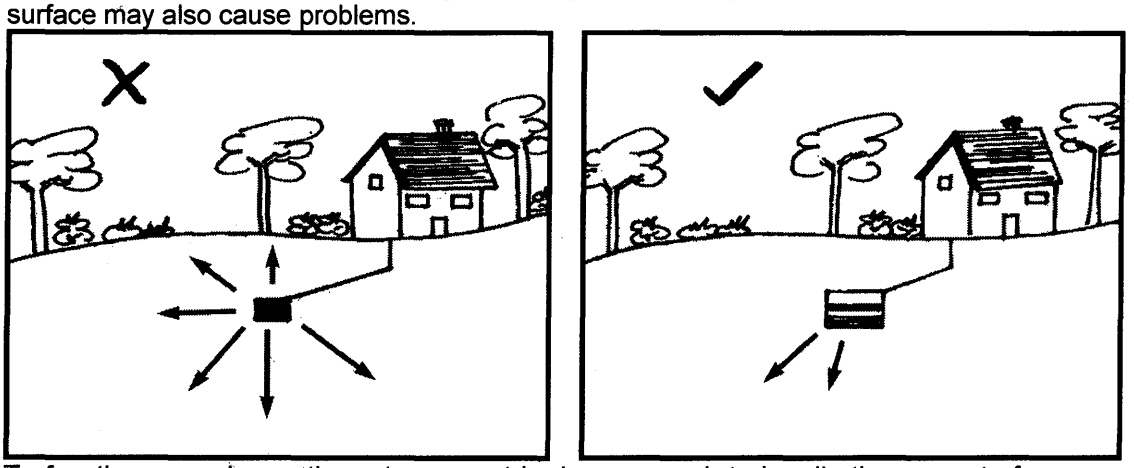


If bedrock is close to the surface, sewage may travel along it and between its fissures, coming to the surface before it has been adequately purified. Bedrock should be at least 5 metres below the surface. If the depth to bedrock is less, special design may be necessary. The bottom of the leaching trenches must be at least 2 metres above the bedrock surface.

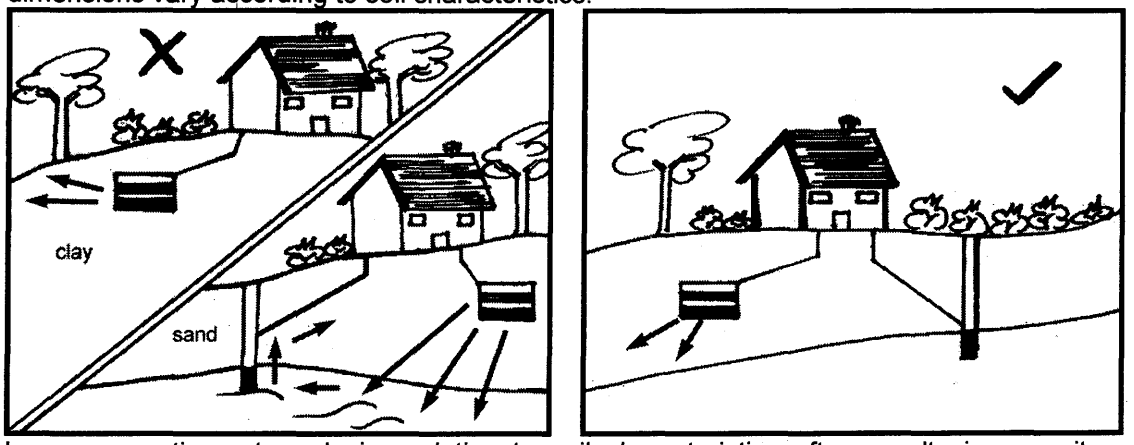
[98] Source: ESCAP, 1995.



Poorly planned septic systems can be especially problematic near the coast. Since the groundwater is usually close to the surface, wastewater may enter the groundwater before it is properly purified. Highly permeable sandy soils and relatively impermeable wetland soils require special consideration in design and may limit development sites; bedrock close to the surface may also cause problems.



To function properly, septic systems must be large enough to handle the amount of sewage produced by the buildings they serve. Otherwise, inadequately, purified sewage may reach the surface or contaminate water supplies. Leaching fields should be of adequate size; dimensions vary according to soil characteristics.



Improper septic system design relative to soil characteristics often results in unsanitary conditions. Relatively impermeable soils such as clay may cause sewage to come to the surface. Sandy, highly permeable soils may allow sewage to enter groundwater or lakes and streams before it is sufficiently purified.

Figure 19. Major issues relating to the design and placement of septic tanks.[99]

[99] After: ESCAP, 1995.

(iv) Disposal of sewage waste effluent after treatment

Sewage treatment processes facilitate the decomposition of wastes into their constituents to a point where they can be discharged to the environment and allow natural systems to continue the recycling process. Nonetheless, treated wastewater retains potentially harmful constituents and it remains important that great care is taken when selecting the means of disposal.

Alternatives and criteria for safe disposal of *treated* sewage wastewater are as follows:

(a) Ocean outfall

A pipeline to discharge effluent into the sea is comparatively expensive to install but thereafter cheap to run. The siting of the outfall is of critical importance and requires specialist investigation. It should be deep (a minimum of 30 metres), away from recreational areas, and sited such that effluents are directed away from the shoreline and dilution is maximised. Outfalls should not be located in embayments, lakes, lagoons, ponds or small rivers, however large rivers may be permissible providing adequate dilution is achieved (dilution rate of at least 10 times during lowest river flow). Appropriate standards for effluent quality discharged directly into water bodies should be determined on a case-by-case basis.

(b) Subsurface irrigation (drainfield) and evapotranspiration beds

These are generally used for smaller projects, specifically as the second phase of septic tank effluent treatment. The main objective is to recycle nutrients (nitrates/phosphates) back into the soil effectively without causing water quality and public health problems. These two options comprise, respectively:

- Percolation of effluent through the soil and bioremediation of nutrient loads by soil processes prior to the effluent reaching the groundwater (*subsurface irrigation* or *drainfield*);
- "Wicking" water out of the trench into the overlying soil by means of capillary action, followed by water loss to the atmosphere as a result of evaporation from the soil surface and transpiration by plants rooted in the overlying soil (*evapotranspiration*). Nutrients are assimilated by plant growth. Figure 20 shows an evapotranspiration bed linked to a septic tank system.

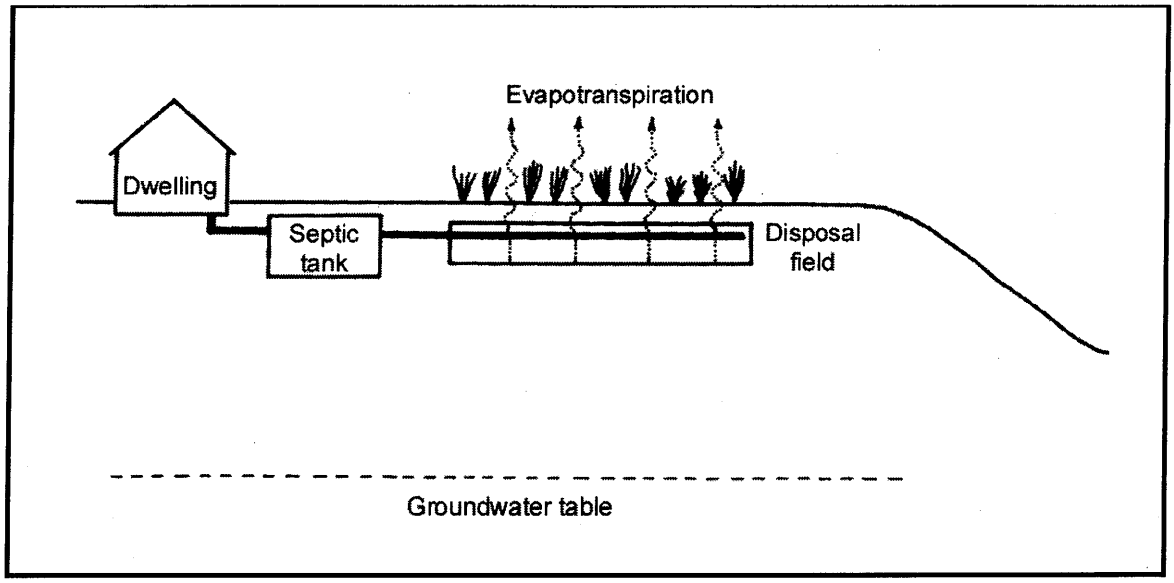


Figure 20 Septic tank and evapotranspiration bed.

Subsurface irrigation (drainfield): The effluent is discharged into subsurface drainage trenches arranged in series. Each trench comprises a perforated pipe running through a 1 metre deep layer of 20 – 50 mm graded rock fill (see Figure 21). The length and number of trenches depends upon the effluent volume and the permeability of the surrounding soil. Not all soils may be suitable for this type of effluent disposal, particularly those that are fine-grained with limited potential for water movement (dispersal). Drainfield trenches eventually clog with sewage solids and sufficient land is required to establish new drainfields periodically. The area required will depend on the volume of effluent generated.

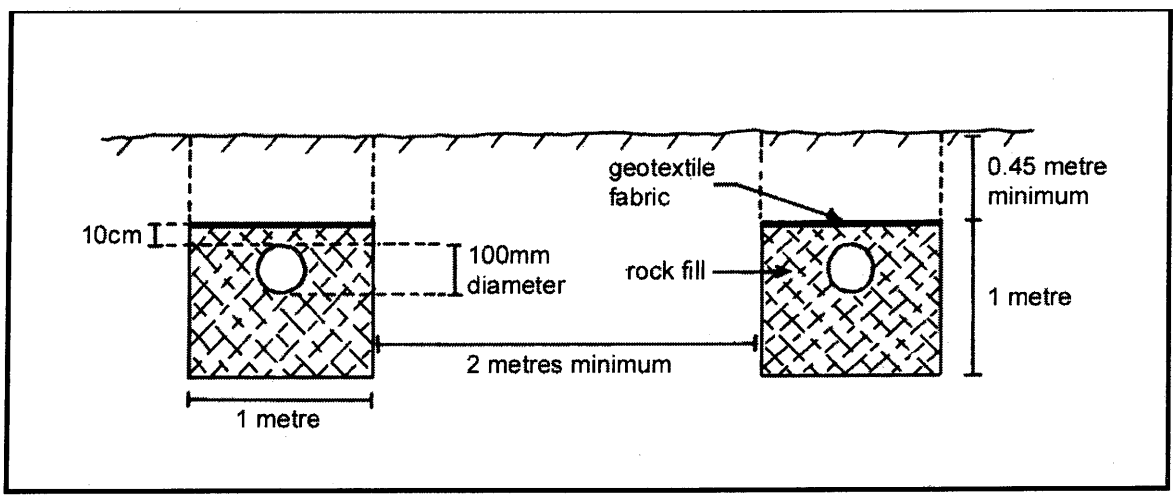


Figure 21. Cross-section of a drainfield trench.

Evapotranspiration beds: Wastewater is released in perforated pipes running through a 20 – 50 cm layer of coarse sand and gravel situated beneath 10 cm of loamy soil planted with a fast growing grass (Figure 22). The process relies on the matric potential of the overlying soil (the ability of the soil to draw water upwards) and this in turn depends upon the maintenance of air-filled voids in the upper soil layers. This potential diminishes where the soil becomes waterlogged by, for example, heavy rainfall or groundwater (i.e. high water table). The size of the evapotranspiration beds needs to be calculated carefully.

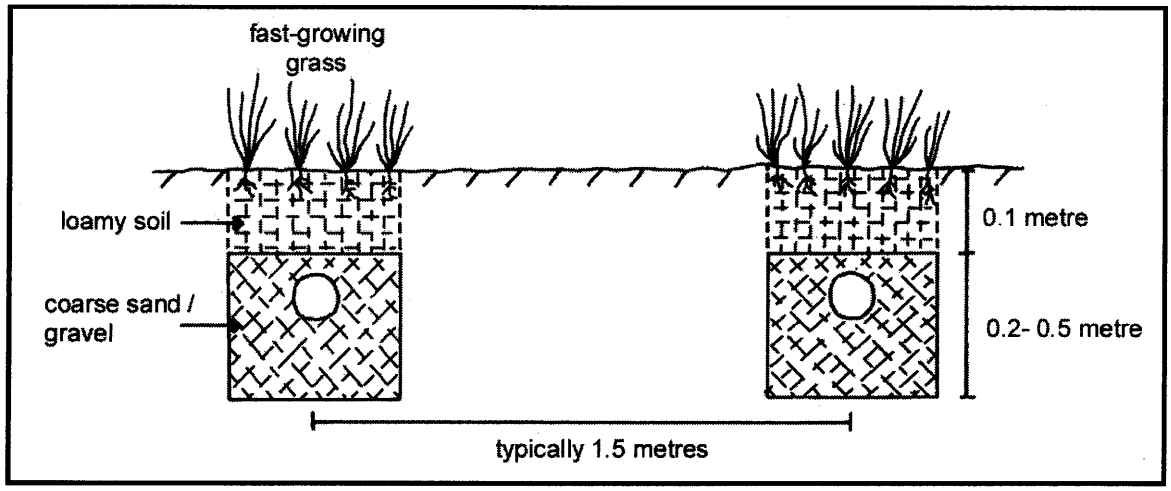


Figure 22. Cross-section of an evapotranspiration bed.

Both drainfields and evapotranspiration beds must be located in areas with good drainage and should not be liable to flooding. To prevent flooding, the area should be surrounded by raised embankments and/or trenches. The need for soils with suitable permeability restricts the application of these forms of disposal. Drainfields in particular are not suited to developments that depend upon groundwater drawn from close by due to the risk of contamination. It is particularly unsuited to a small island that depends on a subsurface lens of fresh water.

(c) Discharge into surface waters

Where liquid effluent is discharged directly to surface waters, the effluent emissions should achieve the standards shown in Table 7.

Table 7. Target standards for selected constituents of effluent water discharged directly into a surface water body.[100]

Parameter	Maximum value
Ph	6 – 9
BOD	50 mg/l
Oil and Grease	10 mg/l
Total suspended solids	50 mg/l
Total residual chlorine	0.2 mg/l
Coliforms	400 counts/100ml
Temperature increase	Less than or equal to 3° C[a]

[a]The effluent should result in a temperature increase of no more than 3°C at the edge of the zone where initial mixing and dilution takes place. Where the zone is not defined, use 100 metres from the point of discharge.

In Table 7, no target standards are provided for phosphate and nitrate and this is due to the fact that these constituents of wastewater are readily assimilated into aquatic plant growth *providing* that levels do not exceed the capacity of the water body to do this. Excessive loading is likely to lead to eutrophication arising from prolific plant growth followed by die-back and decomposition in which dissolved oxygen is depleted with deleterious effects on aquatic organisms and ecosystem health.

[100] Source: *Pollution Prevention and Abatement Handbook*, World Bank, 1997.

Systems most at risk are those with limited capacity for dilution and assimilation, and include standing water bodies, rivers and streams characterised by low or intermittent flow. In South Africa, the special standard for effluent discharge is applied to river systems identified as sensitive with regard to nitrate and phosphate loading.

The South African special standard for nitrate and phosphate (maximum values allowable) in effluents discharged to receiving waters is as follows:

Phosphate (soluble orthophosphate, as P)	1.0 mg l^{-1}
Nitrate (as N)	1.5 mg l^{-1}

In developing effluent discharge standards, a precautionary approach should be adopted where information on the receiving water body is lacking; however, this may be modified in response to information based on monitoring ecosystem health.

Consideration should be given to post-treatment of effluents where artificial reed-beds or ponds utilising macroalgae are employed to "scrub" effluents of excessive nitrates/phosphates. So far, there have been few attempts to explore this option and it may be worthwhile to investigate this further (see Box 9). The use of natural wetlands to process wastewater effluent should be treated with extreme caution.

Box 9. Use of macroalgae to remove nutrients from sewage water[101]

During 1994, studies were carried out to investigate the possibility of using local species of macroalgae for the purification of polluted water, primarily sewage water, from village households in East Africa. The work was done on Unjuga Island, Zanzibar, Tanzania.

Seaweed species diversity of the intertidal mudflats on the east coast of Unjuga was studied outside villages with beach hotels. Nutrient samples (N and P) were taken in the sea close to sewage outlets. Growth characteristics and nutrient uptake rates were investigated for 14 macroalgae and 3 were selected for further study in a model system for wastewater treatment.

High uptake rates for ammonium, nitrate and phosphate were found in three selected species. Nutrient load and composition, mainly the N:P ratio, were varied to optimise uptake efficiency. The conclusion was that local macroalgae are suitable for nutrient removal. A system with simple tanks or ponds with macroalgae can be used for small-scale purification of sewage water in the region.

Where treated wastewater is reused in tourism developments, for example for irrigating gardens or golf courses, the guideline standards shown in Table 8 are appropriate for minimising health risks.

[101] Source: *Integrated Coastal Zone Management in Tanzania*. O.Linden and C.G. Lundin, (eds.), 1996. The World Bank.

Table 8. Requirements for treated wastewater reused for irrigation.[102]

Parameter	Maximum value
Coliforms	< 100 counts/100ml
Helminth	< 1 Viable intestinal nematode egg per litre (> 99 % egg removal).

(v) Water pollution and recreational use

In areas where water-based recreational water activities are important (e.g. swimming, diving, canoeing, sailing), pollution from industrial and sewage discharges can pose serious health risks to tourists. Foreign visitors are often well informed about the dangers of bathing in polluted waters and the consequences of failing to maintain safe standards can impact severely on the popularity of a tourism destination (e.g. Section 6.4.3, "Blue Flag" accreditation programme). Areas of recreational importance (e.g. lakes, coastal waters) depend on effective pollution control to maintain safe water quality standards.

Recreational waters should be monitored routinely and standards should be set appropriate to the types of activities that occur. Reference should be made to published texts for details of sampling intervals, number of samples required and the interpretation of data. Although international standards do exist, their applicability to recreational waters in East Africa and the Western Indian Ocean island states has been questioned. Table 9 shows South African target standards for selected constituents of water used for full contact recreation (fresh waters). It should be noted that less stringent standards may be adopted for intermediate-, or non-contact activities. In the latter case, standards may simply serve to protect aesthetic considerations.

Table 9. Target standards for selected constituents of water used for full contact recreation in South Africa.[103]

Constituent	Target range
Free floating algae	0 – 15 µg/l chl *a*
Floating matter and refuse	Water should be free of floating or submerged debris that may injure, tangle or obstruct water users.
pH	6.5 - 8.5
Faecal coliforms/E.coli	0 – 150 counts/100 ml*
Coliphages	0 – 20 counts/ml**
Enteric viruses	0 – 1 $TCID_{50}$ /10ml

*This range should not be exceeded by the geometric mean or median count over a minimum period of three months.
**This range should not be exceeded by the geometric mean or median of fortnightly samples collected over a three month period.

Few water quality guidelines exist for recreational use of marine waters. However, the Mauritius government has produced guidelines for coastal water quality that

[102] From: *Pollution Prevention and Abatement Handbook*, World Bank, 1997.
[103] Source: *South African Water Quality Guidelines*, Department of Water Affairs and Forestry, 1996.

include recreational use (Table 10), and South Africa[104] has adopted standards for full contact recreational use of marine waters for one of the more commonly used indicators of pollution, faecal coliforms/E. coli.

Table 10. Guidelines for coastal water quality (recreational use categories), Ministry of Local Government and Environment, Mauritius.

Category:		B – Recreational	
Class		B1 Primary Contact	B2 Secondary Contact
Parameters	Unit		
pH	-	6.5 – 8.5	6.5 – 8.5
Temperature	°C	Ambient	Ambient
Suspended Solids	mg/l	5	10
Dissolved Oxygen	mg/l	>5	>5
Chemical Oxygen Demand	mg/l	3	3
Total coliforms	CFU*/100 ml	1000	5000
Faecal coliforms	CFU*/100 ml	<200	<1000
Nitrate Nitrogen	mg/l	0.8	0.8
Phosphate	mg/l	0.08	0.08
Oil and Grease	mg/l	Not detectable by N-hexane extraction method	Not detectable by N-hexane extraction method
Phenol	mg/l	0.05	0.05
Arsenic	mg/l	0.05	0.05
Cadmium	mg/l	0.02	0.02
Cyanide	mg/l	0.01	0.01
Chromium	mg/l	0.05	0.05
Copper	mg/l	0.05	0.05
Lead	mg/l	0.05	0.05
Total Mercury	mg/l	0.0005	0.0005

*CFU: Colony Forming Unit.

The South African standards for recreational use of coastal waters state that for routine sampling of faecal coliforms/E. coli:

50 % of samples < 100 counts/100ml
90 % of samples < 400 counts/100ml
99 % samples < 1 000 counts/100ml

6.2.6.2. Management of Solid Waste

The generation of solid waste is another prevalent problem threatening both the natural environment and human health in East African countries. In Mozambique, for

[104] *Water Quality Criteria for the South African Coastal Zone*, by J.A. Lusher (1984). South African National Scientific Programmes Report No. 94.

example, serious pollution hazards have arisen associated with urban rubbish dumps situated close to the sea which leach materials during times of heavy rainfall.[105]

Apart from pollution, inadequate provision for solid waste disposal may lead to a number of other undesirable consequences that include insect infestation, fire, obnoxious odours and degradation of aesthetic qualities. Collection and disposal of solid waste should be managed to eliminate these hazards. The following guidelines are provided to assist hotel and resort developments evaluate methods that can be adopted for safe solid waste disposal.

(i) Storage of waste

Solid wastes should be separated into their major categories and stored separately. Food wastes should be stored in containers fitted with airtight lids, and stored in a specially constructed outhouse, which should be in a cool place, well-ventilated and inaccessible to dogs and other scavengers. The floor should be constructed of concrete to facilitate easy cleaning (hosing down) with drains connected to the sewerage system.

Paper and plastics should be stored separately in bins, preferably in an outhouse (but separate to the food waste facility). Potentially dangerous chemical wastes such as pesticides, oil, bleaches and cleaning fluids should be kept in a special store that is well-ventilated and kept locked at all times. All bottles, cans and other reuseable materials should be recycled.

(ii) Collection of waste

In urban areas, collection of wastes from hotels and resorts is normally undertaken by the local authority. In areas close to, but outside the normal collection area of the municipality, several options are available to hotels/resorts:

- Deliver the refuse to a pre-arranged site from which the authorities can collect it for disposal;
- Pay the municipality to make special trips to collect refuse from the establishment;
- Deliver the hotel refuse directly to the dump site;
- Make provision for hotel waste disposal system.

Waste disposal involves significant expense whichever solution is adopted. However, the first two options may be more economical and avoid the hotel or resort the necessity of developing its own solid waste disposal system. Projects located far from municipal areas may have no alternative but to develop their own waste disposal systems.

(iii) Disposal of solid waste

The manner in which solid wastes are disposed is critical in maintaining environmental quality, and should be fully investigated during the planning of a new project and form an essential part of the impact assessment. If a large project is proposed in a region where no waste disposal services are available and there is no suitable land nearby on which to develop a landfill site, then such constraints could

[105] J. Hatton and A. Massinga. In: *Integrated Coastal Zone Management in Mozambique.* C.G. Lundin and O. Linden (eds.)(1997). The World Bank.

be serious enough to stop the project. As a guideline, the following aspects should be considered when evaluating the suitability of an area for a landfill site:

- The quality and nature of the wastes;
- Land available for disposal, including the location, area and suitability (geotechnical considerations such as permeability and depth of water table);
- Technological options - complex technologies should be avoided in remote or isolated areas;
- Economic costs of options.

Several options are available and these include sanitary landfill and incineration:

(a) Sanitary landfill

Wastes are dumped in a landfill site and covered daily by inert material such as soil, sand, gravel or sawdust. The cover layer should be of sufficient depth to prevent scavengers (e.g. dogs, cats, pigs, rats, etc) or other disease-carrying organisms (flies) from gaining access to the wastes. Proper management of sanitary landfill sites will allow proper composting and reduce unpleasant odours while preventing windblown dispersal of wastes, breeding by flies, fires and access by scavengers.

There are a number of factors that restrict the siting of landfill sites and the following conditions must be met:

- The soil must be impermeable (e.g. clay) to prevent contamination and pollution of the groundwater (lining is another option);
- There should be no drainage channels entering or leaving the site;
- The soil should be deep;
- The (excavated) site should be above the maximum groundwater level;
- The site should be free from flooding;
- The site should be at least 30 metres (depending on the situation) from wells, streams or boreholes.

Suitable areas such as old quarries, etc, should be identified for landfill sites, otherwise, trenches may be excavated for the purpose. Landfills should be protected by fences and screened using shrubs or trees. Sites should be kept clear of unsightly debris. This type of waste disposal is appropriate for large resort/hotel developments where municipal services are not available; however, the hotel or resort management must be responsible for regular inspection of the operational management of the site.

For smaller projects, a deep pit in the soil offers a possible option. This could be constructed with a manhole lid to prevent access by scavengers and flies, and to prevent the risk of fire. The pit should be above the water table and located in impervious soil, or lined. It should be located at least 20 metres away from any well, borehole or stream, and not in an area prone to flooding.

Chemical wastes including engine oils, household cleaners, etc, should not be disposed of in septic tanks or other sewerage disposal systems since this runs the risk of destroying the micro-organisms responsible for sewage decomposition. These wastes should not be disposed of in landfill sites due to the risk of leaching, and should be disposed of at facilities designed specifically to deal with them.

In coastal areas, great care should be exercised in the siting of landfills. The porous nature of the soils and proximity to groundwater and/or coastal waters leads to serious risk of water pollution. The basic procedure for selecting appropriate landfill sites is shown in Figure 23.

(b) Incineration

This method involves controlled burning in incinerators and may represent the only option available where land is scarce (e.g. islands) or no suitable sites can be identified due to the unsuitability of the soils or risk of pollution. It is an expensive option, however.

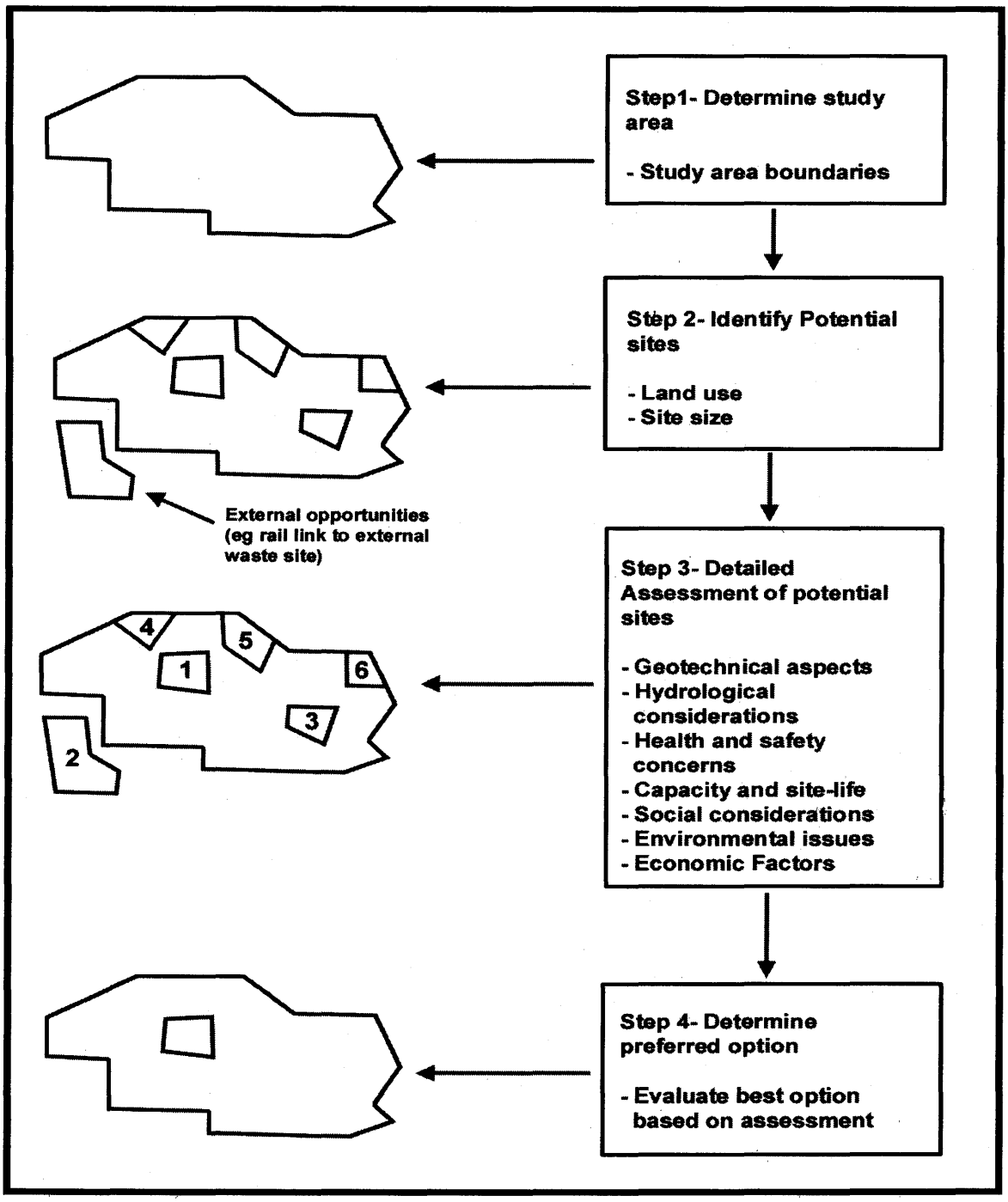


Figure 23. Basic procedure for selecting landfill sites.[106]

[106] Modified from: ESCAP, 1995.

6.2.6.3. Air/noise Pollution

Air and noise pollution from tourism sector activities are generally less of a problem and stem mainly from vehicular traffic. However, other sources such as solid waste incineration can also contribute. Table 11 provides air emission standards expressed as concentrations to facilitate monitoring of such facilities. The concentrations shown are generally acceptable to the World Bank, however emission levels should be established for each project through impact assessment procedures. It is not permissible for the standards provided to be achieved through dilution; and the maximum levels should be achieved for 95 % of the time the plant is operating, calculated as a proportion of annual operating hours.

Table 11. Air emission requirements.[107]

Parameter	Maximum
Particulate matter:	
Fossil fuels	100 mg/Nm^3
Other fuels	150 mg/Nm^3
Nitrogen oxides, from boilers, as NO_2:	
Coal fired	750 mg/Nm^3
Oil fired	460 mg/Nm^3
Gas fired	320 mg/Nm^3
Sulphur dioxide:	2000 mg/Nm^3

Noise abatement measures should achieve the levels shown in Table 12, measured at noise receptors located outside the project property boundary, with a maximum increase in the existing ambient level of L_{eq} 3 dB(A) where the existing ambient level exceeds L_{eq} 45 dB(A).

Table 12. Ambient Noise restriction requirements.[108]

	Maximum Allowable L_{eq} (hourly), in dB(A)	
Receptor	Daytime 07h00 - 22h00	Nightime 22h00 - 07h00
Residential; Institutional; Educational	55	45
Industrial; Commercial	70	70

6.3. Tourism Activities

Development of coastal tourism encompasses the establishment of support facilities to provide a range of recreational opportunities for visitors. Tourism activities may be man-made (e.g. shopping, restaurants) or nature-based (e.g. diving), and can be

[107] Source: *Pollution and Prevention Abatement Handbook*. The World Bank, 1997.
[108] Source: *Pollution and Prevention Abatement Handbook*. The World Bank, 1997.

consumptive (e.g. fishing) or non-consumptive (e.g. sightseeing). The sustainability of the tourism sector depends upon managing the impacts of recreational activities according to principles of appropriate use underpinned by conservation of natural resources. The following section provides guidelines for common coastal recreational activities in East Africa.

6.3.1. Boating

Water areas should be set aside for a diversity of recreational opportunities, taking cognisance of conservation priorities. Certain types of boats (e.g. powerboats) are responsible for high noise levels, physical damage to the environment and air/water pollution. Waves created by powerboats can cause serious shoreline erosion. Sediments are carried into the water column and together with boat emissions, can be deleterious to aquatic life. Boat noise has the potential to disturb bird-life and other recreational users. Boat anchoring and moorings can cause damage to coral reefs and mudflats.

The following measures should be undertaken:

- Permanent moorings should be provided where appropriate and clustered to minimise damage;
- Solid and liquid wastes including sewage, garbage, fish offal, etc, should be disposed of on land. Waste disposal facilities should be provided at slipways, marinas and harbours;
- Transfer of fuel should be strictly controlled and carried out at refuelling docks where provision is made for secondary containment of leaks/spillage.

Certain boating activities may be incompatible with each other, or with other users of the water area. For example, the use of powerboats (e.g. waterskiing) can lead to conflict with canoeists or bird watchers. Where necessary, water areas should be zoned using marker buoys and sign-posting to exclude or control activities in certain areas. For example, powerboats should be prohibited from areas adjacent to important bird habitats and subject to speed restrictions near mooring facilities. The provision of zones should attempt to provide an optimal solution based on the needs of users and conservation (see Box 10).

It is also important to ensure that the carrying capacity of a water area for boat use is not exceeded. Carrying capacity may be defined as "the level of recreational use an area can sustain without an unacceptable degree of deterioration of the character and quality of the resource, or of the recreation experience."[109] Thus, the carrying capacity has both an environmental and social dimension. For example, degradation of coral reefs by boat anchors and subsequent failure to recover is a potential indicator that the environmental carrying capacity has been exceeded. The social carrying capacity is exceeded where visitor enjoyment is adversely affected by overcrowding. Determining the carrying capacity is not an easy task and depends on the size and characteristics of the water area as well as the nature of boat use. For example, one would expect the maximum number of canoes that can be accommodated on a given water area without undue disturbance to wildlife and without conflicting with other users, to be higher than for powerboats.

[109] See: Chapter 2.

Box 10. Zoning of the Knysna lagoon[110]

Zoning is a useful management tool that can be employed where a recreational area (land or water body) is of limited extent and subject to a range of different uses. The primary purposes of zoning are to protect habitats from damaging activities, confine intensive use to sites that can sustain it, and to avoid conflict by separating incompatible activities. The Knysna lagoon is the second largest estuary in South Africa and located in a popular tourism region. It is subject to a diversity of recreational and other pressures, ranging from powerboating, sailing, houseboats, canoes, fishing, oyster cultivation, subsistence fishing, bait collection, swimming and diving. Management of the Knysna lagoon is streamlined as ownership rests entirely with the State, and this eases control and zoning. Indeed, effective management of the lagoon with its special attributes was the primary purpose for the proclamation of the Knysna National Lake Area under the authority of the South African National Parks.

Zoning of the Knysna lagoon is shown in Figure 24. Factors taken into consideration during zoning included locality of sensitive and protected areas and existing practises in terms of water use. Certain guidelines are also applicable. Subject to formal agreements and tariffs, the SA National Parks permit certain categories and numbers of commercial craft while others (hovercraft, parasailing, craft with propellers above water) are not permitted. A certain number of private houseboats are also allowed, subject to formal lease agreements and tariffs, as well as guidelines and standards on the structure of craft, mooring areas, and sewage and litter treatment. An important aid is the control over access to the water at selected boat launching sites. A further method of controlling numbers, types and quality of boats on the lagoon is undertaken through a system of licensing both boats and facilities. The use of the water and mooring buoys is licensed on an annual basis by formal lease agreements and private boats are licensed similarly. Guidelines for the safety and operation of private boats are also provided.

The lagoon is divided into 5 broad zones. Zone 1 is designated for intensive recreational use and extends from the tidal inlet (the Knysna Heads) upstream to the rail bridge. Conservation priorities include two shipwrecks located at the Heads, and the presence of the pansy shell (*Echinodiscus bisperforatus*) along sandbanks adjacent to Leisure Isle. A small area at the Heads is zoned for swimming and snorkelling and boat activities are restricted in this zone. Only sea going vessels are permitted on the seaward side of a line drawn between two beacons on either side of the Heads. Swimming is not permitted in the main flow channel as this area is zoned for use by commercial and private boats (ferries, houseboats, powerboats, yachts, recreational fishing boats, etc), as well as oyster cultivation.

Zone 2, comprising the narrow, shallow Ashmead channel, is demarcated as a low intensity use area. Conservation priorities include the intertidal and invertebrate reserve in which no bait collection or human access is permitted. Small, non-motorised craft (sailboats, canoes, rowing boats, etc) are permitted in the channel and powered boats are restricted to 20, this being intended to provide water access for residential moorings located at the apex of the channel. All powerboats are required to travel at idling speed in the channel however.

Zone 3, from the railbridge upstream to "The Point" is intended as a low intensity use area for recreational fishing, houseboats, oyster cultivation, etc. Zone 4, from "The Point" upstream to the National Road bridge, makes provision for waterskiing and other forms of powerboating. It is intended that the Knysna Waterskiing Club will control the area on an agency basis for the South African National Parks. No waterskiing is permitted above the National Road bridge. Zone 5, above the National road bridge, is demarcated as a nature area and only rowing boats and canoes should be permitted, although powered boats are currently allowed as far as the "Red Bridge". In addition, a limited number of powered boats that are licensed to riparian owners are allowed to proceed beyond the "Red Bridge" in order to access property, although strict speed restrictions apply.

[110] South African National Parks. *Knysna Lake Area Management Plan.*

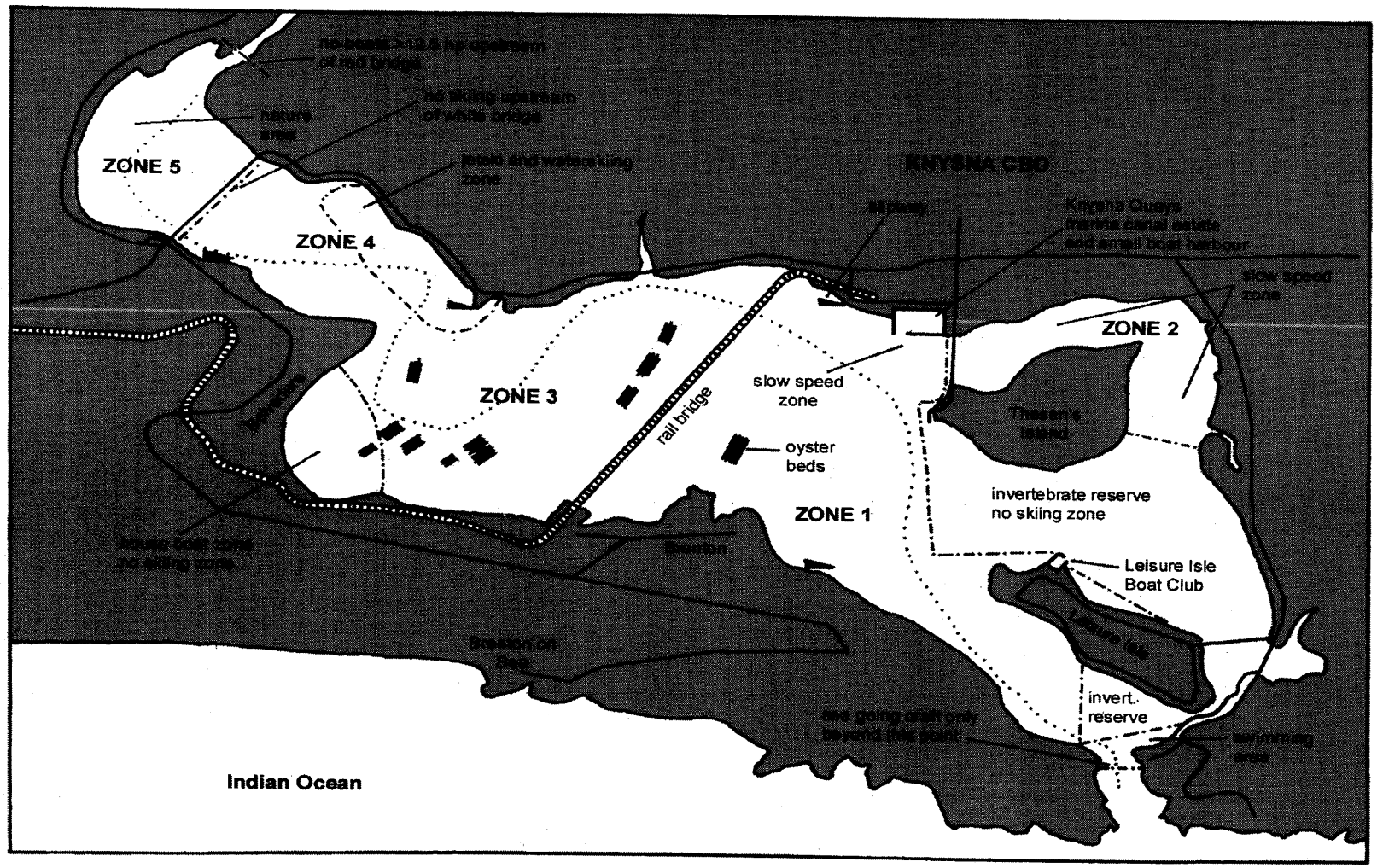


Figure 24. Zoning of the Knysna Lagoon.

Finally, it should be noted that certain areas may need to be declared off-limits entirely to motorised craft in favour of traditional or environmentally-friendly craft such as canoes. Even then, clear guidelines of conduct need to be established on a site-specific basis, as nature-based tourism tends to be intrusive and is often destructive to the resource base.

6.3.2. Fishing/exploitation of Marine Resources

Recreational fishing, spearfishing and other forms of exploitation of marine resources can be destructive, and result in a decline in resource stocks as well as lead to conflict with locals that depend on coastal resources for subsistence. Existing measures aimed at conserving marine living resources should be strictly enforced. These include:

- Closed seasons, daily bag limits and minimum size regulations (for fish, shellfish and bait organisms);
- Permissible fishing/collection methods (e.g. netting, spearing, hook and line);
- Prohibiting the exploitation of certain species (protected, rare, endangered species such as corals, turtles, etc).

In addition, the sale of protected species (or products derived from them) by tourism curio shops should be prohibited. Where possible, efforts should be made to promote sustainable activities such as fish tag-and-release.

6.3.3. Scuba/snorkel Diving

Clear waters and coral reefs offer excellent opportunities for recreational diving, but are extremely fragile. Dive operators should develop codes of conduct to prevent reef destruction. These may include guidelines such as:

- Divers must avoid physical contact with, and disturbance to, coral reefs;
- No animals or plants may be collected from reefs. This includes living as well as dead animals or parts thereof (such as shells, coral skeletons);
- Coral reef fish should not be fed artificially;
- Avoid disturbing reef inhabitants when using flash photography;
- No spearfishing is permitted.

Conservation authorities should protect sensitive areas by restricting access, and/or rotating areas of open/closed access to allow recovery. Conservation authorities should control impacts by, for example, making provision for underwater trails with defined entry and exit points. Measures aimed at protecting coral reefs from destruction should be strictly enforced.

6.3.4. Footpaths, Trails and Off-road Vehicles (ORVs)

The development of access routes to wilderness areas are important to allow visitors the opportunity to explore the destination and pursue recreational activities, but require proper planning to protect against environmental degradation. ORV trails are popular, yet potentially very damaging to coastal areas. Off-road vehicles should be strictly controlled in the coastal zone and the issue is of such a serious nature that site-specific guidelines for this activity should be established. In general, vehicles should be prohibited from entering sensitive systems such as dunes and wetlands or

other areas of conservation significance (e.g. turtle, bird nesting sites) and restrict their activities to below the high water mark.

Access to beaches should be controlled by means of specially demarcated paths or tracks, particularly where the access route traverses a dune system. Vehicle tracks should be laid over the existing dune surface to avoid dune blow-outs which occur when excavations are made through dune systems. Board and chainwalks should be created for pedestrian access to the beach where sensitive areas such as dunes need to be traversed. Trails should avoid areas which are easily damaged by trampling (e.g. wetlands) or where there is a high risk of erosion (cliff edges). Boardwalks may be used to gain limited access to these areas. As with recreational water areas, it is important to assess the carrying capacity for tourism development of the terrestrial environment (see Chapter 2).

6.3.5. Mitigating the Effects of Tourist Behaviour and Presence

Tourists are consumptive and intrusive creatures. Therefore authorities should do everything in their power to mitigate the effects of tourist behaviour and presence, particularly in protected areas.

Authorities should make it as easy as possible for tourists to dispose of litter and waste by:

- Placing a sufficient number of animal-proof litter bins strategically;
- Establishing a system by which litter bins are regularly emptied;
- Locating and operating waste disposal sites according to acceptable standards, and controlling unauthorised dumping;
- Imposing fines for littering.

Authorities should make it clear to tourists what is expected from them by:

- Posting rules and regulations clearly;
- Presenting information about the ecosystem of a protected area in a clear and innovative manner that brings out the fragility of the area;
- Providing high-quality guides. The behaviour of tourists is greatly influenced by the quality and level of training of their guide(s). A guide system is central to the success of any protected area and it is advisable that expert advice is sought in its planning and implementation.

Further information is provided in Section 6.4.2 "Tourism Codes of Conduct".

6.4. Other Useful Information: Tourism Declarations, Tourism Codes of Conduct, and Certification and Accreditation Programmes

6.4.1. Tourism Declarations

Statements and declarations of the World Tourism Organisation relating to sustainable tourism include:

- Manila Declaration on World Tourism, 1980;
- Acapulco Document on the Right to Holidays, 1982;
- Tourism Bill of Rights and Tourism Code, Sofia, 1985;
- The Hague Declaration on Tourism, 1989;

- Lanzarote Charter for Sustainable Tourism, 1995 (jointly with UNEP, UNESCO, EU);
- Statement on the Prevention of Organised Sex Tourism, Cairo, 1995;
- Lanzarote Conference on Sustainable Tourism in SIDS, 1998 (jointly with UNEP).

These documents can be accessed through the internet (www.world-tourism.org), or obtained by contacting the World Tourism Organisation:

World Tourism Organisation (WTO)
Capitan Haya, 42
28020 Madrid
Spain
Tel: + 34 1 571 0628
Fax: + 34 1 571 3733

6.4.2. Tourism Codes of Conduct

The United Nations Environment Programme Industry and Environment Centre (UNEP/IE) produced Technical Report No. 29, Environmental Codes of Conduct for Tourism. This document outlines the need for Tourism Codes of Conduct, their development, objectives and benefits. Examples of Codes of Conduct for different spheres of tourism from around the world are provided. These cover the following categories:

- Environmental Codes of Conduct for the Tourism Industry (e.g. Box 11);
- Environmental Codes of Conduct for Host Communities;
- Environmental Codes of Conduct for Tourists.

The document concludes with sections on implementation procedures and monitoring and reporting.

Box 11. Ecotourism Guidelines for Nature Tour Operators, The Ecotourism Society[111]

1. Pre-departure programs

Visitor information and education – Prepare travellers to minimise their negative impacts while visiting sensitive environments and cultures before departure.

2. Guiding programs

General principles of guiding tours – Prepare travellers for each encounter with local cultures and with native animals and plants.

Prevention of environmental impacts – Minimise visitor impacts on the environment by offering literature, briefings, leading by example, and taking corrective actions.

3. Monitoring programs

Prevention of accumulated impacts of tourism – Use adequate leadership, and maintain small enough groups to ensure minimum group impact on destinations. Avoid areas that are under-managed and over-visited.

4. Management programs

Prevention of nature tour company impacts – Ensure managers, staff and contract employees know and participate in all aspects of company policy to prevent impacts on the environment and local cultures.

Training – Give managers, staff and contract employees access to programs that will upgrade their ability to communicate with and manage clients in sensitive natural and cultural surroundings.

Conservation contribution programs – Be a contributor to the conservation of the regions being visited.

Local employment and jobs program – Provide competitive, local employment in all aspects of business operations.

5. Local accommodations checklist

Offer site-sensitive accommodations that are not wasteful of local resources or destructive to the environment that provide ample opportunity for learning about the environment and sensitive interchange with local communities.

6.4.3. Certification and Accreditation Programmes

6.4.3.1. Agenda 21 for the Travel and Tourism Industry[112]

(i) Introduction to Agenda 21

Agenda 21 is a comprehensive programme of action adopted by 182 governments at the United Nations Conference on Environment and Development (UNCED), the Earth Summit, on 14 June 1992. Agenda 21 was the first document of its kind to achieve international consensus and provides a blueprint for securing the sustainable future of the planet, from now into the 21st century. It identifies the environment and development issues which threaten to bring about economic and ecological catastrophe and presents a strategy for transition to more sustainable development practises.

[111] Only the overview guidelines are stated here. In the full document, each guideline is accompanied by a set of objectives, techniques and visitor benefits.

[112] From: *Agenda 21 for the Travel and Tourism Industry*, World Travel & Tourism Council, World Travel Organisation, and Earth Council, 78pp Report.

(ii) Agenda 21 for the Travel and Tourism Industry

In 1996, three International Organisations, the World Travel and Tourism Council, the World Tourism Organisation and the Earth Council, joined together to launch an action plan entitled "Agenda 21 for the Travel and Tourism Industry: Towards Environmentally Sustainable Development" - a sectoral sustainable development programme based on the Earth Summit results.

The document is of particular significance to Travel and Tourism companies, governments, national tourism administrations (NTAs), trade organisations, and to the travelling public.

The Travel and Tourism industry has a vested interest in protecting natural and cultural resources. As the world's largest industry, it has the potential to bring about sustainable development of the communities and countries where it operates.

(iii) Priority areas and objectives

The document "Agenda 21 for the Tourism and Travel Industry" contains priority areas for action with defined objectives and suggested steps to be taken in order to achieve them. It emphasises the importance of the partnerships between government, industry and non-government organisations, analyses the strategic and economic importance of Travel and Tourism and demonstrates the enormous benefits in making the industry sustainable. The framework for sustainable development to be established by the Travel and Tourism industry should be based on the Rio Declaration on Environment and Development (see Box 12).

Box 12. Guiding principles for the Travel and Tourism Industry based on the Rio Declaration on Environment and Development

- Travel and Tourism should assist people in leading healthy and productive lives in harmony with nature;
- Travel and Tourism should contribute to the conservation, protection and restoration of the earth's ecosystem;
- Travel and Tourism should be based upon sustainable patterns of production and consumption;
- Travel and Tourism, peace, development and environmental protection are interdependent;
- Protectionism in trade in Travel and Industry services should be halted or reversed;
- Environmental protection should constitute an integral part of the tourism development process;
- Tourism development issues should be handled with the participation of concerned citizens, with planning decisions being adopted at local level;
- Nations shall warn one another of natural disasters that could affect tourists or tourist areas;
- Travel and Tourism should use its capacity to create employment for women and indigenous peoples to the fullest;
- Tourism development should recognise and support the identity, culture and interest of indigenous peoples;
- International laws protecting the environment should be respected by the Travel and Tourism industry.

For government departments, NTAs and trade organisations, the overriding aim is to establish systems and procedures to incorporate sustainable development

considerations at the core of the decision-making process and to identify actions to bring sustainable tourism development into being. The nine priority areas for action are as follows:

1. Assessing the capacity of the existing regulatory, economic and voluntary framework to bring about sustainable tourism;
2. Assessing the economic, social, cultural and environmental implications of the organisation's operations;
3. Training, education and public awareness;
4. Planning for sustainable tourism development;
5. Facilitating exchange of information, skills and technology relating to sustainable tourism between development and developing countries;
6. Providing for the participation of all sectors of society;
7. Design of new tourism products with sustainability at their core, an integral part of the tourism development process;
8. Measuring progress in achieving sustainable development at local level;
9. Partnerships for sustainable development.

For Travel and Tourism companies, the main aim is to establish systems and procedures to incorporate sustainable development issues as part of the core management function and to identify actions needed to bring sustainable tourism into being. The ten priority areas for action are:

1. Waste minimisation, reuse and recycling;
2. Energy efficiency, conservation and management;
3. Management of freshwater resources;
4. Wastewater management;
5. Hazardous substances;
6. Transport;
7. Land-use planning and management;
8. Involving staff, customers, communities in environmental issues;
9. Design for sustainability;
10. Partnerships for sustainable development.

For further information on Agenda 21 for the Tourism and Travel Industry, contact:

World Travel & Tourism Council (WTTC)
20 Grosvenor Place
London SW1X 7TT
United Kingdom
Tel: + 44 171 222 1955
Fax: + 44 171 222 4983

World Tourism Organisation (WTO)
Capitan Haya 42
28020 Madrid
Spain
Tel: + 34 1 571 0628
Fax: + 34 1 571 3733

Earth Council, Headquarters
P.O. Box 2323-1002
San Jose
Costa Rica
Tel: + 506 223 3418
Fax: + 506 255 2197

6.4.3.2. ISO 9000, 14000[113]

(i) Introduction to ISO

The International Organisation for Standardisation (ISO) is a worldwide federation of national standards bodies from some 130 countries. ISO is a non-governmental organisation established in 1947, whose mission is to promote the development of standardisation and related activities with a view to facilitating the international exchange of goods and services, and to developing co-operation in the spheres of intellectual, scientific, technological and economic activity. ISO's work results in international agreements that are published as International Standards. The scope of ISO is not limited to any particular sector; it covers all technical fields except electrical and electronic engineering. Many of its facets are applicable to the tourism sector. Two important standards briefly described here are ISO 9000 and ISO 14000.

(ii) ISO 9000 and ISO 14000

Both of these terms refer to "families" of standards and both ISO 9000 and ISO 14000 standards relate to management systems and related supporting standards on terminology and specific tools, such as auditing (the process of checking that the management system conforms to the standard).

ISO 9000 is primarily concerned with "quality management". The standardised definition of "quality" in ISO 9000 refers to those features of a product (or service) which are required by the customer. "Quality management" means what the organisation does to ensure that its products conform to the customer's requirements.

ISO 14000 is primarily concerned with "environmental management". In other words, what the organisation does to minimise harmful effects on the environment caused by its activities.

Both ISO 9000 and ISO 14000 concern the way an organisation goes about its work (the process) and not directly the result of its work (the products). In the case of ISO 9000, the process affects whether or not everything has been done to ensure that the product meets the customer's requirements. In the case of ISO 14000, the process affects whether or not everything has been done to ensure a product will have the least harmful impact on the environment, during production or disposal, either by polluting or depleting natural resources.

However, neither ISO 9000 nor ISO 14000 are product standards. The management system standards in these "families" state requirements for what the organisation must do to manage processes influencing quality (ISO 9000) or the processes influencing the impact of the organisation's activities on the environment (ISO 14000).

In both cases, the philosophy is that the requirements are generic. No matter what the organisation is or does, if it wants to establish a quality management system or an environmental management system, then such a system has a number of essential features which are spelled out in ISO 9000 or ISO 14000.

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[113] From: International Organisation for Standardisation, Internet website www.iso.ch.

Further information on ISO and standards can be obtained from the organisation's internet website (www.iso.ch), or by contacting ISO at the following addresses:

International Organisation for Standardisation (ISO)
1, rue de Varembe
Case postale 56
CH-1211 Geneve 20
Switzerland
Tel: + 41 22 749 01 11
Fax: + 41 22 733 34 30
E-mail: central@iso.ch

ISO/IEC Information Centre
Tel: + 41 22 749 01 55
E-mail: mbinfo@iso.ch

6.4.3.3. European Blue Flag Campaign

The Blue Flag Campaign is run by the independent non-profit organisation, Foundation for Environmental Education in Europe (FEEE). The campaign brings together the tourism and environment sectors at local, regional and national level in 21 European countries. Its principle objectives are:

- To ensure and advertise clean and safe beaches for the public;
- To educate local authorities, private tourism operations and the public about the need and the means to protect the environment, in particular coastal and lacustrine environments;
- To create a basis for voluntary environmental action in communities;
- To bring about co-operation between the sectors of tourism, environment and education at local, regional and national levels.

The activities of the European Blue Flag Campaign revolve around the awarding of the widely recognised and respected eco-label, the Blue Flag. This is given to beaches and marinas where environmental protection is a high priority in site management and information encourages care for the environment.

The award is granted for one season at a time on the basis of compliance with 26 criteria for beaches and 16 for marinas. These criteria cover the same four areas for both beaches and marinas:

- Water quality;
- Environmental management;
- Safety, services and facilities;
- Environmental education and information.

At a local level, participation in the European Blue Flag campaign requires cross-sectoral co-operation between local environmental authorities and private enterprises such as hotels, beach operators and marinas, tourism organisations and local environmental groups.

There is growing interest in the Blue Flag Campaign from countries and regions outside Europe. Contact has been made with South Africa, Mozambique, South-East Asia, Egypt and the USA, with a view to implementing the Campaign in these areas.

For further information on the Blue Flag Campaign, contact the organisation at their internet website (www.blueflag.org).

6.4.3.4. GREEN GLOBE

GREEN GLOBE is a worldwide environmental management and awareness programme developed by the World Travel and Tourism Council for the Travel and Tourism industry. The programme is open to companies of any size, type and location that are committed to improvements in environmental practise. The primary objective of GREEN GLOBE is to provide a low-cost, practical means for all Travel and Tourism companies to:

- Commit to undertaking improvements in environmental practise based on international guidelines;
- Receive expert help in environmental management techniques based on international best practise;
- Demonstrate their commitment through the GREEN GLOBE logo and special achievement awards.

GREEN GLOBE members are offered a wide range of support services, including training, education, and practical management materials. The GREEN GLOBE self-help guides focus on both operational issues and corporate policy matters and provides examples of best practise, evolving environmental trends, and cost-saving techniques. Support services are tailored to the six sectors that make up the Travel and Tourism industry (hotels, office facilities, restaurants and catering facilities, tour operators and travel agents, transport and visitor attractions).

The programme helps consumers to recognise companies that are committed to environmental improvement through the GREEN GLOBE logo, which participants may use on marketing and publicity materials.

For further information, contact:

GREEN GLOBE Office
20 Grosvenor Place
London SW1X 7TT
United Kingdom
Tel: + 44 171 930 8333
Fax: + 44 171 930 7779

6.4.3.5. Tourism Associations

Full details of international and regional Tourism Associations are provided in **Annex 9.**

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GLOSSARY OF TERMS

Accreting beach – A beach that accumulates sand in the long term (over several years). A multiple dune ridge system is characteristic of an accreting coastline. These areas are normally associated with rivers carrying large volumes of sediment to the sea. Man-made structures, such as harbour breakwaters, can cause accretion on the updrift side, but this is normally matched by erosion on the downdrift side.

Auditing – A systematic, documented periodic and objective evaluation of how well environmental management systems and equipment are performing with the aim of helping to safeguard the environment by: (i) facilitating management control of environmental practises; (ii) assessing compliance with company policies, which would include meeting regulatory requirements.

Authority – National, regional or local authority which has a decision-making role or interest in the development.

Backdune – The oldest dune, usually naturally stabilised with woody vegetation, situated behind the fixed foredunes.

Blowouts – These are gaps in fixed dunes through which the sand is being actively transported by wind. Blowouts are often the result of disturbances such as pathways, vehicle tracks, etc, where the vegetation has been destroyed. The onshore winds then move the sand inland, burying and killing vegetation in its path.

Conservation – The act of maintaining all or part of a resource (whether renewable or non-renewable) in its present condition in order to provide for its continued or future use.

Development – The act of altering or modifying resources in order to obtain potential benefits.

Ecosystem – A community of plants, animals and organisms interacting with each other and with the non-living components of their environment.

Environment – The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group. These circumstances include biophysical, social, economic, historical, cultural and political aspects.

Environmental Impact – An environmental change caused by some human act.

Eroding beach – a beach that loses sand in the long term (over several years). A beach could be eroding because of natural processes, or perhaps because its natural sand supply has been cut off as a result of human interference.

Estuary – That portion of a river system closest to the sea, within which there is a gradual transition in physical, chemical and biological characteristics from river water to sea water.

Exotic vegetation – General term for foreign vegetation introduced to stabilise areas, such as timber wood or garden plants. This vegetation is cultivated for its visual beauty. It is not necessarily invasive.

Fixed dunes – Dunes that are stabilised by continuous woody vegetation cover. Fixed dunes may comprise both foredunes and backdunes.

Floodline, 1:50 year – The level reached by the water body, river, stream or watercourse during a 1:50 year flood event (the most severe flood which could be expected to occur within a 50 year period).

Floodplain – The flat, low-lying land between the water body and its 1:50 year flood line.

Foredune – Dune closest to the beach.

Habitat – The natural home of an organism or community of organisms.

High water mark – The highest line reached by the water of the sea during ordinary storms occurring during the most stormy period of the year, excluding times of exceptional or abnormal floods.

Hummock dune – A low, rounded hillock or mound of sand amongst and around isolated plants.

Impacts - The outcome of an action, whether considered desirable or undesirable.

Indigenous vegetation – Vegetation naturally occurring in the country: not imported or originating from another country.

Initial assessment – A report that identifies whether there are significant impacts associated with a development.

Interested and affected parties – Individuals or groups concerned with an activity and its consequences.

Intertidal zone – Area between the low water mark and high water mark.

Invasive alien vegetation – Vegetation originating from other countries and sometimes found in domestic gardens. Invasive aliens, are able to encroach on and ultimately kill other vegetation, whether indigenous or exotic.

Lake – An area that is continuously covered by water of varying depth. The extent of the water surface may fluctuate according to the seasons or the climatic conditions. Levels will drop during dry periods, but with sufficient water supply, will return to normal.

Lead authority – The national, regional or local authority which is given the responsibility for directing or co-ordinating the assessment of a proposal that affects a number of authorities.

Littoral active zone – Beaches and foredunes together form an environment known as the "littoral active zone". Within this zone, sand is moved naturally by wind, water or gravity. No fixed structures or developments should be allowed in this zone.

Management plan – A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation.

Mangroves – These are the only trees adapted to living in salty waters. They are rooted in well-saturated soils and have evolved special aerial roots enabling the trees to "breathe".

Mitigate – The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.

Monitoring – An activity that ensures that the requirements of the *Conditions of Approval*, *Management Plan* or *Environmental Contract*, are met.

Natural Resources – Any resource provided by the biophysical environment.

Perennial flow – Watercourses with a continuous flow that only dries up during drought conditions.

Pollution - The residue of human activity which adversely affect the next user of some environmental resource.

Proponent – The individual or group proposing the activity.

Resource – Any good, service or environmental condition that has the potential to enhance social well-being.

River/stream – Any channel into which water drains and flows towards a water body or the sea. These watercourses may carry water continuously, or have no flow during certain seasons or years, or only flow during floods. Rivers generally have a more constant and stronger flow than streams.

Rocky shores – These vary in appearance, and generally include combinations of exposed rocky headlands (with vertical rock faces) and wave-cut rocky platforms (made up of low-lying and more horizontally-orientated rocky surfaces).

Saltmarsh – Vegetation that is specially adapted to withstand salty conditions, including extremely salty areas. This vegetation is usually found on flat, low-lying areas adjacent to estuaries and lagoons. The major controlling factors for saltmarsh establishment and distribution include; (i) the height above low water mark, (ii) the nature of the underlying rock or soil, (iii) the tidal influence, and (iv) the range of salt gradients that may occur in the water body.

Sandy beach and dunes – Dunes are mounds or ridges of loose wind-blown sand that may or may not be covered by vegetation.

Scoping – A procedure for narrowing the scope of an assessment and ensuring that the assessment remains focussed on the truly significant issues or impacts.

Screening – The classification of proposals.

Significant impacts – An impact which is regarded as important to social well-being; an impact that has crossed the threshold of significance.

Strategic Environmental Assessment (SEA) – Is the process of identifying and addressing environmental consequences (and associated social and economic effects) of existing, new or revised policies, plans and procedures. These may be at any level from international agreements to district level policy or plans.

Water body – General collective term for areas covered by water.

Water table – The underground depth below which the space between the soil grains is filled with water. Normally this is a variable depth that roughly follows the contours of the ground surface above, and intersects with ponds, lakes, streams or springs. Its depth can also fluctuate seasonally or over longer periods.

Wetland – Area that is flooded or saturated by surface water or groundwater. This normally occurs frequently enough to support vegetation adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

ANNEXES

Annex 1. Details of Ministries and other agencies that co-ordinate and/or advise on Environmental Assessment

COMOROS

Direction Generale de l'Environnement
Ex-CEFADER
B.P. 860
Comoros
Tel: + 269 736553
Fax: + 269 736849
E-mail: precncom@snpt.km

KENYA

Ministry of Environment Conservation
National Environment Secretariat
P.O. Box 67839
Nairobi
Kenya
Tel: + 254 2 243088
Fax: + 254 2 248851

MADAGASCAR

Ministere de l'Environnement
B.P. 571
Ampandrianomby
101 Antananarivo
Madagascar
Tel: + 261 202240908
Fax: + 261 202241919
E-mail: minenv@dts.mg, one@dts.mg

MAURITIUS

Ministry of Environment, Human Resource Development & Employment Department of Environment
2nd Floor, Ken Lee Tower Barracks Street
Port Louis
Mauritius
Tel: + 230 2124385, 2126975
Fax: + 230 2126671, 2100865
E-mail: denvmr@bow.intnet.mu
Internet website: www.ncb.intnet.mu/environ.htp

MOZAMBIQUE

Ministry for Co-ordination of Environmental Action (MICOA)
Av Accordos de Lusaka 2115
Maputo
Mozambique
Tel: + 258 1 465843, 465851
Fax: + 258 1 465849
E-mail: micoa@ambinet.uem.mz

RÉUNION

Directres des Affaires Economiques
Hotel de la Region
Avenue Rene Cassin-Moufia
B.P. 7190
97719 Sainte Clotilde

SEYCHELLES

Ministry of Environment and Transport
P.O. Box 445
Victoria, Mahé
Seychelles
Tel: + 248 224644
Fax: + 248 224500
E-mail: doe@seychelles.net

SOUTH AFRICA

Directorate of Environmental Impact Management
Department of Environmental Affairs and Tourism
Private Bag X447
Pretoria 0001
South Africa
Tel: + 27 12 310 3703
Fax: + 27 12 310 3688
E-mail: sek_cue@ozone.pwv.gov.za

TANZANIA

National Environment Management Council
P.O. Box 63154
Dar es Salaam
Tanzania
Tel: + 255 51 134603
Fax: + 255 51 135140

OTHER USEFUL CONTACTS

The World Bank
1818 H Street NW
Washington DC 20523
USA
Internet website: www.worldbank.org (Go to: "Operations and projects", then "Environmental Assessment policy" under heading; "Operational policies").

International Association for Impact Assessment (IAIA)
Internet website: www.ndsuext.nodak.edu/IAIA

Francophone Secretariat:
Secretariat francophone de l'Association (functions as an IAIA affiliate)
International pour l'evaluation d'impacts
380 St. Antoine Street West
Montreal, Quebec H2Y 3X7
Canada
Tel: + 514 288 2663
Fax: + 514 987 1567

Annex 2. Checklist of Environmental Characteristics (to determine the likelihood of significant environmental impacts of the proposed development project)(From: Department of Environment Affairs, 1992. *Checklist of Environmental Characteristics*).

1. PHYSICAL CHARACTERISTICS OF THE SITE AND ITS SURROUNDINGS

Could the proposed development have a significant impact on, or be constrained by, any of the following?

1.1 Land

- The nature of surface (e.g. old weathered surfaces)
- The nature of substrata (e.g. rock, soil, deposit)
- Unstable bedrock or faultlines
- Seismic activity
- Slope of the land
- Waterlogging of depressions
- The binding or bonding of soils
- Stability of site
- Surface subsidence
- Compressive strength of soils
- Rates of erosion or siltation by wind or water
- The potential of soils to be used for formal/informal agricultural purposes
- The potential of soils to be used for commercial purposes
- Access to mineral deposits
- The availability of topsoil or fill material
- The management of excess soil or spoil material
- Unique geological or physical features
- Mobile sand dunes
- Prominent landscape features
- Existing physical degradation of the local environment
- Conservational or recreational value of indigenous forests and other vegetation types

1.2 Freshwater systems

- Streams or river channels
- River flow
- Natural drainage patterns
- Engineered drainage patterns
- Drainage limitations
- The water table
- Run-off as a result of the hardening of surfaces, or loss of the sponge effect of vegetation
- Ability to absorb run-off
- Changes to floodplains
- The quality of quantity of surface water, groundwater or public water supplies
- Conservational or recreational value of rivers, streams, lakes, wetlands, dams or islands
- Threats to hydrological functioning through existing or altered;
    - pollution
    - turbidity
    - salinity
    - chemical processes or nutrient balances
    - changes in sediment flows and siltation rates
    - canalisation
    - impoundment construction
    - water extraction

1.3 Marine and estuarine systems

- Prominent coastal features such as coastal cliffs
- Existing or altered processes such as;
  - wave and tidal action
  - deposition/removal of sand
  - sedimentation rates and patterns
  - turbidity
  - salinity
  - chemical processes or nutrient balances
- Inherently unstable ecosystems such as mobile sand dunes
- Rocky and sandy shorelines
- The seabed and subtidal areas (e.g. coral reefs)
- Coastal islands
- Functioning of estuary systems (including mangrove systems)
- River mouths

1.4 Climate

- Wind strength, direction and frequency
- Frequency of flash-floods
- Rainfall patterns
- Fluctuations in temperature or humidity
- Intensity of inversions
- Dispersal or influx of pollutants
- Global warming and sea-level rise

2. ECOLOGICAL CHARACTERISTICS OF THE SITE AND ITS SURROUNDINGS

Could the proposed development have a significant impact on, or be constrained by, any of the following?

2.1 Vegetation

- Survival of rare or endangered plant species
- Diversity of plant communities
- Sand-trapping vegetation such as that found on foredunes
- Vegetation communities of conservation or scientific importance
- Conservation of vegetation communities of particular recreational value
- The introduction or spread of invasive alien seeds and plants
- Natural replenishment of existing species
- Frequency of bush fires
- Frequency of use of off-road vehicles
- Amount of trampling of special areas of vegetation
- Firewood collection
- Overgrazing
- Over-exploitation
- Genetically engineered organisms

2.2 Animals

- Survival of rare or endangered animals
- Diversity of animal communities
- Animal communities of particular scientific, conservational or educational value
- Natural migration of species

- Survival of animal communities of particular recreational value
- Non-resident or migrant species
- Alien species (including invasive and domestic species)
- Survival of animal communities due to;
  - frequency of bush fires
  - threat from poaching
  - frequency of use of off-road vehicles
  - intrusion of roads and fencing
  - over-exploitation
- genetically engineered organisms

2.3 Natural and semi-natural communities

- Local, regional or national importance of the natural communities (e.g. economic, scientific, conservational, educational)
- Compatibility of the development and the natural communities
- Appropriateness of conservation methods to be employed
- Ecological functioning of natural communities due to;
  - physical destruction of the habitat
  - reduction in the effective size of the community
  - quality and flow of groundwater
  - quality of standing or flowing water
  - oxygen content of the water
  - salinity
  - turbidity
  - flow rate
  - temperature
  - level of chemical and other forms of pollution
  - eutrophication
  - toxins such as effluents or poisons
  - siltation patterns
  - air quality
  - levels of dust pollution and deposition
  - availability of food
  - the construction of access routes, roads and pathways
  - recreational pressure
  - secondary or cumulative impacts affecting other natural communities
  - presence or introduction of alien invasive species
  - rehabilitation potential
  - predator/prey relationships
  - barriers to animal movement or migration
  - altered fire regime

3. CURRENT AND POTENTIAL LAND-USE AND LANDSCAPE CHARACTER

Could the proposed development have a significant impact on, or be constrained by, any of the following?

3.1 General considerations applicable to all development proposals

- Compatibility of land-uses within the area
- Aesthetic quality of the landscape
- Sense of place within the area
- Character of the area
- Compatibility with the scale of developments in the area
- Compatibility with building materials used in the area
- Preservation of scenic views and valued features
- Revitalisation of run-down areas
- Landscaping plans and/or site restoration proposals

- Need for buffer zones to allow for natural processes such as coastal erosion, windblown sand and changes in river channels
- Political considerations such as land claims and historical rights
- Legal considerations such as servitudes and rights of way

3.2 Urban open space, protected and recreational areas

- Urban open space systems or recreational areas
- Natural features such as streams and ridges
- Natural heritage sites
- Changes in use or intensity of use
- Pressures on recreational facilities and open space systems
- Enhancement or linkage of facilities and open space systems
- Rehabilitation of disturbed or degraded sites
- Improved or public amenity
- Potential for harbouring vagrants and criminals

3.3 Residential areas

- Need to displace people or affect existing housing
- Lifestyle, neighbourhood character or stability
- Quality of life within the residential area
- Effect on views; overlooking and privacy
- Effect of overshadowing causing loss of sunlight hours
- Compatibility with the surrounding residential developments
- Community cohesion
- The needs of the elderly, handicapped or other special interest groups
- Community safety aspects such as lighting, open areas and policing
- Adequacy of infrastructure to service the area (see also Section 6)
- Access and movement patterns
- Change in the volume of through traffic
- Property values and local tax base

3.4 Commercial areas

- Character of urban centre
- Volume of traffic and adequacy of vehicular access
- Inappropriate siting
- Provision of parking
- Adequacy of pedestrian walkways
- Conflicts between vehicular and pedestrian traffic
- Safety of the area and surveillance
- The rate of decay or change in character of the area

3.5 Industrial areas

- Volume of traffic and adequacy of vehicular access
- Provision of parking
- Levels of pollution - gas emissions, effluent or solid waste
- Polluted street run-off
- Aesthetic quality of the area

3.6 Agricultural and sylvicultural areas

- Use of high-potential farmland
- Use of areas available for commercial forests
- A need for buffer zones or greenbelts to contain urban sprawl

- Availability of water
- Pollution levels of air and local water supplies by fertilisers, pesticides or feedlots
- Disease control activities such as crop-spraying
- Levels of toxins, dust and bad smells in the air
- Rate of soil erosion and sedimentation
- Bush encroachment
- Damaged land due to overgrazing or bad farming methods
- Spread of invasive alien plants
- Provision of housing and educational facilities

4. CULTURAL RESOURCES

Could the proposed development have a significant impact on, or be constrained by, any of the following?

- Structures and sites of architectural, cultural or historic heritage
- Sites of archaeological or palaeontological importance
- Special attraction of local sites, traditions or events
- Sites or areas of religious or spiritual significance
- Sites or areas of special social or cultural interest
- The integrity of cultural resources

5. SOCIO-ECONOMIC CHARACTERISTICS OF THE AFFECTED PUBLIC

Could the proposed development have a significant impact on, or be constrained by, any of the following?

5.1 Demographic aspects

- Growth rate of the local population
- Location, distribution or density of the population
- Existing age or gender composition of the population
- Existing biographical composition of the population
- Existing migration movements
- Inflow of tourists

5.2 Economic and employment status of the affected social groups

- Economic base of the area
- Distribution of income
- Local industry
- Rate and scale of employment growth
- Labour needs and the spare labour capacity of the area
- Movement of labour away from existing employment in the area
- Competition through non-local labour moving into the area
- Non-local labour remaining in the area after completion of the development
- Pressure placed on particular skills, age range or gender needs
- Job opportunities for school leavers
- Short- and long-term unemployment trends

5.3 Welfare profile

- Incidence of crime, drug abuse, or violence
- Extent of homelessness and overcrowding
- Adequacy of services
- Adequacy of support systems such as creches and shelters for destitute children
- Quality of life (see also Section 6 on infrastructure and Section 7 on community services and facilities)

5.4 Health profile

- Availability of clinics/health services

- Incidence of disease
- Incidence of mental illness
- Threats to health from pollution (see also Section 8 on pollution)

5.5 Cultural profile

- Existing lifestyles, household composition and family network
- Religious and cultural attitudes, outlooks and expectations of the local population
- Cultural or lifestyle diversity
- Cultural or lifestyle stability

6. INFRASTRUCTURE SERVICES

Could the proposed development have a significant impact on, or be constrained by, any of the following?

6.1 Energy supply

- The demand for power and its effect on peak and base loads
- Planned provision of power for the area
- Power generation and associated infrastructure
- The need for new transmission lines
- The adequacy of emergency power facilities
- The danger to the local community and the environment or processing units in the case of a major power failure
- Availability of alternative fuel source

6.2 Water

- Water rights
- Wasteful or excessive water requirements
- Planned provision for water supply to the area
- Adequacy and reliability of water supply
- Adequacy of groundwater reserves
- Adequacy of emergency supply system
- Need for additional abstraction
- Schemes for construction of new supply reservoirs
- Need for additional purification systems
- Need for appropriately sized or located impoundments
- Need for new pipelines
- Danger to local people and industry in the event of a major water supply failure

6.3 Waste management

- Efficiency and capacity of existing waste management facilities
- Extent of contribution to centralised waste-processing facilities
- Ability to provide necessary facilities for new pipelines
- Risk associated with waste transport
- Adequacy of emergency waste disposal facilities
- Risk to the community and the environment should the facility break down
- Hazard of groundwater pollution
- Danger of rodents and scavengers at waste sites
- Potential for windblown or waterborne refuse pollution
- Visual and smell effects of waste sites and treatment works
- Hazard of birds to air traffic near sewage ponds and landfill sites
- Utilisation of treated waste water and recycled materials
- On-site waste management potential

6.4 Transport networks

- Existing transport networks
- Present patterns of circulation or movement of people and/or goods
- Generation of more private and public traffic
- Adequacy of existing road networks
- Adequacy of existing parking facilities
- Adequacy of existing traffic management schemes
- Need for and desirability of additional road schemes over and above those which have been planned
- Temporary access roads used for the development
- Viability of the rail service
- Rail capacity
- Need for additional rail links
- Adequacy of harbour facilities
- Need for expanded harbour and related facilities
- Adequacy of air transport facilities
- Ability of commerce and social facilities to locate along route

6.5 Education

- Demand for specific types of technical skills training
- Demand for specific types of industrial training
- Adequacy of existing technical institutions
- Adequacy of nursery, junior and secondary education facilities
- Demand which exceeds the planned provision of educational facilities
- Pre-school facilities

6.6 Housing

- Property values
- Potential conflict over land-use
- Availability of housing stock
- Need to release additional land for housing developments
- Acceptability of such land release
- Adequacy of infrastructure for further housing developments
- Ability of private or local authority to provide housing
- Compatibility of planned development with existing housing
- Location for suitable housing sites
- Sites suitable for construction camps
- Standard of provision of facilities required by authority
- Design and layout of site facilities
- Use to which construction camp may be put after termination of the construction period

6.7 Telecommunication

- Existing telecommunication network
- Installation of additional telecommunication transmission lines or facilities

6.8 Financial implications to region

- Job creation and economic opportunity
- Enhancement of regional self-sufficiency
- Financial programmes of responsible authority
- Comparative wage rates between those of existing employment in the local area and those offered by the new development

- Insurance rates
- Cost implications of the supply of energy, water, waste management, transportation, education, housing and telecommunication

7. SOCIAL AND COMMUNITY SERVICES AND FACILITIES

Could the proposed development have a significant impact on, or be constrained by, any of the following?

7.1 Health service facilities

- Adequacy of temporary facilities during construction phase of developments
- Adequacy of on-site health facilities
- Adequacy of facilities for primary health care (e.g. screening facilities for tuberculosis or AIDS, family planning advice)
- Adequacy of the existing health services to cope with increased population
- Projected provision of health service facilities
- Need for additional facilities

7.2 Emergency services

- Adequacy of existing emergency services (e.g. fire and ambulance services)
- Projected provision of services to meet increased demand
- Need for additional emergency services
- Adequacy of the emergency and safety services provided by the developer
- Ability of the local resources to deal with emergencies

7.3 Recreational facilities

- Adequacy of existing facilities
- Projected provision of facilities to meet increased demand
- Need for additional services
- Recreational and service facilities in the workplace

8. THE NATURE AND LEVEL OF PRESENT AND FUTURE ENVIRONMENTAL POLLUTION

Could the proposed development have a significant impact on, or be constrained by, any of the following?

8.1 Air pollution

- Existing levels of atmospheric pollution
- The nature of air pollution, such as ozone-depleting gases, acidic compounds and toxic substances
- Extent of the local build-up of pollutants due to inversions
- Compounding of effects with existing pollutants or other chemicals in the atmosphere (e.g. photochemical smog production)
- Smog formation and reduction in visibility
- Quantity and type of particulate matter produced with reference to size, composition and chemical stability
- Production of offensive odours
- Pollution of sensitive areas
- Effects on human health, crops, wildlife, livestock and other potentially affected organisms
- Effects on stonework, buildings or works of art

8.2 Water pollution

- Level of water pollution
- Highly localised levels of pollution
- Pollution of surface waters from polluted underground waters
- The concentration of pollutants due to variations of water flow

- Localised pollution build-up through changes in salinity gradients and/or current movements
- Effective dispersal mechanisms
- Salinization of fresh waters
- Synergistic or compounding effects with existing pollutants
- Production of offensive odours
- Effect of treated or untreated effluent on the flora and fauna of river, lake, canal, estuary or coastal waters
- Effects on dependent natural communities through changes in aquatic fauna and flora
- Effect of irrigation schemes
- Effect on recreational activities

8.3 Noise, vibration and lighting

- Increase in ambient noise, vibration, or illumination levels
- Length of time that there will be noise, vibration or lighting impacts
- Exacerbation of "creeping" ambient noise levels
- Peace and quiet of residential areas either during day- or night-time
- Change in the quality of life due to artificial lighting
- Functioning of schools, hospitals and old people's homes or informal recreation areas
- The need for individual protection against noise
- Levels of annoyance and discomfort due to vibration caused by such activities as blasting and pile-driving
- Structural damage caused to buildings by vibration
- Effects on wildlife of nature reserves, sites of special scientific interest, or high-quality habitat of local significance
- Reduction of wilderness quality in declared wilderness areas

8.4 Visual pollution (see also Section 3 on land-use and landscape character)

- Existing level of visual pollution
- Reduction in aesthetic quality of the environment through;
  - sign-boards and advertising
  - overhead transmission cables and telephone wires
  - unsightly or inappropriate walls, buildings, roads or other installations

8.5 Solid or liquid waste and by-product disposal

- Existing or proposed water disposal plans
- Choice of alternative means of disposal
- Alternative means of disposal
- Alternative treatment technologies
- Choice of disposal sites
- Biological and chemical characteristics of the leachates generated within the disposal site
- The quantity of leachates produced
- Measures to reduce or treat leachates
- Potential pollution of nearby surface waters
- Potential groundwater pollution
- Waste minimisation potential of process
- Containment and treatment of wastes at site of generation
- Final disposal option
- Gas emissions from landfill
- Allowance for physical and chemical variation in waste generated
- Visual intrusion caused by waste disposal site or disposal plant
- Potential health hazard to nearby residents
- Suitability of traffic to transport the waste materials
- Proposed after-use of the site and its management

9. RISK AND HAZARD

Could the proposed development have a significant impact on, or be constrained by, the following?

- The level and identity of hazard to the public
- Probability of occurrence
- Extent of effect - local, regional or panoramic
- Standards required for process equipment in chemical and processing industries
  - safety and design reviews
  - safety audits
  - hazard and operatability reviews
  - failure mode and effect analysis
- Workers' safety/degree of risk
- The level of risk and hazard for other living organisms

10. HEALTH AND SAFETY

Could the proposed development have a significant impact on, or be constrained by, the following?

- Effects in the workplace through;
  - dust, fume and particulate matter
  - noise
  - odours
  - gases
  - vapours
  - use of dangerous chemicals
  - lighting
  - heat
  - cold
  - noise
  - vibration
  - radiation
  - protective clothing and equipment
  - access to recreational facilities
  - risk of workplace accidents
  - risk of major disasters involving multiple loss of life or injury
  - availability of services such as creches, factory-based health services, canteens, changes rooms, toilets
- Effects in the surrounding areas through;
  - dust
  - fumes
  - particulate matter
  - noise
  - vibration
  - radiation
  - odours
  - gaseous emissions
  - vapours
  - use of dangerous chemicals
  - lighting
  - risk of major disasters involving explosions or major leaks of toxic liquids or gases
  - solid waste disposal techniques
  - liquid waste effluent and disposal

11. CUMULATIVE AND SYNERGISTIC EFFECTS

Could the proposed development have a significant impact on, or be constrained by, and of the following?

- The ability of the natural and social environments to assimilate cumulative stresses placed on them
- The likelihood of negative synergistic effects
- Existing or future development rights because of a precedent being set

12. ENHANCEMENT OF POSITIVE CHARACTERISTICS

Could the proposed development be modified to enhance the positive aspects of the following?

- Any of the characteristics listed in points 1 to 11 above

Annex 3. Recommended List of Activities for which initial assessment should be required. Activities apply to tourism developments and associated infrastructure (Modified from: Department of Environment Affairs, 1992. *The Integrated Environmental Management procedure*).

Policy and planning programmes

1. Zoning schemes
2. Re-zoning applications
3. Subdivisions
4. Land acquisition for national parks, nature reserves, marine reserves, protected natural environments or wilderness areas
5. Establishment of townships
6. Declaration of limited development areas
7. Formal disposal of waste

Project proposals

1. Power generation facilities (power output > 1 megawatt) and electrical substations and transmission lines having equipment with an operating voltage in excess of 30 000 volts rms phase-to-phase
2. Major roads
3. Railways
4. Commercial aerodromes
5. Ports harbours and marinas
6. Major pipelines
7. Cableways and cableway stations
8. Television and radio transmission masts
9. Major canals, aquaducts, river diversions and water transfers
10. Permanent flood control schemes
11. Major dams
12. Buildings with a floor space of 500 square metres or more
13. Public transport mode transfer facilities
14. Reclamation of land from the sea

Annex 4. Recommended List of Environments for which initial assessment should be required (Modified from: Department of Environment Affairs, 1992. *The Integrated Environmental Management procedure*).

Designated areas or features

1. Limited development areas
2. Protected natural environments
3. National, provincial and municipal reserves
4. Private nature reserves
5. Mountain catchment areas
6. Wilderness areas
7. National monuments
8. Shipwrecks
9. Archaeological and palaeontological sites
10. Graves and burial sites
11. National gardens of remembrance
12. Conservation areas
13. Off-shore Islands
14. Intertidal zone
15. Admiralty reserve
16. Lake areas
17. National heritage sites
18. Sites of conservation significance

Demarcated areas or features

1. Estuaries and lagoons
2. Streams and river channels, and their banks
3. Floodplains
4. Wetlands
5. Lakes
6. Dunes
7. Beaches
8. Reefs
9. Indigenous forests
10. High potential agricultural land
11. Caves
12. Green belts or public open space in municipal areas
13. Architectural precincts
14. Buildings
15. Battle sites
16. Burial sites
17. Immovable property
18. Landscapes
19. Islands in rivers
20. Biotic assemblages and communities
21. Habitat of Red Data Book species
22. Bird migration sites
23. Aquifers and aquifer re-charge areas
24. Areas with a high natural water table
25. Unstable soils
26. Natural resource areas (including minerals)
27. Sites of geological significance
28. Geologically and geotechnically unstable areas
29. Areas of outstanding natural beauty
30. Scenic drives and panoramic views

31. Areas or sites of special scientific interest
32. Areas or sites of religious or spiritual significance
33. Areas or sites of special social, cultural or historical interest
34. State land

Annex 5. Description and Terms of Reference for the Banyan Tree Beach Resort Project, Anse Intendance, Mahe [114]

Applicant: Sorento Estate Ltd
Designated Development: Intendance Five Star Resort Project
(Banyan Tree Beach Resort)
Location: Intendance, Mahe

Preamble

Pursuant to Schedule 1, Regulation 3(1)(b) of the Environment Protection (Impact Assessment) Regulation 1996, a hotel development is a prescribed project. Under Section 15(1) of the Environment Protection Act, the preparation of an Environmental Impact Assessment (EIA) is required when an application is made to the Authority for Environmental Authorisation.

The impacts of hotel developments vary widely according to their type, size and location. Hotel developments tend to be proposed in areas of high environmental value (such as coasts and islands) and care needs to be taken to ensure that this environmental value is able to be maintained given the proposed increased usage of the site. Additionally, hotel developments have been regarded as contributing to a loss of community character, particularly when located close to small population centres.

Degree of detail

In preparing the EIA, it is the applicant's responsibility to address the impacts of the proposal to the degree necessary to enable the Authority to be informed of all relevant impacts of the proposal. The level and nature of investigations should be relative to the likely extent and scale of impacts. It is suggested that the applicant/consultant contact the relevant referral agencies to clarify the nature and level of investigations.

Contents

The EIA produced to accompany the application is to address the issues set out below and should generally follow the format as suggested in this document.

1. Executive summary
An executive summary of no more than 5 pages must be included. The format of the Executive Summary should generally follow the format of the EIA.

2. Alternatives to the project
Describe any prudent and feasible alternatives to the proposed development investigated during the planning process, including alternative locations for such a development, with an overview of the consequences in each case. Discussion should include the reason for choice of the preferred option, and the likely situation and use of the site if the project does not proceed. Alternatives need to include alternative technologies as in sewage or wastewater disposal systems.

3. Terms of Reference
The Terms of Reference provided by the Ministry of Environment must be included in the EIA documentation.

4. Description of the Proposal
State the objectives of the proposal and why it is needed. Describe the type of development proposed including information on:
- Location of the site (including map);
- Detailed concept and staging proposed;

[114] Information supplied by: Ministry of Environment and Transport, Division of Environment, Seychelles.

- Prospects or proposals for expansion;
- Location criteria, including constraints;
- Area of land required for development;
- Number of residential units, allotment size, and resultant population size and structure likely to be generated by the development.

Provide details of the development including:
- Construction timetable;
- Quantities, nature and sources of materials required for fill, construction and operation, access routes and methods of moving materials to and from site;
- Extent and methods of blasting/excavation, extent of earthmoving, and methods of spoil disposal;
- Construction methods and containment/disposal of construction spoil;
- The machinery and equipment to be used for excavation and construction;
- Building design limitations and standards (e.g. height, materials, aesthetic value);
- Life of operations and employment projections; and
- Hours of work;
- Temporary housing and on-site sanitary facilities.

State and discuss pollution management strategies and control measures to be used, including;
- Control measures to be taken during construction to minimise dust, noise, air, water pollution and sediment loss in rainfall run-off;
- Impact of dust nuisance during construction stage, including that associated with access roads should be detailed;
- Proposed sewage treatment method and proposed staging of the works.

Effluents Standards to be met
The effluent standards should be mentioned for the different options for the discharge that may depend on the location of the discharge point and disposal method.

A special attention should be paid to the following parameters:
- Total Suspended Solids (TSS);
- Chemical Oxygen Demand (COD);
- Biological Oxygen Demand (BOD);
- Ammonium (NH_4^+);
- Nitrites (NO_2^-);
- Nitrates (NO_3^-);
- Total Nitrogen Kjeldahl (NTK) = Organic Nitrogen = $N\text{-}NH_4^+$;
- Total Nitrogen (NGL) = NTK + $N\text{-}NO_2$ + $N\text{-}NO_3$;
- Total Phosphorus (Pt)
- Faecal Coliforms (FC)
- Faecal Streptococcus (FS)

Pollution management and control
State and discuss pollution management strategies and control measures to be used to handle influents and effluents produced under all operating conditions including:
- The control of air emissions and odours to meet occupational and environmental standards;
- The control of occupational and environmental noise;
- Pay particular attention to the sludge disposal by:
    - Evaluating the frequency for desludging, the quantity and the quality (particularly concentration) of the sludge;
    - Forecasting sludge storage (3 months at least) related to the local material means and availability of sludge transport.

Receiving water bodies

A special survey should be provided if the effluent discharge is made to superficial waterbodies (constructed wetland, reef flats, etc). The following aspects should be covered:

- Definition of the catchment area and its characteristics (geology, vegetation cover, pedology, human activities, etc);
- Physical-chemical parameters;
- Biological parameters;
- Existing or planned activities in the water area (bathing, fishing, etc);
- Assessment of the degree of pollution of the waterbodies.

Waste management/minimisation

- Describe all waste products and methods employed to reduce waste including recycling, reusing, exchanging, composting, and/or treatment or disposal.

Developed site

Provide details and plans of the site area and layout showing:

- Distance to boundaries;
- Slopes and elevations;
- Site drainage and erosion controls.

The following details relevant to the proposed site and surrounding area should also be described:

- Laws and policies applying to the development;
- Approvals required for the project and expected program for approval applications;
- Land tenures affecting the site and surrounding areas that can be affected by the development;
- Past and current usage of the site and surrounding area, current applications or approvals, and;
- Existing infrastructure facilities available on and adjacent to the site.

5. Description of Environment and Assessment of Potential Impacts

Describe the area surrounding the proposed site including information on: buffer distances from the site to alternative land-uses; location of closest residences and business premises; aesthetic and landscape values.

In addition, detail overall environmental protection measures incorporated in the design, siting, layout, landscaping, rehabilitation and associated works to minimise impacts on the environment. Taking into account the adequacy of controls and safeguards, assess the impact of the development during construction and operating phases. Information required includes:

Topography

A description of the proposed site in relation to the catchment system and any waterways on, or near, the site. Contour information for the site should be detailed at 10 metre increments on a map (at suitable scale).

Soils and Geology

- A description and map (at suitable scale) covering areas to be disturbed with particular reference to those physical and chemical properties of the materials which may influence erosion potential, a rehabilitation programme, or the quality of water leaving the site;
- Landscaping especially in steep terrain.

Hydrology

- Describe the surface and ground water quality and quantity in the region of the project. Details provided should include a description and map of existing surface drainage patterns, flows in each stream, the nature and extent of flooding, and a description of present downstream water uses. Predict the quality of wastewater to be produced and indicate any effects on water quality of nearby watercourses. Assess the effect of the development on nearby watercourses;

- Fresh water supply resource;
- In the event that a desalination plant is to be utilised, the following should be addressed:
    - Sea outfall;
    - Chemicals to be used;
    - Impact on ground water resource;
    - Noise.

Flora

- A vegetation map with particular attention paid to populations of regional significance. The description should contain an assessment of the regional significance of native vegetation and a statement of the potential impacts of the proposal on the terrestrial and aquatic flora in particular any endemic or endangered species. The degree of disturbance to the landscape, stage of regeneration of the vegetation, and the level of weed infestation should be outlined;
- Particular attention to be paid to coastal replanting program to replace the *Takamaka* trees.

Fauna

A determination of the fauna occurring in the area, on site and at a regional scale, and a statement of the potential impacts of the proposal on the terrestrial and aquatic fauna. A description of the fauna present or likely to be present in the area should include:

- Ecosystem and habitats for indigenous species and any migratory species;
- A list of principal species, and;
- Any rare or endangered species (particular attention to be paid to nesting turtle sites).

Economic

The economic impact including costs and benefits to local, regional and state economies; effects on employment; and implications for future development in the locality including constraints on surrounding land-uses.

Social

Discuss the following:

- The effects of the proposal on various individuals and social groups in the area, including measures to mitigate and accommodate any adverse effects of the proposal;
- Visual intrusion relating to the impact of the proposal upon the existing appearance and views of surrounding areas. Consideration should be given to incorporating features within the design of the proposal to mitigate visual intrusion.

Others

- Beach and dunelands protection *vis-à-vis* set-back for construction;
- Reliability and security of electricity supply;
- Public access to the beach/car parking facilities;
- Any other relevant issues that have been discussed with the Division of Environment and other concerned interest parties.

6. Environmental Management

In respect of impacts identified that need to be controlled, an environmental management programme incorporating an Environmental Management Plan, Monitoring and Reporting should be considered. Where practicable the costs of monitoring programmes should be estimated and responsibility for monitoring programmes specified. References should be made to relevant legislation and standards.

An environmental management plan should detail any: habitat enhancement projects or rehabilitation measures; maintenance schedules; erosion and sediment management strategies; pollution control and waste management methods; and a management and administration plan outlining strategies and procedures in the event of an emergency.

Monitoring programmes should: ensure safeguards are being effectively applied; identify any unpredicted impacts requiring remedial measures; and measure any differences between predicted and actual impacts.

The reporting programme should detail: steps to be taken to correct detrimental effects identified by monitoring; and procedures for reporting on monitoring programmes and proposed recipients of reports.

7. Conclusions and Recommendations

As a result of the findings of the EIA, present a balanced overview of the proposal's net impact and provide recommendations on the proposal. This should include the identification of any alterations to the proposal considered to further mitigate environmental impacts.

8. Consultation

In preparing the EIA, the applicant/consultant should consult affected and interest groups. The EIA should detail any public comment sought from and consultation conducted with any affected groups (e.g. community, environmental, industry) in developing the proposal and preparing the EIA.

Annex 6. Recommended format for an environmental impact assessment report (Modified from: Department of Environment Affairs, 1992. *Guidelines for Report Requirements*).

Outline of format:

1. Cover page
2. Executive summary
3. Contents page
4. Introduction
5. Terms of reference
6. Approach to the study
7. Assumptions and limitations
8. Administrative, legal and policy requirements
9. Proposed actions
10. The affected environment
11. Assessment
12. Evaluation
13. Incomplete or unavailable information
14. Conclusions and recommendations
15. Definitions of technical terms
16. List of preparers
17. References
18. Personal communications
19. Appendices

Format:

Cover page - displays important information prominently and facilitate referencing. It should include; the title of the proposed development, the location, proponents, lead consultant(s)/EA co-ordinator(s), contact details, report designation (main or draft report), decision making authorities and date of submission.

Executive summary - provides a brief and accurate overview of the report, in particular highlighting the main findings and recommendations. It should be clear and concise as it will be widely circulated as a stand-alone document. It should include an outline of the proposal and a summary table of significant impacts. As a general guide, the executive summary should be approximately 10 % of the length of the main report and/or not exceed 10 pages.

Contents page - indicates the content of the report and assists the reader to locate specific sections. It should include the following elements; List of major sections of the report, list of tables, list of figures (including maps), list of appendices, page numbers of preceding elements. The contents page should be concise and for more complex reports, a more detailed table of contents can be inserted at the beginning of the chapter.

Introduction - provides background on the study or proposal and indicates how the report is structured. It should include background information, an outline of the proposal (objectives, location, proposed actions, duration of construction, life-span of development), and an outline of the report structure.

Terms of reference - provides guidelines for undertaking the impact assessment study as determined during the scoping process. It should include an outline of alternatives identified and the nature of the alternative (e.g. site, technology, sources of materials, etc). Alternatives may include the "no development" option.

Approach to the study - describes the approach to the study and objectives of the assessment. This section is important because certain sectors of stakeholders may view the proposed development with scepticism. The approach must therefore reflect the concerns of

all interested and affected parties identified and examined in the study. If a steering committee or working group was constituted to direct the study or the scoping process, this should be explained.

Assumptions and limitations - should indicate any assumptions made by the study, or limitations under which the study was carried out. It should outline the implications of assumptions/limitations on the assessment. The section should include; the stage of planning and decision-making at which the report was produced (and what decisions may already have been taken); availability of baseline information; financial, time and confidentiality constraints; implications of the constraints/limitations identified.

Administrative, legal and policy requirements - outlines compliance with administrative, legal and policy requirements. Elements which should be included are; review of the planning and administrative procedures followed, and the relevant legislation; indication of how compliance has been achieved with respect to other legislative provisions.

THE FOLLOWING THREE SECTIONS SHOULD BE CARRIED OUT FOR EACH OF THE ALTERNATIVES IDENTIFIED IN A WAY THAT FACILITATES COMPARISON BETWEEN THEM.

Proposed actions - provides a factual but non-technical outline of the project proposal. Attention should be given to those factors that are likely to give rise to significant impacts. Elements covered may include;

- Nature of development
- Surface area (coverage and floor area)
- Area of land influenced (e.g. by noise or from a visual perspective)
- Density and layout
- Height/elevation
- Architectural character
- Site access and parking provision
- Open space
- Landscaping
- Time schedule
- Phasing of development (construction/ operation/ maintenance/ decommissioning)
- Duration of each phase
- Days/hours of operation
- Description of machinery
- Output volume
- Volumes and concentrations of effluents, emissions and by-products
- Sources and quantities of raw materials
- Energy and water requirements
- Removal and disposal of waste
- On- or off-site infrastructure and stormwater management
- Support services
- Personnel
- Costs
- Location maps/layout plans

The affected environment - provides a brief description of the environment that will be affected by the development. A broad definition of the term "environment" is required, including biophysical, socio-economic, cultural, historic and political factors. The information should provide only the baseline required to assess impacts and should not be encyclopaedic. The elements of this section should include;

- Location (e.g. regional context, physical constraints, land tenure, surrounding land-uses, direction and distance to neighbouring towns, local infrastructure).
- Boundaries (of the development and of the environmental effects)
- Biophysical environment (e.g. climate, soil, geology, hydrology, topography, flora and fauna)

- Socio-economic environment (e.g. demographics, standard of living, employment levels, housing, education, services, social infrastructure, local government, and administration, water and power supply)
- Cultural and historic environment, (e.g. sites of architectural and cultural interest, visual impact)
- Interested and affected parties
- Other aspects of particular significance or value
- Reference to specialist reports which have been prepared

Assessment - synthesises and analyses information relevant to the environmental impacts of a proposal. Two elements are required; namely the methodology used, and the assessment of impacts.

1. Methodology - should include an outline of methods used to identify, assess and evaluate impacts

2. Assessment of impacts - An assessment should be carried out for each impact and the description should consider whether impacts are direct, indirect or secondary; short-term or long-term; reversible or irreversible. They may remain static or vary with time, manifest locally or regional or even have national implications. Particular attention should be paid to controversial issues. The extent to which an effect may vary and the level of certainty should be clearly stated. Mitigating actions that could be taken to prevent or ameliorate adverse impacts should be proposed and the significance of both mitigated and unmitigated impacts must be shown, using comparable methods. Where mitigation is not feasible or cost-effective, it should not be included. Compensatory measures, including trade-offs or measures to enhance the positive effects of the project, should be explored. The following points should be included for each impacts;

    - Statement of impact or effect
    - Brief description of impact or effect
    - Landowner(s)/interest group(s) affected
    - Statement of criteria for determining significance
    - Significance of impact or effect without mitigation
    - Degree of confidence in prediction

Evaluation - to weigh the information available and to determine which alternative is in the best interest of the community at large. The following should be included;

- Method of evaluation
- Comparison of alternatives
- Recommendations

Incomplete or unavailable information - indicates incomplete or unavailable information that may be of *importance* to the assessment. The following elements should be included;

- Identification of gaps in knowledge or unavailable information
- Reason for the incomplete nature of the information
- Implications for the decision-making process

Conclusions and recommendations - highlights key conclusions and presents recommendations arising from the study. The conclusion should highlight those issues that are likely to form the basis of the decision. If an alternative is to be recommended, the key factors on which the recommendation was based should be indicated. Where unavoidable adverse effects are likely, trade-offs that have been introduced in compensation should be noted. A cost-benefit analysis could be carried out if no suitable trade-offs can be identified. If a serious risk has been identified, strategies to reduce this risk should be developed, possibly in an accompanying risk assessment document. Contingency plans should be formulated to deal with accidental events. Many of the proposals undergoing a full impact assessment are

likely to require ongoing management, rehabilitation or monitoring. This section should provide an outline of issues that will be covered in a *Management Plan,* as well as an indication of the resources required to produce such a plan.

Definitions of technical terms - assists non-specialist readers and comprises a glossary of terms, with explanations in non-technical terms.

Contributors - identifies the contributors to the report and provides the following details; name; qualifications/field(s) of experience and professional affiliations; current position; contribution to the study.

References - identifies and records the material used in the study. It enables reviewers to verify details provided by the report, particularly where unpublished "grey" literature has been used.

Personal communications - identifies and records the personal communications included in the study, including both that of specialists and interested and affected parties.

Appendices - provides support for recommendations made in the main report and ensures that the main report is a streamlined and concise document.

Annex 7. Checklist of important considerations in planning tourism development

1. Tourism policy and national and regional land uses (Section 6.2.1.)

- What (if any) National or Regional tourism policy frameworks/plans are applicable? Does proposed development conform to these?
- What (if any) National, Regional or Local land-use (structure) plans or any other related plans are applicable to the area? Does proposed development conform to these?
- What activities is the coastal zone currently used for? For example:
  - Recreation
  - Tourism
  - Fishing
  - Boating or launching
  - Water sports
  - Camping
  - Off-road vehicles (4x4)
  - Mining
- Does the development require a coastal location?
- Is development planned in areas that have been identified as environmentally sensitive or potentially hazardous to development?
- Which of the following features or landforms are present in the coastal zone? For example:
  - Rivers, estuaries, floodplains, coastal lakes and wetlands
  - Rocky shores, beaches and dune systems
  - Coastal forests and mangroves
  - Cliffs and steep slopes
  - Small coastal islands

2. Rivers, estuaries, floodplains, coastal lakes and wetlands (Section 6.2.2.1.(i))

- Is development planned in areas in close proximity to rivers, estuaries, etc?
- Will development require structures to be built in the floodplain?
- Does proposed development make provision for short, medium and long-term fluctuations in water level?
- Will developments lead to hardening of surface, increased surface run-off or disturbance of habitat (e.g. wetlands, saltmarsh) and/or natural processes?
- Will development require the discharge of sewage or other effluent into the water body?

3. Rocky shores, beaches and dune systems (Section 6.2.2.1.(ii))

- Is development planned in areas in close proximity to rocky shores, beaches, etc?
- Will development require fixed structures in the *littoral active zone* of the shore?
- Will development require fixed structures on dunes? Can the *littoral active zone* and the *erosion setback line* be identified?
- Does development require access routes (vehicular, pedestrian) across dunes or beaches?
- Will development require that dune environments be re-shaped, removed, flattened or cleared of vegetation?

4. Coastal forests and mangroves (Section 6.2.2.1.(iii))

- Is development planned in areas in close proximity to coastal forests or mangroves?
- Will development require forest clearance/felling of trees?
- Does development require access routes through forested areas?

5. Cliffs and steep slopes (Section 6.2.2.1.(iv))

- Is development planned in areas located on, or in close proximity to, cliffs, etc?

- Is development planned on geotechnically unstable slopes?
- What is the nature of the slopes (steepness) on which development is planned?
- Will development employ construction methods that minimise the potential for slope destabilisation?

6. Small coastal islands (Section 6.2.2.1.(v))

- Is development planned in areas located on, or in proximity to, small coastal islands?
- Does the island have special conservation significance as a habitat for rare or endangered species?
- Does the island have adequate resources to support development?
- Will measures be implemented to avoid the accidental and/or deliberate introduction of exotic species?

7. Landscape and building design (Section 6.2.2.2.)

- Is the architectural style of planned development in keeping with existing development?
- Will planned development be located on flat, or sloping terrain?
- Will planned development influence existing viewsheds?
- Do height restrictions for development apply?
- What planning standards would be appropriate to proposed development?
- Have the advantages of clustered development with regard to the provision of infrastructure and services been considered?
- What measures have been incorporated to minimise the visual impacts of development?

8. Construction site management (Section 6.2.2.3.)

- Has an environmental management plan been formulated to address procedures for minimising/mitigating construction impacts, conservation of ecological processes, site rehabilitation and maintenance?

9. Sustainable construction (Section 6.2.3.)

- Can development make use of local materials in construction?
- Is the supply of materials for construction based on principles of utilisation of renewable resources and environmental sustainability?
- What potential exists to utilise recycled materials in construction?
- Are there risks of pollution and emission of hazardous substances associated with the use of treatments (e.g. glues, timber preservatives, paints, etc) in construction?

10. Power supply and energy conservation (Section 6.2.4.)

- Can development be linked to a national power supply grid or is the development located in a remote area?
- Has development given consideration to alternative (i.e. renewable) sources of energy supply?
- Has development made provision for energy conservation measures?

11. Water supply (Section 6.2.5.)

- Are water resources for development plentiful, seasonally available or generally scarce?
- Can the water requirements of planned development be met using either a combination of on-site (groundwater, rainwater) and/or external (e.g. municipal) sources?
- Will the demand for water by planned developments have adverse consequences for the natural environment, i.e. water required for maintenance of ecological processes, or for other human users?
- Does planned development have an especially high water demand (e.g. for irrigation), and if so, are alternative water resources available and have these been considered?

- Have measures for water conservation been addressed in development planning?
- Does the source of water meet acceptable health standards?

12. Liquid waste management (Section 6.2.6.1.)

- Is adequate infrastructure available for proper treatment and disposal of sewage effluent or are on-site facilities required?
- Has the most appropriate technical option for sewage waste treatment been established, and are the design specifications (based on the estimated waste load) adequate to ensure an acceptable quality of final effluent?
- Have routine maintenance procedures for the sewage waste treatment plant been established?
- If on-site treatment and disposal is required, is there sufficient *suitable* land available?
- If on-site treatment and disposal is required, will the facility be situated in an area characterised by any of the following?:
  - high water table
  - bedrock close to the surface
  - impermeable soils
  - proximity of steep slopes
  - presence of wells, or natural water bodies
- Will treated sewage effluent be discharged to a water body (e.g. stream, river, lake, estuary, sea), and if so, will adequate dilution be achieved to prevent disruption of ecological processes and public health problems arising?
- What water quality standards apply with regard to disposal of treated sewage effluent into surface water bodies?
- Will disposal of sewage effluent impact negatively upon water bodies used for recreational activities?

13. Solid waste management (Section 6.2.6.2.)

- Has provision been made for recycling (separation and safe storage of wastes at source)?
- Does infrastructure for waste collection and disposal exist?
- Are suitable sites available for the establishment of a landfill, or will an alternative means of disposal have to be found?
- Are proposed landfill sites characterised by any of the following?:
  - permeable soil
  - drainage channels
  - shallow soil
  - high groundwater table
  - susceptible to flooding
  - close proximity to wells, streams or boreholes

14. Air/Noise pollution (Section 6.2.6.3.)

- Will proposed development result in unacceptable noise levels or air pollution?

15. Tourism activities (Section 6.3.)

- Have management controls been set in place to minimise physical impacts to the environment due to boat activity (e.g. arising from anchoring, shoreline erosion and increased turbidity, disposal of wastes, transfer of fuel, etc)?
- Have management controls been set in place to minimise conflict between boat activities and conservation, and to minimise conflict between incompatible boat uses (e.g. sailing and powerboating)?
- Does tourism pose threats to marine resources through over-exploitation (e.g. fishing, spearfishing, bait collection, collection of corals, shells), or by creating demand (sale of curios by local inhabitants)?

- Have management controls been implemented to ensure that damage to subtidal resources (e.g. reefs, shipwrecks) by divers is minimised?

- Have management controls been set in place to protect coastal environment features (e.g. dunes, cliffs, roosting sites, nesting sites) from physical damage or disturbance due to pedestrian and/or vehicular access (e.g. hiking, 4x4 ORV routes)?
- Have Environmental Codes of Conduct aimed at the tourism industry, host communities and tourists, been established?
- Have developments established procedures for environmental management in accordance with international standards protocols?

Annex 8. Summary of some of the key issues identified and addressed by the Environmental Management Plan for Knysna Quays small boat harbour/marina canal development, Knysna, South Africa.

- Indigenous trees. Numerous indigenous trees as well as other exotic trees with historical importance were identified on the development site. The location of these was identified on the site map and actions to be taken were listed. Where trees could be retained in the development, these were protected by fencing and instructions provided to contractors to avoid disturbance/damage. Where the position of trees was such that they could not be retained in the final layout, these were either; (i) removed and re-planted at alternative sites within the development prior to construction (and similarly protected during construction activities), or (ii) felled and replaced by an equivalent number of new trees of the same species.

- Archaeological sites. Although the development site was not specifically known to contain artefacts of archaeological significance, the developers recognised the potential for remains to be found in view of the rich history of the region. Contractors documents specified that any remains found during excavations should be preserved and the National Monuments Council notified immediately.

- Sediment contamination. Historical records confirmed by geotechnical testing revealed the presence of sediment layers contaminated by creosote (a tar-based wood treatment compound) at various localities on the development site. Since these locales coincided with areas that would be excavated during the construction of the marina canal (and recognising the potential for contamination of surface waters), the EMP stipulated that all contaminated spoil should first be excavated, stockpiled separately, and then disposed of at a suitable landfill.

- Excavation of marina canal. Since the estuarine sediments contain largely fine-grained materials with the potential to substantially increase the turbidity of surface waters in the adjacent estuary, the EMP specified that the canals should be excavated mechanically (as opposed to dredging) prior to the link from the canal to the estuary being opened. The excavated spoil material still required drying on-site and retention ponds were excavated to retain silt-laden water draining from the spoil. The retention ponds allowed for settlement of much of the suspended load, and screens were employed to reduce remaining suspended loads to acceptable levels. Provision was made in the EMP for monitoring levels of suspended solids in surface waters draining back into the estuary.

- Dredging of small boat harbour. Suction dredging was employed, as opposed to mechanical dredging, since this reduces the potential for disturbance of sediments and elevation of turbidity in the adjacent estuary. Spoil from the dredging activities was treated in the same manner as spoil from the marina canal excavation.

- Compensation for loss of saltmarsh habitat. The creation of the small boat harbour basin required the loss of a small area of ecologically sensitive saltmarsh habitat. Due to the historical loss of a large percentage of the estuaries' total saltmarsh as a result of reclamation by "creeping" development, a *no net loss* principle was adopted. The development undertook the rehabilitation of an existing degraded saltmarsh elsewhere in the estuary (by removing earthwork berms) and to transplant as much as possible of the saltmarsh from the small boat harbour site to this site.

- Dust control. The development required the demolition of existing buildings. The rubble generated through demolition was broken up and used in foundations. The EMP made provision for rubble to be sprayed with water during the crushing process in order to reduce dust levels.

Annex 9. Tourism Associations: The following is a list of the main tourism organisations and their details for the countries covered by these guidelines, as well as other useful organisations.

COMOROS

Ministere du Transport et du Tourisme
Direction du Tourisme
Boite Postal 97
Place de l'Independance
Moroni
Grand Comore
Tel: + 269 732927, 732725
Fax: + 269 730071

ERITREA

Ministry of Tourism
Asmara Zone, Adm. 07
Harnet Avenue n° 129
P.O. Box 1010
Asmara
Eritrea
Tel: + 291 1 120073, 126997, 123941, 122999
Fax: + 291 1 126949

KENYA

Ministry of Tourism and Wildlife
Tourism Department
P.O. Box 54666
Nairobi
Kenya
Tel: + 254 2 24811, 331030-9
Fax: + 254 2 217604

MADAGASCAR

Ministere du Tourisme
B.P. 610
Rue Fernand Kasanga
Tsimbazaza
Antananarivo 101
Madagacascar
Tel: + 261 2 26298
Fax: + 261 2 35613, 26719

MAURITIUS

Ministry of Tourism
Emmanuel Anquetil Building, 10th Floor
Port Louis
Mauritius
Tel: + 230 210 2286
Fax: + 230 208 6776

MOZAMBIQUE

Ministry of Industry, Commerce and Tourism
Praca 25 de Junho, n° 37
C.P. 1831
Maputo
Mozambique
Tel: + 258 1 421662
Fax: + 258 1 431346, 421305

RÉUNION

Delegation Regionale au Commerce A l'Artisanat et Tourisme
Prefecture de la Réunion
Rue de la Victoire
F-97405 Saint-Denis
Réunion
Tel: + 262 407755, 407758
Fax: + 262 407701

Comite du Tourisme de la Réunion
Boite Postal 1119
23, Rue Tourette
Residence Vetiver
F-97482 Saint-Denis
Réunion
Tel: + 262 210041, 418441
Fax: + 262 202593

Federation Réunionnaise de Offices de Tourisme
Et Syndicats D'Initiatives
18, Rue Saint-Anne
F-97400 Saint-Denis
Réunion
Tel: + 262 217376
Fax: + 262 218447

SEYCHELLES

Ministry of Tourism and Civil Aviation
Independence House, Victoria
P.O. Box 92
Seychelles
Tel: + 248 225313, 224030
Fax: + 248 224035, 225131

SOUTH AFRICA

South African Tourism Board (SATOUR)
442 Rigerl Avenue South
Erasmusrand 0181
Private Bag X164
Pretoria 0001
South Africa
Tel: + 27 12 3470600
Fax: + 27 12 455182
E-mail: satour@africa.com
Internet website: www.africa.com/satour

Department of Environmental Affairs and Tourism
Fedlife Forum, North Tower, Room 432
Cnr Pretorius & Van der Walt Street
Private Bag X447
Pretoria 0001
South Africa
Tel: + 27 12 3103660
Fax: + 27 12 3229231

TANZANIA

Ministry of Natural Resources and Tourism
Tourism Department
Clock Tower Building
P.O. Box 9372
Dar es Salaam
United Republic of Tanzania
Tel: + 255 51 36601
Fax: + 255 51 46504
E-mail: md@ttb.ud.or.tz

Ministry of Foreign Affairs
Principal Secretary
P.O. Box 9000
Dar es Salaam
United Republic of Tanzania
Tel: + 255 51 21928, 21234
Fax: + 255 51 21881

OTHER USEFUL ORGANISATIONS

International Federation of Tour Operators
170 High Street
Lewes
East Sussex BN7 1YE
United Kingdom
Tel: + 44 273 477722
Fax: + 44 273 483746

International Hotels Environment Initiative
5 Cleveland Place
St James
London SW1Y 6JJ
United Kingdom
Tel: + 44 171 321 6384
Fax: + 44 171 321 6418

The Ecotourism Society
P.O. Box 755
North Bennington, VT 05250
United States
Tel: + 1 802 447 2121
Fax: + 1 802 447 2122

The Secretariat for Eastern African Coastal Area Management

The Secretariat for Eastern African Coastal Area Management (SEACAM) was launched in 1997 by the Eastern African countries to accelerate implementation of integrated coastal zone management (ICZM) in the Region following up on the Arusha Resolution (1993) and the Seychelles Statement (1996) on ICZM.

Based in Maputo, Mozambique, SEACAM is hosted by the Ministry for Coordination of Environmental Affairs (MICOA). The Secretariat assists a broad spectrum of stakeholders to improve management of their coasts in ten Eastern African countries: Comoros, Eritrea, Kenya, Madagascar, Mauritius, Mozambique, Reunion (Fr.), Seychelles, South Africa and Tanzania. A Reference Group of representatives from the ten countries guides the strategy and policies of the Secretariat.

SEACAM is designed to implement its capacity building and information sharing activities with speed and efficiency, focusing on five priority areas: (i) capacity building of local NGOs; (ii) a database of ICZM programs, projects and activities, as well as institutions and individuals; (iii) environmental assessment training in tourism and mariculture; (iv) public sector management training; and (v) sustainable financing of coastal management programs.

For further information please contact:

SEACAM
Av. Amilcar Cabral, 874
P.O. Box 4220
Maputo,
Mozambique

Tel: + 258 1 300641/2
Fax: + 258 1 300638
E-mail: seacam@virconn.com
Internet webpage: www.seacam.mz

SEACAM

Secretariat for Eastern African Coastal Area Management

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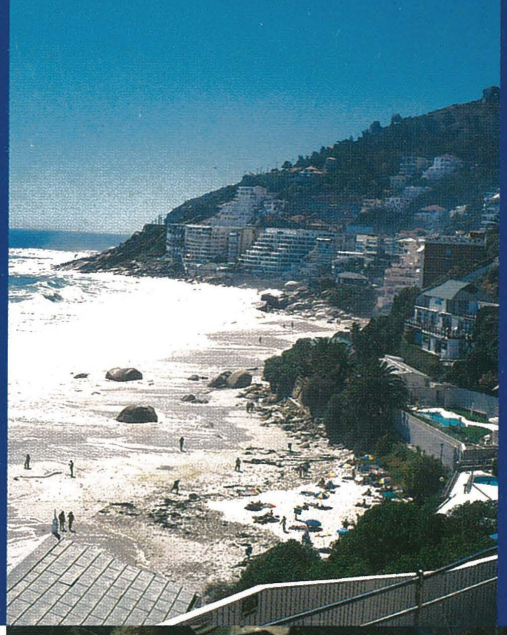

Secretariat for Eastern African
Coastal Area Management (SEACAM)

Caixa Postal 4220

874 Av. Amilcar Cabral

Maputo, Mozambique

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Email: seacam@virconn.com

http://www.seacam.mz