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Physical Alteration and Destruction of Habitats (PADH)

An Assessment of the Socio-Economic Implications of PADH due to Coastal Tourism; Mangrove Destruction; and Mining/Sediment Movement, Ports and Land Reclamation & Damming of Rivers



An Assessment of the Socio-Economic Implications of PADH due to Coastal Tourism, Mangrove Destruction, Mining/Sediment Movement, Ports and Land Reclamation and Damming of Rivers

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EXECUTIVE SUMMARY

This report presents an assessment of the social and economic importance of three priority activities contributing to physical alteration and destruction of habitats (PADH) within the coastal and marine environments on the well-being of countries in the Western Indian Ocean (WIO) region. These activities include:

- Coastal tourism - which includes issues related to land use planning such as urbanization, siting of hotels and eco-architecture, and location of tourist facilities;
- Mangrove destruction – due to salt works, aquaculture and mangrove harvesting;
- Mining/Sediment movement, ports and land reclamation and damming of rivers.

It is one of the studies assigned by the Co-ordination Office of the Global Programme of Action (GPA) for the protection of the marine environment from land-based activities of the United Nations Environment Programme (UNEP). This follows the need to identify activities that will demonstrate how to address the problems of PADH that are associated with the above-mentioned priority activities.

PADH is an issue of both social and economic significance to the countries in the WIO region. This is because coastal ecosystems contribute significantly to the economies of countries in the WIO region by providing a range of livelihood opportunities for the people and revenue for national economies. Coastal resources provide employment opportunities, income, food security, construction material and medicinal products for coastal people. Economic activities such as coastal tourism, harbours and the mining industry are also dependent on environmentally sound uses of the coastal environment to be able to contribute to the much needed GDP for these countries. Hence the significance of the coastal resources to the region's social and economic well-being cannot be over-stated.

Regrettably, physical alteration of the coastal environment and destruction of the habitats it sustains is undermining the continued prosperity of these activities. To a large extent most of these activities have been fuelled by national economic priorities that focus on those sectors that promote growth, such as tourism and port development. On the other hand, poverty and people's means of sustenance encourage unsustainable uses of resources leading to uncontrolled mangrove harvesting or cutting for household needs, or clearing areas for activities such as salt production, agriculture and mariculture. The challenge has been to balance these demands with conservation of the coastal environment on which these activities greatly depend.

An assessment of the priority activities leading to PADH raises several issues of social and economic importance that have negative implications on the well-being of countries in the region. These issues include the following:

- *Rapid population growth and infrastructural development* due to factors such as natural increase, urbanization and national economic priorities continue to put pressure on the coastal physical environments leading to extensive degradation in some places that have destabilized residences and livelihood sources;
- *Coastal tourism* that is increasingly becoming a significant contributor to national GDP is now extensively being exploited as governments as governments take advantage of its suitability to stimulate economic growth and creation of employment opportunities. Establishment of tourism infrastructure and facilities, however, have caused destruction of environments. In addition, coastal tourism has also caused

- significant levels of pollution due to inappropriate waste disposal systems and loss of aesthetic value and hence declining attractions for tourism;
- ❑ *Mangrove destruction* that is a result of uncontrolled exploitation for local domestic uses and to a lesser extent for the export market. Locally, mangrove areas also provide income from small-scale industry such as farming, solar-salt manufacturing and shrimp farming, indicating continuous demand for their exploitation,
 - ❑ *Port and harbour activities* have also been significant causes of sedimentation. This is irrespective of the fact that most ports and harbours are major trade centres for the region and beyond, commanding significant amounts of bulk cargo and contributing greatly to national income. Port and harbour activities are also dependable sources of local employment. Competition and concentration of activities in a few ports have encouraged physical expansion that has involved dredging activities of the harbours in order to improve efficiency and hence secure revenue;
 - ❑ The current concentration in exploiting *oil and gas reserves* and *mining of sand and aggregates* have increased the threat of destruction to the coastal environment by either destroying the physical features and hence aesthetic value of the land, or exposing people to the threat of health and employment problems;
 - ❑ *Intensified agriculture* using irrigation schemes or basic tools is a central component of local economies. Agriculture along the major river basins has however led to sediment movement and thus siltation that affects water quality and hydro-electric power plants. The demand for agricultural land has driven people to encroach into marginal lands and water catchments areas, including mangrove areas with disastrous effects on coastal and marine habitats.

Key implications of the resulting PADH that have threatened the social and economic well-being of countries in the region include:

- ❑ Diminishing livelihoods – due to food insecurity, lack of employment, loss of income sources
- ❑ Loss of cultural heritage
- ❑ Loss of aesthetic value
- ❑ Access and right to resources use
- ❑ Health hazards
- ❑ Displacement
- ❑ Loss of cultural identity
- ❑ Loss of revenue dues from destroyed tourist attractions,
- ❑ Increased costs of restoration of ecosystems
- ❑ High costs for maintenance of environmentally sustainable utilization practices
- ❑ Increased costs for water treatment

There are however, promising measures in addressing PADH that have been taken across the region, some of which have indeed mitigated extensive damage due to PADH. Most of these measures, in this text named best practices, are *ex ante*, indicating a gap in identification of *ex poste* measures, possibly due both to limited resources and management capacity, and to poverty. There is also a dearth of comprehensive studies on various social and economic dimensions and implications of PADH on coastal and marine environments in the region to be able to grasp the full meaning of PADH. This situation has impeded full grasping of the meaning and implications of PADH.

In view of the above, the following recommendations are thus advanced:

- ❑ Address root causes of PADH that include – poverty, equity and redistribution in utilisation and access to resources;
- ❑ Prioritise research programmes that focus on understanding the ecosystem's functioning as the starting point to achieve conservation;
- ❑ Identify and promote economically viable alternatives that are environmentally sensitive;
- ❑ Conduct studies on innovative and less costly ways of waste management along the coast to contain pollution of coastal waters and environment;
- ❑ Harmonize policies for conservation of the coastal zone within the countries and at the regional level;
- ❑ Integrate environmental concerns in national planning processes;
- ❑ Enhance the capacities of stakeholders (local communities, private sector developers, policy makers etc) to handle or address PADH;
- ❑ Strengthen enforcement of laws and institutional capacity;
- ❑ Improve and support the tradition of fishing by improving fishing methods to reduce dependence on sensitive ecosystems such as coral reefs and mangrove areas; and,
- ❑ Identify and promote alternative and feasible/usable sources of household materials.

1.0 INTRODUCTION

1.1 Background to the Study

In 2002, The United Nations Environment Programme Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) initiated a programme in the Eastern African Region with special emphasis on one out of GPA's nine Focal Areas: Physical Alteration and Destruction of Habitats (PADH). This initiative is a follow-up and response to the outcome of the First Intergovernmental Review Meeting of the GPA held in 2001 in Montreal, Canada.

The overall PADH Project aims at supporting the efforts of stakeholders in protecting coastal and marine environment against physical alterations and destruction of habitats. It focuses on sediment mobilization effects by the four economic sectors that potentially pose a threat to such habitats. Those sectors include: tourism, ports and harbours, aquaculture and mining (sand and aggregate extraction).

According to the Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), PADH is now viewed as arguably the most important single threat to the coastal and marine environment. Poor planning and accelerating social and economic development in coastal areas are the main driving forces for PADH. These problems are further exacerbated by the failure to consider the economic value of the environment when planning and implementing activities in the coastal and marine areas.

A regional meeting for PADH held in Nairobi, Kenya later the same year (2002) subsequently drew up priority issues of concern in the region regarding PADH. These issues are: tourism, mariculture/aquaculture, ports, mining, salt works, agriculture, urbanization and land reclamation. These were prioritised into three main groups namely:

- ❑ Coastal tourism - which include issues related to land use planning such as urbanization, siting of hotels and eco-architecture and location of tourist facilities;

- ❑ Mangrove Destruction, due to salt works, aquaculture, agriculture and mangrove harvesting; and,
- ❑ Mining/ sediment movement, ports and land reclamation and damming of rivers.

This report forms part of the efforts to address the problems of PADH in the region that are associated with the above priority activities. Proposed activities under the PADH component of the GPA will be cross-referenced with regional and national level initiatives/activities that contribute to the objectives of the PADH project. These include outputs of the integrated problem analysis conducted under the African Process for the Development and Protection of the Marine and Coastal Environment, particularly in Sub-Saharan Africa. The outputs cover the following priority areas that are relevant to the PADH work: coastal erosion, management of key habitats, pollution, sustainable use of living resources and tourism.

1.2 Objectives of the study

Against the above-mentioned background, this study was commissioned with the following terms of reference:

- ❑ To assess on the basis of national reports/studies prepared by national experts and other sources of information, the socio-economic importance of the three main priority activities on the well-being of the countries of the region.
- ❑ To determine overall economic valuation of the socio-economic impacts (including the costs of restoration and rehabilitation of degraded areas) as a result of PADH due to the identified priority activities.
- ❑ Taking into account the results of (i) and (ii) above, to prepare relevant conclusions and make recommendations for the necessary actions to be taken (from a social and economic perspective) at both national and regional levels for addressing issues related to PADH affecting coastal and marine resources.
- ❑ On the basis of the national studies, to prepare a set of findings, observations, conclusions and recommendations addressing the regional dimension of the issues dealt with and
- ❑ To prepare two case studies that highlight best practices/model as far as social and economic importance and impacts of PADH is concerned.

1.3 Methodology

Documentary sources were mainly used in obtaining information for producing this report. The main documents consulted were PADH country reports, UNDP and UNEP published reports, other country official reports and relevant literature on the region. Literatures that have dealt with social and economic issues particularly on the coastal zone of developing countries were also consulted.

In the analysis, the study examined, in addition to other things, the following main aspects of the social and economic impact of the priority activities.

- ❑ Cultural identity and livelihoods sustainability of coastal people;
- ❑ Direct and indirect [use] values;
- ❑ Direct and indirect effects of these activities on the economy and social well-being;
- ❑ Multiplier effects from the activities at the local, national and regional levels;

- ❑ Contribution to GDP;
- ❑ Externalities that accrue from those activities;
- ❑ Employment creation including levels of employment;
- ❑ External cooperation and positive and negative aspects on the coastal environment; and
- ❑ General perspectives with respect to impact on empowerment, equity and accessibility of people.

The study also analysed the issue of conservation and restoration, including the costs of restoration and its immediate and long-term impact on the well-being of the inhabitants of the region. Two case studies of the best conservation practices of social and economic importance have also been presented.

Limitations

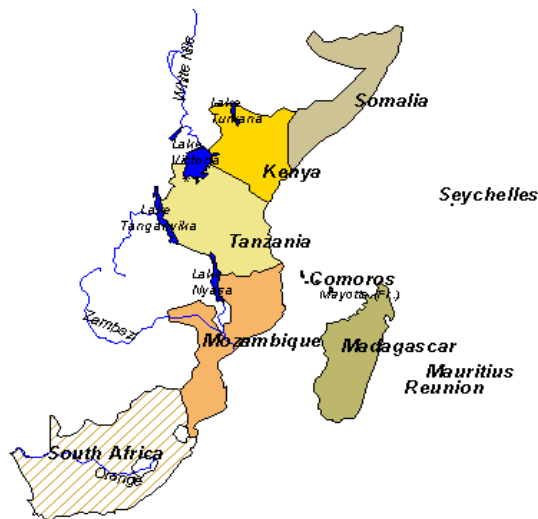
A major challenge that this assessment has faced is the lack of comprehensive social and economic studies on what can be regarded as new priorities within coastal management efforts in the region. For example, it has been difficult to get hold of analytical data on the magnitude of activities such as sand mining, ports development and sedimentation in some countries. What this assessment largely provides is thus exploratory and descriptive information on the trends and related social and economic significance and implications of these activities that may be valuable as background for future studies.

Despite this limitation, the report is able to illustrate the extent to which PADH is indeed a great threat to the social and economic well-being of the region, the challenges the region faces in terms of balancing economic interests, livelihoods of the people and coastal zone management, and the possibilities that could be captured by resource users and planners.

1.4 Scope of the Study

This study addresses the socio-economic importance of land-based activities contributing to PADH in coastal areas of the WIO region (See map of the region in Figure I). This region comprises three coastal states (Kenya, United Republic of Tanzania and Mozambique) and four island states (Madagascar, Mauritius, Seychelles and Comoro). Due to the small sizes of their areas and the proximity of any land point from the sea, most of the island states, are considered as coastal zone.

Figure I: Map of the Western Indian Ocean Region



All the WIO region states are heavily dependent on their coastal environments for the sources of food, employment, income and government revenue. Some of the main factors behind this dependence are poverty, rapid population expansion, urbanization, globalisation and adoption of more liberal economic policies as a result of market reforms. Other activities include land reclamation and construction of tourist hotels. People's livelihoods are also largely dependent on coastal resources, where their major economic activities include fishing, mining of corals, sand and aggregates, mangrove (and other coastal) forest harvesting, and tourist activities like boating, diving and curio collection. These aspects underscore the importance of coastal environments for the social and economic development of this region.

The sustainability of most of these economic activities is however seriously threatened by coastal environmental damage caused mostly by the nature of these activities themselves. A case in evidence is Madagascar (see insert). Consequently, continued social development is also threatened in these areas, and this has far reaching consequences in terms of poverty alleviation and the well-being of the citizens of these countries.

Coastal environments in danger - Madagascar

The destruction of the marine habitat - coral reefs, mangroves, marsh, algae, etc. - has had catastrophic effects on Madagascar's coastal environment. Hundreds of thousands of hectares of mangroves have been destroyed in order to build breeding ponds for shrimps. The coral reefs, where more than 25% of marine species are to be found, have been damaged by fishing tackle and through pollution. It's estimated that 10% of the coral reefs have already been destroyed and 60% could be in the same position within the next twenty years (Ramasiarisolo, 1999)

The environmental and social/economic consequences arising from these activities have been addressed by several studies (ref. studies on the root causes of biodiversity loss in the Eastern African Marine Ecoregion, EAME, 1999-2002). This study builds upon these previous ones to develop a comprehensive assessment on the social and economic implications of PADH in the WIO region with a specific focus on tourism activities, mangrove forest destruction, mining and sediment movements, ports construction and river damming.

The need for further assessment of the socio-economic impact of these activities is important to the governments of the region whose major interests are in ensuring the improved and sustainable welfare of its citizens. Logic also dictates that if the current state of affairs is allowed to continue, the entire region may be heading towards ecological and social disaster. This study can thus be taken as one of the attempts to put this issue into perspective by drawing on information from the region.

1.4.1 Brief Socio-economic Characteristics of the Coastal States in the Region

Poverty in the WIO region is still a significant problem. Most of the countries are rated among the 20 poorest states in the world (Tanzania, the Comoros and Madagascar included), with an estimated GDP per capita below US\$1000. The need to stimulate sustainable economic growth is thus very pressing. From the year 2000, the situation was however regarded as a period of continued economic growth, a performance attributed mainly to progressive implementation of macroeconomic policies in some countries in the sub-region, such as trade

liberalisation and investment policies, streamlining taxation efforts, promotion of strong business investment, particularly in transport and telecommunications, as well as favourable weather conditions.

Parallel to that, the region has also been undergoing rapid social and economic changes in the coastal environments. Firstly, population growth are said to be rapidly increasing especially around urban centres. The cities of Mombasa (Kenya) and Dar es Salaam (Tanzania) for example are among those cities in Sub-Saharan Africa said to have an annual population growth rate of 4% or higher (Hewawasam, 2002). About 8 million of Tanzania's 34.5 million people are said to live just in the coastal regions of Tanga, Dar es Salaam, Coast¹, Lindi and Mtwara. The same proportion applies to other countries in the region.

Secondly, urbanization along the coastal areas in these countries has increased at a fast pace as residential, commercial, industrial (including harbours and port construction) and recreational facilities (especially for tourism) have developed. Pollution due to uncontrolled disposal of wastes into the seas has also been noted as a problem (Mwaguni and Munga, 2003). Sedimentation due to dredging and agricultural activities, and physical alteration due to construction, mining and other activities are continuous threats. Some countries such as Kenya have also experienced oil spillage due to port activity. Yet these activities have significant contributions to the countries economic growth as the discussion in Section 2.0 illustrates.

Thirdly, increasing poverty and inflation in the region are also big challenges to communities in terms of enabling them access more environmentally friendly alternatives to household needs. The cost of living has gone up significantly and therefore there is increasing pressure on natural resources. For example in the year 2001 it was estimated that 90% of households in Madagascar depended directly on fuel wood and charcoal due to intense poverty, and inability to access environmentally sound technologies compared to only 8% of the people in the Seychelles (FAO, 2001). Subsistence agriculture remains the predominant means of livelihood for many people, as unemployment rates in the once major economic strongholds (e.g. in manufacturing, traditional cash crop production) increased. These situations have indeed added pressure on environmental and in this case on the coastal resources.

A summary of key social and economic characteristics of these countries is presented below to place these activities and their implications in context.

Kenya

Kenya, the regional hub for trade and finance in East Africa, is located between Somalia, Ethiopia, Sudan, Uganda and Tanzania, and borders the Indian Ocean. The country has a total area of 582,650 km² of which water occupies 13,400 km². It has a coastline extending to 536 km. The population of the country is 31,138,735 with a growth rate of 1.15% (2002 national estimate). The sex ratio is 1.01 male(s)/female (2002).

After a strong economic growth experienced in 1995 and 1996, Kenya's economy stagnated in the following years, with GDP growth failing to keep up with the rate of population growth. In 1997, the IMF suspended Kenya's Enhanced Structural Adjustment Program (ESAP) due to the Government's failure to institute reforms and to curb corruption. A severe drought from 1999 to 2000 compounded Kenya's problems, causing water and energy rationing and

¹ 'Coast' is the official name of one of Tanzania's coastal regions

reducing agricultural output. As a result, GDP contracted by 0.3% in 2000. The GDP (purchasing power parity) is \$31 billion (2001 est.) with a growth rate of 1% (2001 est.). The composition by sector is: agriculture, 24%; industry, 13%; and services, 63% (2000 est.). The main economic activities are small-scale consumer goods manufacturing (plastic, furniture, batteries, textiles, soap, cigarettes, flour), agricultural products processing, oil refining, cement and tourism.

Seychelles

Seychelles constitutes a group of islands in Eastern Africa in the Indian Ocean, located toward the northeast of Madagascar. It has a total land area of 455 km² and has a coastline of length 491 km. The population size is 80,098 (July 2002 est.) with a growth rate of 0.47% (2002 est.) and a sex ratio of 0.93 male(s)/female (2002 est.). Since independence in 1976, per capita output in this Indian Ocean archipelago has expanded to roughly seven times the old near-subsistence level. Growth has been led by the tourist sector, which employs about 30% of the labour force and provides more than 70% of hard currency earnings. Tuna fishing is another major employer. In recent years the government has encouraged foreign investment in order to upgrade hotels and other services. At the same time, the government has moved to reduce the dependence on tourism by promoting the development of farming, fishing and small-scale manufacturing. The GDP is \$605 million (2001 est.) with a growth rate of 1.5% (2001 est.). The composition by sector is: agriculture, 3%; industry, 26% and services, 71% (1999 estimates). The main economic activities are fishing; tourism; processing of coconuts and vanilla, coir (coconut fibre) rope, boat building, printing, furniture making and production of beverages.

Comoros

The Comoro Islands are an archipelago of four islands and several islets located in the Mozambique Channel, about ten to twelve degrees south of the Equator and less than 200 miles off the East African coast. They lie approximately halfway between the island of Madagascar and northern Mozambique at the northern end of the Mozambique Channel. The total area of the four islands is 2,034 km². The four major islands are Ngazidja, Mwali, Nzwani and Mayotte (Maore). The total length of its coastline is 340 km. The size of the population is 614,382 (July 2002 est.) with a growth rate of 2.99% (2002 est.). The sex ratio is 0.99 male(s)/female (2002 est.).

The GDP is \$424 million (2001 est.) with a growth rate of 1% (2001 est.). The composition by sector is: agriculture, 40%; industry, 4%; and services, 56% (2001 est.). Agriculture, including fishing, hunting and forestry, contributes 40% to GDP, employs 80% of the labour force and provides most of the exports. Other major economic activities include tourism and perfume distillation.

Mauritius

Mauritius is an island located east of Madagascar. Its total area is 2,040 km², which includes Agalega Islands, Cargados Carajos Shoals (Saint Brandon), and Rodrigues. The country's coastline has a length of 177 km. The population of Mauritius is 1,200,206 (July 2002 est.) with a growth rate of 0.86% (2002 est.). The sex ratio is 0.98 male(s)/female (2002 est.). Since

independence in 1968, Mauritius has developed from a low-income, agriculturally based economy to a middle-income diversified economy with growing industrial, financial, and tourist sectors. For most of the period, annual growth has been in the order of 5% to 6%. This remarkable achievement has been reflected in more equitable income distribution, increased life expectancy, lowered infant mortality, and a much-improved infrastructure. Sugarcane is grown on about 90% of the cultivated land area and accounts for 25% of export earnings. The GDP (purchasing power parity) is \$12.9 billion (2001 est.) with a growth rate of 5.2% (2001 est.). The sectoral composition of the GDP is: agriculture, 6%; industry, 33%; and services, 61% (1999 est.). The main economic activities are food processing (largely sugar milling), textiles, clothing; chemicals, metal products, transport equipment, non-electrical machinery and tourism.

Madagascar

Madagascar is a large island in the Indian Ocean, east of Mozambique with a total area of 587,040 sq km of which water occupies 5,500 km². The length of the coastline is 4,828 km. The population is 16,473,477 (July 2002 est.) with a growth rate of 3.03% (2002 est.), and a sex ratio of 0.99 male(s)/female (2002 est.). Agriculture, including fishing and forestry, is the mainstay of the economy, accounting for one-third of GDP and contributing more than 70% to export earnings. Industrial activities include textile manufacturing and the processing of agricultural products. The GDP (purchasing power parity) is \$14 billion (2001 est.) with a growth rate of 5% (2001 est.). The composition by sector is: agriculture, 34%; industry, 11%; services, 55% (1999 est.). Other main economic activities include meat processing, soap, breweries, tanneries, sugar, textiles, glassware, cement, automobile assembly, paper, petroleum and tourism.

Tanzania

Tanzania is located on the east coast of Africa, bordering the Indian Ocean, and lies between Kenya to the north and Mozambique to the south. Its total area is 945,087 km² and this includes the islands of Mafia, Pemba and Zanzibar. Water covers 59,050 km² of this area and the coastline along the Indian Ocean is 1,424 km. The population of the country is 34 million (2002 census) with a growth rate of 2.6% (2002 est.). The sex ratio is 0.99 male(s)/female (2002 est.). The economy is heavily dependent on agriculture, which accounts for half of GDP, provides 85% of exports, and employs 80% of the work force. Industry is mainly limited to processing agricultural products and light consumer goods. Growth in 1991-2001 featured a pickup in industrial production and a substantial increase in output of minerals, led by gold. Natural gas exploration in the Rufiji Delta looks promising. The GDP is \$22.1 billion (2001 est.) with a growth rate of 5% (2001 est.). The sectoral composition of GDP is: agriculture: 48%; industry: 17%; and services: 35% (2000 est.). The main economic activities are agricultural processing (sugar, beer, cigarettes, sisal twine), diamond and gold mining, oil refining, shoes, cement, textiles, wood products, fertilizer and salt production.

The establishment of a free and export processing zone at Fumba, Zanzibar, is planned for the development of several industries. This zone is expected to boost the islands economy in the near future and to improve local people's livelihood status.

Mozambique

This country is located in Southern Africa, bordering the Mozambique Channel, between South Africa and Tanzania. Its area is 801,590 km² of which 17,500 km² is water. The coastline is 2,470 km in length. The population size is 19,607,519 with a growth rate of 1.13% (2002 est.). Of these about 59% of the population live within 100 km from the coast. The pressure on resources is however great in the coastal districts whereby 40% of the total population live in the coastal districts of Mozambique which accounts for about 19% of the total land area (Hoguane *et al*, 2002). The sex ratio is 0.98 male(s)/female (2002 est.). Subsistence agriculture continues to employ the vast majority of the country's workforce. The economy is still not robust due to the historical conflicts, but the country has undergone dramatic reforms that , are helping in ensuring modest growth. A substantial trade imbalance persists, although it has diminished with the opening of the MOZAL aluminium smelter, the country's largest foreign investment project. Additional investment projects in titanium extraction/processing and garment manufacturing are helping in further closing the import/export gap. The GDP is \$17.5 billion (2001 est.) with a growth rate of 9.2% (2001 est.). The sectoral composition of the GDP is agriculture, 33%; industry, 25%; and services, 42% (2000 est.). The main economic activities apart from agriculture are production of food, beverages, chemicals (fertilizer, soap, paints), petroleum products, textiles, cement, glass, asbestos and tobacco.

2.0 REVIEW OF SOCIAL AND ECONOMIC ISSUES (BY COUNTRY)

The three priority areas of coastal tourism, mangrove destruction and mining/sediment mobilisation leading to PADH have significant social and economic value for individuals, communities and the countries in the region as a whole. Most of the coastal households depend on direct extraction of coastal resources for their livelihoods or on employment in the priority sectors. Taking into consideration most coastal people's poverty status, availability of materials such as fuel wood, foods and building materials at very low costs is important for sustenance. At the national level, the activities contribute significantly to national revenue. However, the resulting PADH from these activities has several social and economic repercussions on the well-being of people and countries in the region. An assessment of the social and economic importance of the priority activities by country is presented below.

2.1 Coastal Tourism

Coastal tourism in the region involves activities that range from construction of facilities such as beach hotels to recreational activities such as boating, diving and acquisition of curios (e.g. seashells) and corals. The scenic and spectacular coral reefs in some parts of the region provide refreshing recreation for diving and snorkelling. The general trend is that the tourism business in the WIO region is growing with rising volumes of tourists visiting each year.

The social and economic contribution of tourism is substantial. Some of its benefits include the following:

At the national level:

- Increased revenue and particularly much-needed foreign currency;

- More foreign investment in terms of tourism flows into the countries of this region; and,
- Boost in tourist related businesses through complementary activities, e.g. tour operators, airlines, suppliers of hotel goods etc.

At the local levels:

- Tourist hotels provide direct employment such as in catering, cleaning, marine guides and security to local residents;
- Local suppliers of fresh foods (e.g. fish, vegetables, etc.) enjoy lucrative markets created by these hotels;
- Tourism stimulates local industry such as - curio selling;
- Multiplier effects generated by tourism including, the flourishing of local transport and communications (e.g. taxi cabs, Internet cafes, telecommunications suppliers, etc.);
- Indirect effects to the local economies include benefiting in utility supply, entertainment, etc and,
- Opportunities for empowerment and income to women through employment (e.g. in catering, as receptionists, in housekeeping) and even the sale of local products (e.g. handicrafts, food).

Coastal tourism, however, contributes to land use pressures caused by hotel development or the establishment of tourism related infrastructure. Coastal tourism also contributes to restricted access of local people and community residents to coastal spots such as public beaches. The demand for coastal spots has also pushed out small business people such as small investors who cannot compete, while at the same time successful investors in the trade have contributed to increased waste loads (domestic sewage) in the marine waters leading to habitat destruction. Some operators have also been known to uproot seagrass and cut down mangroves to establish swimming sites (Ngusaru, *et al*, 1999).

In addition to these consequences arising from the activities of business operators, coastal tourism has in many areas ended up restricting access to coastal areas to local communities and residences. Sometimes these restrictions have limited people's pursuit of their livelihood options, forcing them to over-utilise what is available – such as mangrove forest.

The socio-economic importance of tourism in the region on a nation-by-nation basis is discussed in the following sections.

2.1.1 Kenya

The tourist industry in Kenya is promoted as a destination for sun, sand and safari, and is one of the highest foreign exchange earners, only surpassed by tea and coffee. Europe is the main source continent for Kenyan tourism, accounting for 69.3 percent of the market share. Indeed, in the early 1990s the industry surpassed the traditional cash crops of tea and coffee, contributing 22 % to foreign exchange earnings and 12.5 % of the GDP. Its earnings in foreign exchange now stand at 18%, contributing 9.2% to the GDP. Earnings from tourism have been showing signs of picking up after a slump between 1992 and 2001 occasioned by political related disturbances.

At least 60 % of the industry depends on coastal tourism which is conducted with a mass orientation and strong cultural component. The primary attractions are the warm climate, the

beautiful coastal scenery and clean sandy beaches. Thus, tourism infrastructure and related facilities have mushroomed along the beach areas.

Various facilities and services have also mushroomed in the major tourist centers to meet the demands of the tourist industry. Such services include tour operators, banking and recreation services. Indeed, the rapid growth of Ukunda (near Diani Resort), Malindi and Watamu are directly attributed to the development of tourist facilities. In Malindi and Watamu the main activity driving the local economy is tourism, which accounts for approximately 60 % of business. The tourism industry also supports local livelihoods and economy through the provision of employment, services, and through the supply of commodities such as agricultural products, seafood and building materials.

However, the promotion of mass tourism has tended to centre on beach tourists and this increases the pressure on marine and coastal resources. In the year 2000, it was estimated that the tourism sector contributed about 25% of the pressure on the coastal area due to construction of tourist and recreational facilities, and consumption of local material such as mangroves for construction. Pollution of the coastal waters in Kenya is also attributed to development of the tourism industry. According to a UNEP study conducted in 2000, about 113.4 tonnes of Biological Oxygen Demand (BOD) and 239.2 tonnes of suspended soils were estimated to have been discharged directly into the sea from coastal tourist hotels in the country (Kazungu *et al*, 2003).

2.1.2 Madagascar

Although tourism in Madagascar is a relatively young industry, it is the country's second-largest source of foreign currency revenues, growing at a rate of 18% per year. There is a huge potential for growth in tourism, since the country accounts for only 10% of all tourism in the southwest Indian Ocean. There is a range of popular destinations where tourists, can enjoy beach sport surfing and diving, as well as discover the parks and reserves. Madagascar has also a regional training programme for the tourism and hotel industry, carried out in conjunction with the University of the Indian Ocean.

The significance of tourism in Madagascar has led the government to identify strategic programmes to attract further investment and local capacity building in the sector. For example, a Tourism Land Reserves (Réserves Foncières Touristiques or RFTs), which is dedicated to beach and nature tourism has been set aside. The National Association for the Management of Protected Areas manages these reserves. Land has been fully serviced, in order to accelerate development and RFTs for beach and nature tourism have been created, or are being created, to make it easier for both local and foreign investors to access land. As a consequence, more employment and incomes for local people and the government is envisaged.

The lack of mass tourism in Madagascar is an advantage on the coastal environment, since tourists can observe Madagascar's fauna and flora without disturbing the natural harmony of the canyons, volcano ranges, primary forest and its bays lined with white sandy beaches. In this respect, there are less negative social and economic implications on people resulting from PADH. Despite these many attractions, Madagascar has lagged behind its neighbours in terms of tourism, and she has been trying to catch up in the past four years. The number of visitors since the early 1990s doubled to reach 130,000 in 1997.

2.1.3 Mauritius

Economically, the coastal zone is by far the most valuable segment of the Mauritian territory. Located here are the tourist facilities of very high standard, secondary homes, ports, the fisheries infrastructure and the public beaches. In this zone, billions of rupees are being invested in the form of hotels, infrastructure, water sport facilities and coastal developments in general.

During the past decade, the tourism industry has emerged as the fastest growing sector, establishing itself as the third pillar of the Mauritian economy. It is also the second largest foreign exchange earner. The tourism sector recorded a growth of 11% in the year 2000, which is a marked up-turn in the declining trend registered since 1996. Gross receipts from tourism for the year 2000 amounted to around 14,234 million Mauritius Rupees (Rs), representing an increase of 4% compared to Rs 13,668 million in 1999. The total number of tourists visiting the country reached around 656,453 (Bhikajee & Bhagwant, 2003).

Table 1. Tourism Main Indicators in Mauritius 1998 - 2001

		1998	1999	2000	2001
Real growth	%	4.0	11.0	7.0	0.6
Gross earnings	Rs m	11,890	13,668	14,234	18,166
Tourist arrivals	No.	558,195	578,085	656,453	660,320
Expenditure per tourist	Rs	21,301	23,644	21,683	27,511
Employment (March)	No.	16,490	16,235	17,811	19,944

Source: Central Statistical Office, Mauritius. March 2003, in Mauritius PADH country report (2003)

Infrastructure related to tourism has also almost doubled between 1990 and the year 2000. For example, the number of rooms in tourist hotels shot up from 4603 (1990) to 8000 (2000), and hotels increased from 75 to 93, respectively (Dulymamode *et al*, 2002). This expansion increased employment opportunities and incomes on local populations by more than 20%.

2.1.4 Mozambique

Tourism in Mozambique experienced a boost after the civil war, and represents a potentially viable economic activity. There is currently a promising future in the tourist industry mainly in the centre and south due to historical ties with South Africa and Zimbabwe, and Mozambique is now striving to exploit other markets in the developed world. Coastal tourism is well developed especially in the southern part of the country. This region has beautiful sandy beaches and extensive corals. Some of the tourist activities include beach sailing and game fishing, with the latter culminating in annual fishing competitions in Bazaruto, Inhambane, Maputo and Ponta do Ouro. Direct economic benefits for local people include employment in tourist facilities, as guides, and in the local service industry.

The substantial increase in tourism along the coast has, however, led to some destructive impact on the coastal and marine environments. For example, physical destruction of coastal habitats occurred during construction works especially in clearing of mangroves and dune vegetation due to the construction of tourism complexes on sand dunes. This has exposed the habitats to erosion, thus destroyed the nesting sites of turtles. Another destructive activity on the natural environment is created by the driving of 4 wheel drive vehicles on the beaches, above the high water marks, particularly along the coastline between Po Ouro and Inhambane.

Another phenomenon associated with the development of tourist activities is the declining local fisheries in the coastal areas. This situation is contended to be a result of pollution due to the discharge of untreated sewage and wastewater from coastal tourist complexes into the sea, a tendency that destroys the marine environment (Fernandes and Hauengue, 1997).

2.1.5 Comoros

There is a small tourist industry on the Islands of Comoro, which has recently been promoted by South African interests. The country attracts around 20,000 tourists annually, mainly from South Africa and Europe. The beaches on all the islands (including those at Itsandra, Galawa, Bouni, Chomoni and the palm-fringed Planet Plage) and the diving school at Galawa Beach on Grande Comore are major attractions and sources of employment for the local people. Pirogue (canoe) races are occasionally staged in the lagoon that surrounds Mahore. Sailing boats and canoes are available for hire in many ports. Local incomes are also earned from organising trips with local fishermen to view the Comoro Islands' distinctive (and now protected) green turtle that can be seen in the marine reserve off the southern coast.

2.1.6 Seychelles

The unique and natural beauty of the Seychelles including abundant sun and relatively unpolluted sandy beaches have provided tourism investors with the ideal setting for high quality tourist resorts. Tourist marketing in this country focuses mainly on beach tourism and therefore most hotels are located within the coastal plateau in front of a beach. Although the government set a limit of 100,000 tourists to visit the country annually, this limit has been breached and it is estimated that by the year 2010, the number might reach 260,000.

Tourism and its related industries are the most important and vital economic sectors for the country. It has enormous implications in determining the availability of foreign exchange for imports and employment. The government receives revenue directly from tourists in the form of departure taxes, tourism taxes on hotel beds, and other taxes levied on goods and services sold to tourists. Incomes from tourism almost doubled from SR 330.9 to 645.5 (between 1980 and 1990) and had remained quite steady at SR 600 by the year 2000.

The tourism industry also provides direct employment for about 17% of the working population. In 1991, tourism expenditure was responsible for approximately 3772 full-time jobs and an additional 4520 casual jobs (Payet, 2003). The ratio, therefore, between the total employment generated and the direct employment created by tourism was 2.20, which implied on average one direct tourism job supported 1.2 secondary jobs in the Seychelles. These hotels have however been a big source of pollution due to disposal of untreated sewage, and have caused coastal erosion due to improper siting of tourist hotels along the beach.

2.1.7 Tanzania

Tanzania, like other countries in the region, has a significant tourist potential that is currently concentrated around the country's several national parks, featuring game and forest reserves. The most exploited coastal recreation includes visiting the exotic 'Spice islands' of Zanzibar. Between 1992 and 1999 the number of tourists increased three fold, illustrating the growing exposure of the country to foreigners as well as the increasing percentage of foreign exchange contribution to the country's GDP from Tourism. Table 2 compares the number of tourists who visited the country in 1992 and in 1999 and demonstrates the increasing trend.

Table 2. Earnings from Tourist visitors 1992 & 1999

Number of Visitors	Forex Earnings in million US\$
201,744 (1992)	120
627,325 (1999)	733

Source: EIU Country Profile (2000)

Currently, coastal tourism is said to be rather undeveloped along the mainland coast and near-shore islands. This is largely due to inadequate infrastructure along the coast, as well as government and investor focus on wildlife tourism in the Northern circuit and Zanzibar. Capacity constraints and poor infrastructure and service connections in the mainland have challenged the existing tourist potential for the coastal region despite its several attractions such as the unexploited beautiful beaches and diverse marine life and features. Most of the rural coast is thus almost unexploited. Potential areas include Mnazi Bay in Mtwara and Pangani area. A number of hoteliers have shown interest in investing in such areas (TCMP, 2002). Existing coastal tourist hotels are concentrated in Dar es Salaam and Bagamoyo and mainly cater for conference and business tourists as well as for resident (weekend) tourists. These are medium sized hotels having between 40-70 rooms. Small clusters of hotels, each with less than 12 rooms, can be found in Pangani, Mafia Island and Mtwara that predominantly cater for resident tourists.

Hotels and communities

The three tourist hotels in Ushongo village, Pangani district in Tanzania have entered into a contractual agreement with the local village (Ushongo) whereby a percentage of the hotels revenues are channelled to the village to fund specific development activities. Under this type of arrangement, care has to be taken to ensure that the money is utilized for the intended purposes agreed by all parties to the contract. (TCMP, 2002:29)

Apart from providing employment opportunities and incomes to local households, tourist establishments especially in the rural coastal areas have contributed to local development. These hotels either provide cash income or support development activities to communities through a special arrangement between hotels and villages, whereby a percentage of the hotels revenue is given to fund specific development activities.

In order to cater for the growing demand of tourist accommodation, the government is encouraging the construction of hotels, which has an implication on the state of the

environment. Hotel construction along the coast has tripled over the last five years. However, a study in 1999 established that most of the tourist hotels are built within the coastal strip in less than 50m from the highest watermark. This poses many management challenges, including problems related to shoreline stability. The causes of unregulated tourism include: poor land use planning, poor enforcement of legislation, setback lines and lack of coastal management policy.

For Zanzibar, in particular, tourism is one of the highest foreign earning sectors. The 1986 Private Investment Act that ensured investment protection and provided incentives and guarantee rights and obligations of investors stimulated the growth of the tourist sector in the island. It is reported that the number of hotels in Zanzibar mushroomed from 3 in 1987 (all government owned) to over 104 in 1997, and the number of visitors skyrocketed from 77,700 in 1985 to 226,000 in 1994 (Mohammed, 1997). Unfortunately, this rapid but poorly planned tourism development has generated some problems – key ones being physical and cultural degradation. Degradation of the coastal environment has been due to uncontrolled dumping of solid waste that has reduced the aesthetic value of the areas around some of the tourist hotels.

Conclusions: The magnitude of the social and economic implications resulting from PADH due to coastal tourism in the region has not been comprehensively assessed, but all indications illustrate the negative social and economic costs that the region's countries bear or are threatened with. Tourism and related infrastructure have encouraged rapid and large increase in population densities especially on the coastal urban areas, which have in turn contributed to the pressure on the coastal environment. The negative impact of this as generating from PADH is the loss of employment and incomes for local people, loss of national revenue and costs for maintenance or restoration of ecosystems. These aspects are elaborated in section 3.0.

2.2 Mangrove (Exploitation) Destruction

Mangrove forests within the region have significant social, economic and environmental value. Their overall benefit lies in their function of supporting the coastline from erosion, and supporting habitats for marine species whose extraction is part of the coastal people's livelihood endeavours and brings income for national economies. These functions are irreplaceable, yet the rate of exploitation of mangrove forests has been increasing due to extensive harvesting and clearing for a range of activities including infrastructural development for various purposes at both the local and national levels. At the national levels, mangrove exploitation is sometimes not counted as a significant economic activity. However, a significant proportion of mangrove ecosystems has been disturbed when areas are cleared for conversion into salt works, mariculture and aquaculture activities or for major constructions such as for ports and harbours.

Until the 1960s, tannin production, and exports of timber from mangrove trees provided a significant portion of some countries GDP. In the present decade, the magnitude of mangrove exports has considerably declined into smaller scale exports. The rapid expansion of tourism, particularly since the mid 1980s, has also increased the rate of exploitation as a result of tourist hotels opting to build shelters of exotic traditional designs using mangrove wood. In addition, some tourist establishments clear mangrove forests in order to create convenient recreational facilities such as swimming and boating bays.

At the local level, numerous activities involving exploitation of mangroves have provided a livelihood to the growing populations within coastal areas for decades. These forests have been a major source of household energy needs, providing the most affordable fuel wood for many households. Coastal people also exploit mangroves timber and poles for construction. Charcoal making and a variety of other products have also been obtained from mangroves. Some mangroves are used for medicinal purposes and for customary rites. Molluscs, crabs, fishes and shrimp caught within the mangrove ecosystems are direct sources of food and income for many people (UNEP, 1998). In some areas, mangrove forests are continuously cleared for agricultural production that is necessary for household food security. Indeed, with extreme poverty facing a majority of the inhabitants in these areas, the engagement of activities that invariably result in mangrove forest depletion is seen as an unavoidable means for their survival.

The socio-economic importance of mangrove exploitation in the region on a country by country basis is discussed in the following sections.

2.2.1 Kenya

The Kenya coast has 530 km² of mangroves with the largest strands occurring in the Lamu area and the Vanga-Funzi system. Mangroves in Kenya have been exploited both for export and for the local market. Mangrove poles have been exported to the Arabian peninsula as building material until a ban was effected in 1987. Local consumption has been for building poles, production of tannin and dyes. Most of the mangrove species produce high quality firewood and charcoal for domestic and industrial use, such as in brick and calcium (lime) manufacturing. Products from a few species possess medicinal properties and/or have been used as human and animal food. The high quality mangrove wood has been utilized for making various domestic utility items (e.g. drums, beds etc.) and fishing gear (e.g. traps, etc.). Mangrove poles are the preferred building materials in all rural settings and most of the coastal urban centres and Mombasa suburbs (Mwaguni & Munga, 2003). There has also been a demand for mangrove poles for construction of tourist facilities, such as hotels and sheds. In Gazi and Lamu in particular, noticeable reduction of mangrove due to over-harvesting is evident, although there is no monitoring data. The loss of mangrove since pre-agricultural times is thought to amount to 70% (Mwaguni & Munga, 2003).

Expansion of salt production and agriculture are now posing serious threats to the mangrove ecosystems, although the activities are central for the livelihoods of coastal people. In the Ngomeni Swamps, for example, over 5000 ha of mangroves were cleared to give way for the construction of solar-salt pans. To-date the area covered by the salt pans exceeds 6,500 ha and the trend of their construction is increasing. The salt manufacturers are now extending northwards towards Lamu, another rich mangrove area; hence the impact on mangroves is expected to be more severe.

The ever-growing demand for agricultural land has also resulted in encroachment into coastal forests, including mangrove areas. A case in point is the encroachment into the Arabuko-Sokoke coastal forest, the catchment area for the supply of freshwater to the Mida Mangrove Creek. The destruction of the water catchment area is thus a potential threat to the health and existence of the mangrove ecosystem (Mwaguni & Munga, 2003).

Oil spills, from the shipping activities at the Mombasa harbour have also posed a threat of mangrove forests in the vicinity. There have been reported increased incidences of oil spills

during off-loading and bunkering operations in the harbour. Currently, the Port of Mombasa does not have receptacles for waste ballast water, and equipment for handling major spills is lacking (Kazungu *et al*, 2002). In 1988, a crane accidentally punctured a fuel oil storage tank, spilling 5000 tonnes of its contents into the Makupa Creek, Mombasa, resulting in almost total destruction of approximately 2 ha of mangrove cover from that incidence with adverse impacts on the mangrove community structure.

2.2.2 Madagascar

Mangrove forests in Madagascar cover an area of 327,000 ha and are accompanied by an extremely diverse fauna. These mangroves are an important source of income, both for the local population as well as the whole country. The mangrove trees are used in building and, to a lesser extent, as firewood. Traditional and industrial fishing and other extraction activities are practiced in several areas mainly for shrimp. The local population has for many years been involved in these activities, which have resulted in very low impacts on the ecosystem. In Baly Bay for example, the collection of crabs in the area is carried out all year round to feed the local population.

However, during the last ten years, shrimp has become one of Madagascar's main exported sea products and the development of shrimp farming is reaching critical levels. For example, since 1998 the Baly Bay region that has become involved in shrimp farming and it has about 600 hectares of a semi-intensive shrimp farming industry. This has resulted in extensive exploitation of the mangroves. Although the social and economic impacts of these activities on mangroves are still difficult to identify due to lack of information, fishermen using traditional methods recorded that the proportion of catches of the two shrimp species (*Penaeus monodon* and *P. indicus*) drastically increased from less than 1/10 before 1998 to 1/4 in 2000 (Rivo, 2001). The causes of this change and other unexpected effects need to be identified and addressed to limit their impacts on the surrounding habitats.

2.2.3 Mauritius

Mangrove covered a large part of the Mauritian coastline in the past, but its area has decreased markedly over the last three decades particularly due to coastal area infrastructural developments and settlements. Nowadays, mangroves are found at river mouths and estuaries such as Riviere Noire, Baie du Cap, Trou D'eau Douce, Poste Lafayette, Bras D'eau and Poudre D'or. A reforestation programme is now in progress in the areas where mangroves thrived in the past.

At the local level, mangroves in Mauritius are not extensively used. The two species occurring in Mauritius, *Bruguiera gymnorhiza* and *Rhizophora mucronata* are not exploited, and very few parts are traditionally or commercially used. Only very rarely are their barks used for medicinal purposes. However their non-market value (indirect benefit associated with the preservation of the ecosystem) is important when the importance of the coastal zone in foreign exchange generation is considered.

2.2.4 Mozambique

Most of the mangroves in Mozambique are of the fringing type, and they are distributed almost entirely along the coast. The mangrove forests have been depleted over the years (and continue to be depleted) mainly for firewood and construction and this is observed especially

in the vicinity of large cities such as Beira and Maputo. A study in 1994 revealed a high deforestation rate of mangroves in some areas, ranging from 1.2% in the Inhambane area to about 15.2% in Maputo between the years 1972 and 1990 (Hoguane *et al*, 2002). Other causes for depletion include clearing for salt production and for agricultural practices, mainly in the Northern provinces. Mangrove forests have also been depleted or modified due to erosion - especially at the Zambezi Delta, land reclamation, and blockage of creeks by sand shifted by waves or storms, which connect the mangrove swamps to seawater.

2.2.5 Seychelles

There is little information on the local uses of mangroves in the Seychelles, but at a general level, the causes of their destruction are similar to those observed in other countries. These include beach area development and pressure from local household needs. Land reclamation activities such as the East Coast Reclamation project are also responsible for mangrove depletion although some species have now re-colonized the area. Hence, the best-developed mangrove forests that remain in the Seychelles are located behind beach ridges near open-stream mouths. Most areas have undergone extensive exploitation by land-based activities.

2.2.6 Tanzania

Mangrove forests in Tanzania occupy about 225,000 ha, which is about 0.3% of the forest cover in the country (Mariki, 2000). The Rufiji Delta, located about 150 km south of Dar es Salaam, contains the largest continuous block of mangrove forest in East Africa, comprising some 53,000 hectares. This delta also supports the most important fishery along Tanzania's coastline, accounting for about 80% of all shrimp catches in the country. The Delta is home to about 41,000 people, many of whom are small farmers and traditional fishers.

Up to the mid 1990s, the exploitation for export of mangroves for poles (for construction) and bark (for tannin extraction) was common in the region (Mainoya, *et al*, 1986). The rate of this exploitation later ceased after the introduction of less expensive alternatives. By then, significant income in foreign exchange encouraged the exploitation of mangroves. For instance in 1979 Tanzania earned 4 million Shillings in foreign exchange after selling 30,000 scores of mangrove poles (Mainoya, *et al*, 1986). A more recent study on mangrove exploitation in the Rufiji Delta has revealed uncontrolled harvesting of mangrove logs and poles that are cut for commercial and domestic use within and outside the areas. This is vivid at the following places: Kikale, Konde, Chaka Nganuni A & B, Kifuruni and Mnyali areas (TCMP, 2003).

Currently, the major economic activities impacting on mangrove areas in Tanzania include **mariculture** and **salt production** by solar. Solar salt contributes about 76% of the total salt produced in Tanzania (TCMP, 2001:16). This is a big industry, employing many people in household based or private companies. **Mariculture**, on the other hand, is becoming an important sector, which is regarded as having the potential to provide an alternative source of livelihood for coastal communities. Mariculture is, however, mostly limited to seaweed culture, with prawn/shrimp farming still in the planning stages. This is because the siting of farms within mangrove areas has been argued to be environmentally and socially destructive, and has met significant resistance. A case in hand is the abandonment of plans to build one of the world's largest shrimp aquaculture facility in the Rufiji Delta of Tanzania, proposed by a

company called the African Fishing Company (AFC) in 1996. The AFC had proposed to establish about 2,000 ha of shrimp farms in the area – establish ponds, a hatchery, a processing plant and a feed mill, which would have involved destroying 1200 ha of mangroves in the area. In its proposal, the AFC envisaged to realise US\$500 million a year in export profits. In 1997 the Government and Tanzanian Cabinet approved the project, but social and environmental activists concluded that the damage to the environment and consequently to the local people’s well-being would far outweigh the profits (WRM, 2001). A group of local Rufiji people filed an application with the High Court to challenge the project’s approval. These processes were finally halted on August 15, 2001 when a High Court ruling ordered the selling of AFC’s assets to offset part of the company’s debt accumulated over the years, as a result of opposition by local people to its implementation (WRM, 2001). Permits on proposals to establish shrimp farms have thus been suspended.

Agriculture has also contributed to clearing of mangroves in several areas, but it is more common around the Rufiji Delta where mangrove areas are cleared for rice cultivation. This practice has now become a threat to the survival of the mangrove forest in the area (Ngusaru *et al*, 1999). Under this practice, rice fields have to be renewed approximately after every 7 years (with a range of 4 to 11 years), because after this period the rice yields fall drastically. The old farms are then usually abandoned and new areas of mangrove have to be cleared (Ngusaru *et al*, 1999).

Conclusions: Although the actual extent and value of mangrove destruction as a result of these various socio-economic and development activities has not been comprehensively documented, the threat of the various benefits that are gradually being superseded by negative implications due to PADH are clear.

2.3 Mining/Sediment Movement, Ports and Land Reclamation and River Damming

Mining, agricultural production, harbour activities, land reclamation and river damming are activities that have significant social and economic value. They facilitate international relations, trade and regional development, while creating employment and incomes for local people on a wide scale. Yet, these activities have stimulated sediment movement and siltation and an increase in the level of suspended soils in the marine waters, destroying the quality of the waters.

Port development in the region has been stimulated by local and national circumstances, such as the demand for port services from the hinterland, both in terms of export generation and import consumption. The ports of Mombasa, Dar es Salaam and Beira provide strategic entry points for goods on transit to the land-locked countries of Burundi, Rwanda, the Democratic Republic of Congo (DRC) Uganda, Malawi and Zambia.

<p>The socio-economic value of a seaport</p> <p>A seaport is a national and international transport facility responding to local demands but reflecting global change (Hoyle, 2000:1)</p>
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Many of the major ports in the region have recently undergone expansion and other developments as a response to global market conditions, such as trade liberalization,

international political changes and development in technologies (Hoyle, 2000). These activities invariably involve dredging to increase port depth in order to accommodate bigger ocean vessels. The cargo bays themselves are also being expanded, and subsequent overlays of concrete mixtures to establish the loading and off-loading bays developed. The benefits of these activities have increased port efficiency and thus reliable revenues.

Land reclamation due to scarcity of land has also been necessary to serve various purposes, which include, investment purposes for tourism, extension of ports, and construction of roads and to provide space for service infrastructure, such as dumping sites. Land reclamation projects, however, have a permanent impact on the economy and social structure of the country. Whilst they offer many potential advantages, they also have many disadvantages, including loss of habitats and the high cost of reclamation. Although the percentage of GDP relative to these investments could raise concerns on economic stability, the projects offer the countries new opportunities for economic diversification and especially consolidate other economic sectors.

Activities such as the mining of sand, corals, limestone and other resources are done due to their easy availability and need for cash income, and they provide cheaper alternatives to people's sustenance needs. Agricultural production on the other hand is an inevitable activity for food security of most coastal peoples. Despite their importance, these activities are now gradually raising the costs of living for coastal people. An assessment of their importance by country is presented below.

Figure 2: A House built with lime chalk from live corals. Mchinga II village, Mtwara region.

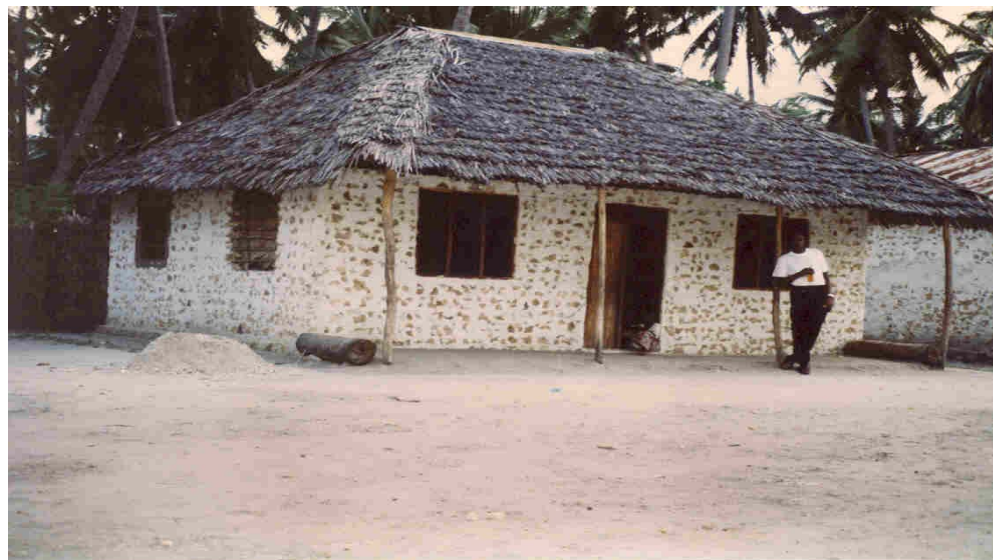


Figure 2 shows an example of a house constructed from coral stones. Lime chalk from live corals makes beautiful and strong houses. It is cheap and locally available in many coastal communities. Without cheaper and accessible alternatives, the likelihood for coastal communities to harvest live corals will continue causing significant damage to the coastal environment.

2.3.1 Kenya

Port activity, damming of rivers and agricultural production along the coastal zone of Kenya are high in comparison to other countries in the region due to the advanced economy. The port of Mombasa, Kenya's largest port, provides one of the country's economic strongholds, maintaining maritime trade, commerce and harbour activities. Other ports are generally smaller, mainly serving fishing boats and some small craft transporting consumer goods. These include: Lamu (which has also historical significance in maritime trade), Malindi, Kipini, Kilifi, Mtwapa, Gazi and Shimoni. Developments at the Mombasa port have a long-term outlook in order to extend facilities for oil reception and the container terminal, indicating extensive use of land (Hoyle, 2000). From time to time the navigational channel in the Mombasa inshore water areas is dredged to maintain the depth required for shipping activities. The dredged material is usually dumped at a deepwater site off the entrance into the Mombasa harbour causing significant levels of suspended solids on the Kenyan coastal waters. An additional ship loading facility for exporting titanium mined from Kwale District will soon be constructed within the Mombasa Harbour area. The setting of such a facility will inevitably entail major works for the development of port facilities.

Damming of rivers in Kenya is developed in the quest to meet energy needs through hydroelectric power generation. The Tana, Kenya's longest river (850 km) has a catchment area of 95,000 km², extending into the Mt. Kenya region. It is the most dammed river in Kenya with 5 major hydroelectric power schemes. Damming activities have led to reduced stream flow, denying the estuaries the much needed freshwater inflow to sustain the ecosystem, as exemplified by damming along the River Tana, such that the flow is now less than 50% of that measured in the 1950s.

The reduction of water flow due to damming has also affected the productivity of the mangrove ecosystems, threatening the future socio-economic well-being of the community. The River Tana, for example, discharges about 4,000 million m³ of freshwater and 3 million tonnes of sediments annually through an expansive delta into the Ungwana Bay. The River Athi-Galana-Sabaki complex is 650 km long with a catchment area of 70,000 km² extending into the Nyandarua mountain range. It discharges about 2,000 million m³ of freshwater and 2 million tonnes of sediments annually into the Malindi Bay. The high volumes of freshwater discharged carry with it nutrients, which maintain the high productivity of the Ungwana and Malindi Bays. Consequently, estuarine conditions, as indicated by a high productivity, prevail within the bays. The Ungwana-Malindi Bay complexes form the richest fishing ground for artisanal fishers, semi-industrial fishers and prawn trawler operators.

It is clear that the reduction of river flow and the discharge of freshwater into the Ungwana and Malindi Bays can result in far reaching changes in the ecosystem, impinging on the socio-economic well-being of the community.

Cultivation upstream along rivers that discharge into the sea, has also resulted in high levels of suspended soils. These sediments have reduced the recreational value of the area and, consequently, tourism because they interfere with the aesthetic value of the beaches, coral reefs and mangroves. However, farming upstream is expected to continue since it is a significant economic activity even for coastal people. National records classify 87% of coastal land as agricultural, with 70% of the labour force in the area engaged in this activity (GOK 1996 in Mwangi & Munga, 2003). Demands to maximise food production have encouraged farming activities in this area to adopt irrigation schemes.

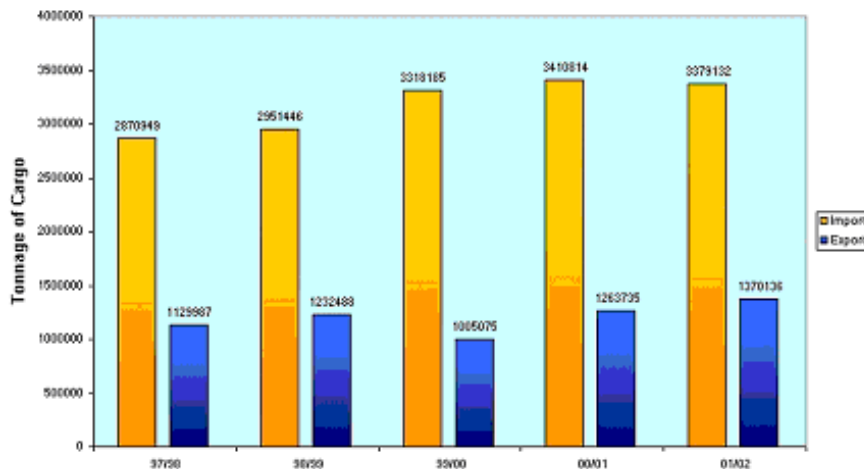
2.3.2 Mauritius

Port activity in Mauritius has increased over the last four years. This is possibly due to improved infrastructure and facilities, but with a cost to the environment. The new container terminal at Port Louis harbour was constructed on reclaimed land. The area was already impacted by the presence of other port infrastructure. The 1995 report of the World Bank mentioned that:

“The proposed container terminal facilities at Mer Rouge site is unlikely to have any major negative environmental impact on the landside as the land has recently been reclaimed with no established fauna and flora. On the marine side the dredging of the channel and turning basin has already been completed since 1990”

– before the requirement of a formal EIA became mandatory. Port Louis handles about 4.8 million tonnes of cargo annually. Over the past years an average annual growth of 8% has been registered in total cargo traffic. Some 1900 vessels call at Port Louis annually and over the recent years a vessel traffic growth of 4% has been recorded.

Figure 3: Total import and Export Cargo Traffic for Port Louis, Mauritius 1997 - 2002



Source: Mauritius Ports Authority, 2003, in Mauritius National PADH Report, 2003.

Another economically important activity is *sand mining*. Until the year 2001, this activity was a large employer of coastal populations, being run by 25 co-operative associations using 310 boats and employing nearly 1,000 people. In economic terms, this business had an estimated turnover of US\$8 million per year (Dulyamamode *et al* 2002). The devastating impact of this practice became felt on the destruction of lagoon ecosystems and habitats, and was later found to cause suspension and movement of sediments. After a moratorium period, sand mining was declared illegal with effect from 1st October 2001. The workers of this sector are currently being financially compensated and alternative jobs including training facilities are being offered. Adequate substitute materials are now available, particularly through the use of advanced technologies for crushing rock and utilising it for construction (Bhikajee & Bhagwant, 2003).

2.3.3 Mozambique

The maintenance of Mozambique's *harbours* is also a major contributor to PADH. The country has three large ports: Maputo, Beira and Nacala, and several small ports (Inhambane, Quelimane, Pebane, Angoche and Pemba). The major harbours provide significant service to foreign countries including Swaziland, South Africa, Zimbabwe, Zambia, Malawi and the Democratic Republic of Congo. The total cargo handled in 1995 and 1996 was about 7,500,000 and 8,400,000 tons respectively. To keep the navigational channels operational in the two largest ports of Beira and Maputo, continuous dredging is carried out. This is because the ports are situated at river estuaries and are therefore heavily affected by siltation. As a result, the bottom topography of the ocean bed is altered and a re-suspension of sediments occurs. Further inland, rivers are dammed to alter the flow of water for various purposes. This has affected the import of sediments and nutrients in the river delta areas and it causes imbalances in sediment fluxes, leading to chronic erosion or sedimentation.

The country is also planning to construct an open-sea harbour with associated land infrastructures such as railways, housing, shops, etc. at Ponta Dobela, in Maputaland near Maputo. This will definitely have an impact on the environment.

Mining of minerals is carried out all over the country and has increased since the end of the civil war in 1992. The activities involve extraction of minerals such as gold, copper, marble, and stones for building. Sand mining for building purposes is also undertaken along riverbanks and in the coastal areas. These activities induce high rates of erosion, destruction of the environment and pollution of coastal waters. Some types of mining involve the use of pollutants that are discharged into the sea.

2.3.4 Comoros

There isn't much information on the depth of PADH along the main ports of the Comoros that include, Toamasina, Mahajanga, Antsirana (Diego Suarez), Taolagnaro, Antsohimbondrora, Morondava and Toliara. These ports are mostly used for maritime cargo.

Extraction of coastal materials is however an ongoing concern in the Comoros, and it is practiced at different scales in the region. Coral sand, pebbles, gravel for concrete and corals for lime have been mined for construction of mosques, cultural centres, public buildings, individual houses and for surfacing of roads.

2.3.5 Seychelles

Land reclamation is probably the single most serious activity impacting on the coastal environment of Seychelles, propelled by the scarcity of land in the islands. The Seychelles International Airport and most commercial and fishing ports were built on land reclaimed from the sea. In 1973, 102 ha of land were reclaimed at Anse Des Genets and used for the building of the international airport, a cruise ship port, and a storage facility for a power station. In 1986, in Victoria to Providence islands, 133 ha were reclaimed and used for housing, industry, and water front developments. Dredging and land reclamation have continued on a large scale, and one output is the creation of large coral fill stockpiles, which have at least provided alternatives for illegal sand extraction from the beaches.

However, the benefits of this additional land may not be totally exploited if suitable land use policies are not put in place. For example, the last reclamation is estimated to have cost the Government a total of US\$ 110 million, with a foreign exchange component of US\$ 47 million. The costs also increase significantly to justify the strict environmental regulations imposed by the EIA and the Ministry of Environment. Additional contributions to the cost also included raising the ground level of the reclamation from 2.5 m to 3.2 m, to accommodate anticipated sea level rise.

On the other hand, land reclamation projects have offered the country new opportunities for economic diversification and consolidation of other economic sectors, rather than making it rely exclusively on tourism. The socio-economic importance of wetlands in the Seychelles islands may not be quantifiable at present due to the absence of studies on this issue and primarily because they are not commercially exploited. The cost of indirect destructive uses such as, land reclamation can however provide an insight into the perceived value of these wetlands. What is however realised is that the availability of coastal land in the Seychelles is increasingly becoming a problem. But at the same time, the average costs for reclamation of a wetland for one house would cost about 25,000 to 50,000 Seychelles Rupees, which is much cheaper than the estimated cost for a similar sized plot of land on the coast, which can range from 80,000 to 100,000 Seychelles Rupees.

However, when the value in terms of services to the environment is considered, such as, protection against potential flooding, the cost of wetland conversion becomes more real. For example, recent flooding within the Anse auz Pins area on Mahe may include costs such as damage to property and roads. Another problem is to do with irrigation activities whereby diversions of fresh water have brought about shortages. Also the reduction in flow is causing stagnation and fouling of water bodies. Consequently, residents are subjected to unpleasant odours from anaerobic decomposition. Siltation is another problem that is caused by deforestation, construction on steep slopes and dumping of construction materials.

In addition, the fisheries and biodiversity are invariably affected by land reclamation activities. For the East Coast Phase III reclamation project, it has been estimated that fish habitat loss would amount to USD 600,000 per year. The income to local subsistence fishermen will therefore be significant. This will in turn encourage some fishers to invest in bigger boats for offshore fishing and consequently spend more time at sea. Coastal fisheries in crustacean, molluscs and bivalves will be more or less eradicated in the short-to-medium term period.

Haphazard developments including construction of coastal residences and also tourist hotels have fuelled the demand for sand which has been mined from inland areas along the coastal strips. This has caused huge crevices, which are lower than the water table to be backfilled during periods of heavy rain. In addition to natural factors, the coastline is continuously being eroded causing the beach to retreat inland to as much as 10 metres in some places over a ten-year period.

2.3.6 Tanzania

Port activity in Tanzania, which is one of the country's economic strongholds, commands significant amounts of bulk cargo for the country and its neighbours. At the local level, the country's ports also offer sizeable employment opportunities. Tanzania has four major

harbours, namely, Dar es Salaam, Mtwara, Tanga and Zanzibar. The mainland ports are under the Tanzania Harbours Authority (THA). THA had 3163 permanent employees in 2003, a reduction from the 9349 employees in 2002. Despite the yearly reduction of staff, the activities of the port and harbour are still a dependable source of employment for local populations since they offer casual labour opportunities and subsidiary jobs such as food vending during periods of peak activities. The intake of casual labourers ranges from 20 to 250 people a day, each earning on average an income of TShs 2500 a day and 5000 on weekends (on average US \$ 2.5 - 5).

The main port at Dar es Salaam has undergone modernization to enhance its competitiveness among ports south of the Western Indian Ocean. In 1956, three deep-water berths were opened to cater for increased demand and also to serve Zaire, Rwanda, Burundi and later Zambian cargo (Hoyle, 2000). More recently, improvement of the Dar es Salaam Port Entrance Channel was one of the major works undertaken. This project took off in July 1997 by shifting the old fish market and the ramp to Magogoni Ferry. Dredging works were completed in April 1998 at a cost of about US\$ 24 million. Other complementary works (on shore works) such as building a new and permanent ramp and installation of navigational aids and a new signal station were completed in 2002. The economic benefits of the dredging works in particular have been significant. These include increased harbour efficiency since big ships can now enter the port for 24 hours instead of waiting for high tide only, although overall revenue levels have not changed much. Currently the port has eight deep-water berths for general cargo, 3 berths for container vessels, eight anchorages, a grain terminal, an oil jetty and offshore mooring for super tankers.

The Zanzibar Port has also expanded considerably in terms of marine transportation, particularly after the liberalisation of trade in the country. The number of cargo vessels calling at the Zanzibar Port has shot up from 40 in 1990 to 190 in 1995 (Mohammed, 1997). These developments have increased the risk of oil pollution in the Port areas, threatening the reef formations fronting this area.

Some environmental effects are also said to have generated from dredging around the Dar es Salaam port. Examples that are cited include increasing levels of siltation in the area due to the increase in current flow. Land erosion eating away the beach at Kigamboni CCM College is also suspected to be a result of dredging activities in the Dar es Salaam entrance channel (pers. comm. THA officials, Aug, 2003).

Agricultural production using poor farming methods that lead to sedimentation is more practised in the mainland than in Zanzibar. Agriculture in Zanzibar is still artisanal to a large extent, and does not involve techniques such as large-scale irrigation as in other countries in the region.

Conclusions: There are different levels of intensity on the activities related to mining, ports, land reclamation and river damming in the region, each activity fulfilling an important role in the development of the economies of countries within the region. What is however evident is that dredging activities, agriculture along or within catchment areas, land reclamation and mining have serious negative implications to PADH and the social and economic well-being of the countries.

3.0 REGIONAL OVERVIEW OF PADH

The significance of the coastal environment and its resources to the region cannot be denied. They support both national economic growth and livelihoods of the people. Rapid population increase and urbanization along the coastal areas have aggravated the levels of competition for resources, putting pressure on coastal resources. The attractive coastal areas, sandy beaches and coral reefs and lagoons have stimulated the region's coastal tourism industry. Other areas are also exploited for their exotic qualities of biodiversity, cultures and other recreational opportunities. The development of infrastructure related to tourism has, however, affected the physical structure of the coastline, reducing its natural protective cover and therefore exposing coastal developments to erosion and decline.

Mangrove ecosystems also have multiple functions. But increasing demand for their products and areas seem to override efforts for conservation done by coastal management activities in the region. Further, the demand for agricultural land and other activities such as solar-salt production has driven the people to encroach into marginal lands and water catchment areas with disastrous effects that eventually impact on coastal and marine habitats.

Improved port activity and mining are also inevitable processes in the current world economy, having multiple benefits in terms of trade, stimulating industry and offering sources of foreign currency for these countries. However, these activities, including other land-based investments such as damming for hydroelectric power, have led to significant disturbance of coastal ecosystems. The major implications include raising the level of sedimentation downstream that has particularly affected mangrove ecosystems. Reduction in water flows due to river damming has also reduced the amount of freshwater supply to these systems, causing an imbalance in their productivity.

There is thus a serious need to balance policies that seek to stimulate economic growth and livelihood opportunities for the people by such infrastructural investments and activities with environmental issues in the region in order to maintain sustainable social and economic development. Brief regional overviews of the situation under the three priority sectors are presented below.

3.1 Regional Overview: Coastal Tourism

Tourism development in the region can rightfully be assessed as becoming a major pillar of the economies in the region, a situation that is supported by macroeconomic policies in most countries. Its rapid development in the area has entailed high capital investments in terms of infrastructure in order to establish related facilities. Coupled with weak regulatory mechanisms, this investment has, however, been at the cost of the coastal environment.

The inadequacies of appropriate sanitary and waste disposal systems for tourism related infrastructure also contribute to destruction of habitat through uncontrolled discharges of waste into coastal waters. Pollution of coastal waters has resulted in health disorders and loss of aesthetic values that discourage tourism.

Partly due to unregulated infrastructural developments along beaches, many investors and residents now incur increased costs for maintenance or rehabilitation of facilities (e.g. hotels) and residences because of soil erosion and destruction of infrastructure.

These situations may be aggravated in future as tenure systems are decentralized to local levels without proper awareness raising or preparation of local communities to handle issues of PADH. A case in point concerns the disposal of land to investors. For example, the new Land Policy (1999) of Tanzania that gives villagers the mandate to dispose of land is a case in point. Ushongo villagers, in Pangani, Tanzania had by May 2003 sold 14 beach plots to investors on tourism and private developers. These plots are located along the village's 10 km stretch of beach (Village Executive Officer –Ushongo village, 2003)². Such developments, irrespective of their short-term benefits to local people, have serious implications related to PADH of the coastal environment, and the same people's future.

3.2 Regional Overview: Mangrove Destruction

Several studies indicate that mangroves often yield greater net social benefits if they remain as natural ecosystems (WB, 1994; WRM, 2001b). This is because, the total values and benefits of mangrove ecosystems when determined from both marketable and non-marketable goods and services are irreplaceable. Indeed, many conversion-based alternative uses – such as clearing mangrove area for shrimp culture or for tourist recreation facilities - have proved to be expensive to construct and maintain, or have produced disappointing economic results due to low and declining productivity. Some studies have illustrated that the net benefit of a shrimp farming project usually drops after a period of 5 years due to ecosystem degradation that cannot support the activity any longer.

Mangrove trees, in the vicinity of coastal communities provide the most accessible source of fuel wood for households and local industry e.g. lime production.

For a comprehensive valuation of the benefits of mangroves, an in-depth study has to be conducted on the national and local benefits of aspects such as the value of timber and non-timber products from mangrove forests. It is however clear that the destruction of mangrove ecosystems has led to a loss of direct and indirect social and economic values and services affecting people at household and national levels.

Demand for mangrove products for local uses such as fuel wood, charcoal, construction (boats and houses) and for making lime etc has not abated despite the establishment of programmes for community-based mangrove conservation. This is because mangrove forests still provide the cheapest and relatively easily accessible sources for several subsistence needs for poor coastal populations. Unsustainable harvesting practices will continue. Urbanization and the transport sectors, uncontrolled disposal of solid waste, and liquid waste and oil spills also cause significant damage on mangroves.

These impacts are likely to be more intense in future due to several reasons including the following:

- Firstly, the cost of solar salt production is low while there is a high demand for salt in both the domestic and regional markets. The likelihood that salt production using this technology will expand implies further destruction to mangroves if not checked.
- Mangrove ecosystems provide the most attractive areas for alternative and viable sources of livelihood activities within the coastal belt. Shrimp farming and logging for

² Interview with Village Executive Officer at Ushongo village, Pangani, Tanga region Tanzania. June 2003.

timber are examples. It may be problematic to constrain cash-strapped communities from practising uncontrolled harvesting, just as it has been challenging for national bodies to develop a comprehensive but environmentally sustainable mariculture policy.

3.3 Regional Overview: Mining/Sediment Movement, Ports and Land Reclamation and Damming of Rivers

Activities relating to expansion of ports, mining, reclaimed land and damming of rivers have significant positive impacts on local economies and national revenues. But they also significantly contribute to physical alteration and destruction of habitats. The net benefit may therefore, be negative if these activities have to be assessed on the basis of a sustainable development framework.

What is apparent is that all these activities have shown signs that they are on the increase. For example, dredging activities for port expansion and maintenance have all indication of continuing, mostly due to inter-port competition and concentration. Political and economic circumstances affecting the region as a whole, such as economic liberalisation have encouraged port expansion in order to increase efficiency. In a situation where ports in neighbouring regions are currently winning some percentages of the cargo services originally handled by some of the region's ports, some countries have been compelled to expand and modernize facilities to be more competitive. For example, the bulk of Zambian cargo traditionally handled by Dar es Salaam Port is slowly declining as political reforms in South Africa have enabled the latter to win some of this trade. In 1997, the Tanzania Harbours Authority initiated a US\$ 24m modernization programme in an attempt to win back such trade (EIU, 2000:18).

There is also a tendency to modernize 'central' ports as strategic investment relegating other ports to smaller roles and activities. In East Africa, concentration on the ports of Mombasa and Dar es Salaam has relegated the position of the Tanga and Mtwara ports to minimal contribution. These ports currently handle only 0.25m tonnes of cargo per year compared to the 8m and 5m tonnes of cargo handled by Mombasa and Dar es Salaam ports, respectively (Hoyle, 2000).

Mining of sand and other aggregates has also contributed to destruction of the coastal zone, predominantly the coral reefs, and have consequently further exposed the shores to wave action, storm surges and inundation (Mauritius). Uncontrolled mining of sand and gravel has also diminished the aesthetic value of the coastal belt in several places particularly near large cities where huge pits have been left unfilled creating lakes that breed mosquitoes and thus threatening people's health (Kenya, Tanzania).

Agricultural production and intensified farming practices especially cultivation close to river banks and catchment areas have enhanced soil erosion. This has resulted in increased levels of suspended sediments, which are discharged into the marine environment. For a predominantly rural-based population, whose farming technology is mainly crude, poor farming practices will continue and so will siltation.

4.0 SOCIAL AND ECONOMIC IMPLICATIONS OF ACTIVITIES LEADING TO PADH

The social and economic benefits that activities along the coastal zone provide for the well-being of the people and countries in the region cannot be overemphasised. In addition to those mentioned in section 2.0 above, women's empowerment is also one of the benefits that these priority sectors provide, particularly through their potential of a multiplier effect. For example, many women earn income by engaging in small-scale activities that serve major economic sectors along the coast, such as, serving cooked food (food vending) for tourists, port activities, sand mining, salt making and others. Their ability to earn an income enhances their economic status and wards off poverty for many coastal households.

Likewise, the degree to which these activities leading to PADH bear negatively both upon coastal people's livelihoods and on the viability of national economies in general cannot be undervalued. These impacts relate to declining food security, loss of cultural heritage, high costs for maintaining or restoring environmental quality, and declining revenues, all of which together accelerate a chain of consequences such as declining livelihood insecurity, poor health and unsustainable development alternatives. Hence the activities have a negative impact on the general well-being of these countries.

However, in view of the economic priorities of countries in the region, resource allocations to sectors such as tourism and port maintenance will continue. The coastal environment is thus likely to continue to deteriorate if investments within the context of current planning and management systems continue. As such, in the long run these sectors will experience loss in revenue and employment potentials etc. Key socio-economic implications arising from the resulting PADH are presented below.

4.1 Socio-economic Issues related to PADH

Key socio-economic consequences arising from PADH include the following:

- **Food Insecurity:** The modification of marine habitats and mangrove ecosystems, sometimes due to destruction of mangrove areas or due to discharge of untreated domestic sewage has reduced their capacity to support household food security for coastal communities in particular. This is because these modifications have caused a decline in the fisheries and thus consequently a reduction in people's direct source of protein intake and cash-income. In Mauritius for example, studies indicate that due to mangrove destruction the fish catch has dropped from 1597 tonnes in 1987 to 1246 tonnes in 1997 (Dulymamode *et al*, 2002:13).
- **Loss of employment:** PADH has also led to loss of employment in many ways. Firstly as habitats become affected, local communities who predominantly depend on fishing as their major livelihood activity become directly affected due to declining fisheries. Declining fisheries indirectly affect other people such as women who in the region are noted for their fish-retailing activities. Secondly, destruction of the coastal environment either due to uncontrolled infrastructural developments or due to pollution of coastal waters has led to loss of aesthetic value of areas surrounding tourism spots. This situation has affected the tourist industry especially as loss of aesthetics have discouraged and reduced the number of visits to recreation centres. For

example, Malindi Bay and Malindi Watamu Marine Park and Biosphere Reserve, one of Kenya's hot spot and selective area, respectively, are the most impacted by suspended solids. As a result, some tourist hotels have lost their beach frontage with consequent loss of tourism business and increase in unemployment to many hotel employees. In 2001 it was reported that the situation in Malindi Bay is that out of 4 beach hotels, three have closed down, and the remaining one is operating at less than half the capacity. One investor was forced to abandon the construction of another hotel at an advanced stage (Kazungu *et al*, 2001). As a result, many hotel employees lost their jobs and incomes, while the country lost the corresponding foreign exchange earnings.

- ***High costs of living:*** Decline in the availability of coastal resources (such as mangrove products, and the fisheries) and employment opportunities as caused by PADH have raised the costs of living for coastal communities. This is because of reduced employment and income earning opportunities. In addition, scarcity has caused the prices of household materials and items such as fuel wood, charcoal and fish to go up, or people have to seek for expensive alternatives.
- ***Loss of cultural heritage:*** – extended clearing of mangroves for example has led to soil erosion and a complete distortion of natural shorelines. At Gazi Bay, in Kenya for example, uncontrolled harvesting of mangroves has led to loss of land through erosion of the shoreline. There is also documented evidence of a decline in sea turtles and marine mammal populations in Kenyan waters attributed to the loss of their sea-grass habitats [including intensive hunting primarily for their meat and oil]. Since turtles are endangered/threatened species such destruction of their habitats and uncontrolled exploitation may result in their extinction and loss of cultural heritage.
- ***Loss of aesthetic value:*** - Pollution by both solid and liquid waste, abandoned sand or gravel pits, coastal erosion and sedimentation resulting in high levels of suspended soils in the waters have all reduced the aesthetic value of beaches, coral reefs and mangrove areas in many places around the region. These situations have reduced the tourist and recreational potentials of these areas and have caused local people to lose sources of income. On the other hand, they also make the areas unattractive even to local people who use them daily.
- ***Resource use and conflicts over access to resources:*** Conflicts in access to or use of resources have occurred when resources become less available due to PADH. In many cases, PADH creates inequity in access, since usually those with the most power, in terms of economic resource or political influence, become able to access the declining coastal resources at the expense of others. The constant clashes between artisanal and industrial fishing trawlers over declining shrimp and prawn populations are a common example in the region.
- ***Health Hazards:*** Activities such as sand mining in the vicinities of large coastal cities have threatened the health status of coastal dwellers particularly because the quarries are usually abandoned after the sand/gravel is exhausted and as people move to another site (e.g. in Maputo, Mozambique and at Kunduchi/Dar es Salaam, Tanzania). As a consequence, water bodies are created which become breeding sites for mosquitoes. These conditions create fertile environments for increase in the spread of diseases like malaria and typhoid.

- **Displacement:** Erosion, especially along the beach has threatened to destroy people's residences and business premises. For example, the situation in Beira (Mozambique) is particularly serious as important infrastructures including the harbours and almost the whole city are notably under threats of collapsing (Hoguane *et al*, 2002).
- **Loss of cultural identity** – ‘*it is fishing that makes the fisher*’. Destruction of ecosystems that support the fisheries have caused a decline in fishing activities, making people struggle to seek for alternative sources of livelihood. Their meaning of life is thus also affected since they become compelled to change their lifestyles and incorporate new practices, and possibly new identities often different from marine resource extraction. This loss has impacted different social groups at different degrees. In most experiences, the youth in particular have suffered more from decline in the health of coastal ecosystems that has been caused by, among other factors, PADH.

4.2 Overall Economic Valuation

The overall economic valuation of the socio-economic impacts (including the costs of restoration and rehabilitation of degraded areas) as a result of PADH due to the three main activities has been difficult to establish at the regional level because only limited information exists from most countries. However, this valuation suggests that the economic benefits accrued from these activities are high, but their value is threatened by the heavy costs that are incurred or will be incurred from the implications of physical alteration and destruction of habitats on which these activities depend. Therefore, both pros and cons of the activities need to be considered. Table 3 illustrates key aspects that need to be considered under each sector.

Table 3. Economic Valuation of the key impacts of activities related to PADH

S/ No.	Economic valuation	Coastal Tourism	Mangrove Destruction	Mining/Sediment movement, Ports and Land reclamation and damming of rivers
1.	Market values – earnings from sector	-GDP -hotel turnover	-indirect support to mariculture, salt industry -timber exports,	-GDP -International trade and communications
2.	Non-market values – economic benefits from maintaining sector within coastal region	-recreational value of the beach	-preservation of mangrove ecosystems -medicine, domestic fuel wood, sources of food (fish, shrimp, crabs)	-aesthetic value of coastal region, -physical stability of coastline -water quality
3.	Costs of loss	-loss of revenue -loss of employment	- decline in household needs (poles, charcoal,	-maintenance of harbours -costs for water

		-loss of aesthetic value	fuel wood), -destruction of marine species habitats leading to decline in fisheries, and in food/income security -loss of beach area for residence and other developments	treatment -destruction of habitat due to sedimentation and reduced water flow, thus low productivity and food/income insecurity
4.	Costs for restoration, rehabilitation	-pollution -costs for erection of walls	-maintenance of infrastructure threatened by erosion	-maintenance of infrastructure

Source: Summarized from PADH (WIO region) Country reports 2003

Key economic issues arising from PADH in the region include the following:

□ ***Loss of revenue:***

The decline in the health or attractiveness of coastal resources has affected business within the tourism sector. This is mostly due to pollution and poor waste management systems along beaches. Any subsequent decrease in tourist arrivals might impact negatively on the hotels' turnover and tourist-related activities. The ultimate loss of revenue has thus generated a chain of losses affecting not only hoteliers, but also other tourism related businesses, local economies and National governments in terms of revenue.

□ ***High costs for restoration of ecosystems:***

Restoration of ecosystems, once degraded is very costly, and it takes too long to restore an ecosystem. Hence this compromises the survival of future generations. For example, an economic valuation study conducted on the Tana Delta wetlands (Ungwana Bay) in Kenya illustrated that the wetlands and mangroves of Tana Delta provide significant flood and storm control functions. This study computed a total (1999) value of KSh 275 million (US\$ 4,586,333) in terms of re-establishment and maintenance expenditures avoided (Emerton 1998, in Kazungu *et al*, 2002). This figure when scaled up to cover the entire Kenyan Coastline reaches to US\$13,749,999 that the country would have been compelled to incur towards re-establishment and maintenance activities if the natural coastal ecosystem around the area would have been left to destruction. These estimates illustrate the high price that any economy in the WIO region would have been made to pay as a result of PADH.

□ ***High costs for maintenance of environmentally sound practices:***

Land-based activities have also contributed to erosion and the flooding of major river systems. These forces, coupled with the natural impact of waves, have forced many tourist development centres to erect walls for protection against shoreline erosion, thereby increasing the costs of maintenance. Documented examples on areas most affected by erosion are found in Kenya illustrating the damage in areas around Malindi Bay, Mombasa and Diani, Malindi/Watamu Marine Park, Biosphere reserve and Ngomeni (Kazungu *et al*, 2001).

As indicated above the costs for maintenance are also dear. Another valuation study also by Emerton (1999, in Kazungu *et al*, 2002) estimated that the direct costs for maintaining 3 of

Kenya's Marine Parks – Kisite, Malindi and Watamu from erosion was equivalent to US\$ 0.28 million (1999 prices). When scaled up to cover all of Kenya's marine parks the cost reaches an approximate figure of US\$ 560,000 million per annum.

□ ***Costs for water treatment***

Increase in water treatment costs due to sedimentation or suspended soils has been detrimental to coastal dwellers and tourist establishments that are obliged to meet their guests' expectation of healthy services. Many such establishments have thus been compelled to install expensive water treatment systems.

5.0 BEST PRACTICES

From a socio-economic perspective, the most ideal way for identifying 'best practices' that minimise PADH in the coastal management should take into consideration the multiple stakeholders depending on the coastal and marine environment for survival. These range from people in local communities, business establishments to national governments. Another aspect is recognizing the dynamic entity of the coastal zone, whereby stakeholder interest and values change over time, taking in new issues and responding to new demands influenced by social, economic and political changes. These two key processes are in addition to the range of impacts affecting directly the physical environment and coastal ecosystems due to PADH.

The role and obligation of stakeholders in protecting the coastal and marine environment from PADH is therefore high, and so should be the commitment to enable them to be able to do so. It is necessary therefore to identify practices that balance most (if not all) of these aspects.

The following two examples of best practices have therefore been selected with this thinking in mind and due to having met the following criteria:

- Participatory decision making based on exchanges of information, discussions and negotiations about best practices among stakeholders;
- A balance between local social and economic needs and environmental conservation;
- Innovative methods and technology used that are effective in meeting the demands of the different stakeholders;
- The technique or method (of the practice) is readily transferable;
- High potential for ecological recovery of coastal environment;
- Training and education component.

Case Study 1

Ecotourism at Chumbe Island Coral Park Project (Zanzibar, Tanzania)

Chumbe Island lies 8 miles to the south-east of Zanzibar, and covers about 20 ha. The fringing reef along its western coast harbours an abundance of coral and fish species. Chumbe's marine park is a private venture set up by a marine biology and diving enthusiast, whose ambition was to create a small private marine park where profits from tourism would help to support conservation and environmental education (ICRI, 1998). A private company, Chumbe Island

Coral Park Ltd (CHICOP), was set up in 1992 to create and manage the reserve, and the Zanzibar Government in 1994 officially created the Chumbe Coral Sanctuary. The reserve encompasses a reef sanctuary and a protected forest on the island itself. A management plan for 1995 to 2005 was adopted, and the park is now one of the world's very few private marine protected areas.

The reasons for selecting Chumbe Island Coral Park as one of the best practices are based on the following:

- The project combines eco-tourism and environmental conservation, especially in coral reefs;
- All infrastructure and installations are designed to be environmentally sound;
- The park is a good example of private sector tourism contributing to the protection of coral reefs;
- The project is helping to strengthen local and national capacities;
- It is helping to raise awareness and contributing to environmental education among neighbouring communities.

Revenue and profits from eco-tourism are reinvested in both conservation and management activities as well as in educational activities for school children in particular. A management plan for the park for 1995-2005 was drawn up on the basis of broad consultations with the different parties involved. An advisory committee was established representing the relevant ministries, the Dar es Salaam University's Institute of Marine Sciences and local village chiefs and it is still a focal point for discussions on the park management.

The park's hotel installations ('eco-bungalows') are all designed with environmental protection in mind, especially coral habitats (local plant materials, rainwater collection, solar panels, sewerage and recycling of some of the wastewater for watering). The toilets work on the principle of anaerobic composting and are particularly well suited to conditions on a coral islet as no excess nutrients or pathogenic germs are released in wastewater. Six fishermen from neighbouring villages have been trained as park wardens.

Training and education is provided for park wardens, fishermen, children from neighbouring schools and tourists visiting the park. Reef monitoring operations have shown that the protection has been effective: coral diversity and abundance are high, with 90% of all East African species represented, and both the quantity and diversity of fish stocks have also increased. The park is one of the best preserved of all Tanzania's marine areas. An added quality develops from its emphasis on joint management, continuous consultations and negotiations. These processes have minimized conflicts, resource use and access.

Experience with the Chumbe Marine Park has shown that private management of a marine protected area can be both technically feasible and effective. The project has shown that a private protected area can be of major benefit to the local communities, especially by strengthening their skills, conserving biodiversity and restocking commercial species. The coral sanctuary provides a refuge for threatened species, which are being heavily exploited elsewhere along the coast. Studies of marine currents in the area suggest that adjacent fishing grounds are being restocked by species breeding in the coral sanctuary.

However sustainability of such a project demands heavy investments. In this case, private investment without adequate government support has made the Chumbe project a costly undertaking. At present, the Tanzanian authorities are treating CHICOP in the same way as

they treat any other tourist operator, with no particular consideration for its important contributions to environmental protection. For example, it is not being granted any tax relief. Some of the innovative and environmentally sound technologies used to build the park's installations – especially the compost toilets – are very costly. This increases tourist prices, which cannot compete with destinations that do not have environmentally friendly facilities or where environmental protection and management is funded by donor agencies.

Chumbe Marine Park received the “1999 British Airways Tourism Award” and it was selected as an exhibitor in Tanzania's pavilion at EXPO2000, the World Exhibition that was held in Hanover.

Case Study 2

Mangrove Forest Conservation: *Bee-keeping in the Mida mangrove forest-Kenya*

The bee-keeping project in the mangrove forest of Mida Creek in Malindi is an offshoot of the ‘kipepeo’ butterfly farming in the Arabuko-Sokoke forest supported by the European Union through the National Museums of Kenya. When the butterfly project was started, it was observed that the local community in Malindi, used to harvest honey both in the Arabuko-Sokoke Forest and in the mangrove Forests of Mida, albeit at a small scale. This activity promised to be a very lucrative business if well developed. At the same time, the communities harvested mangrove and the other forest products directly as another source of income. The direct harvesting of the forest products was considered to be occurring at a rate that was unsustainable. A balance had therefore to be found that could improve income without necessarily destroying the forest. The bee-keeping project was conceived and promoted. Today, the proceeds from honey gathering are high enough to make up for the lost income from the sale of mangrove poles, now long lost due to the ban on mangrove poles harvesting.

Having realized the potential of the indirect use of the forest, the communities living adjacent to the forest formed themselves into an association that protect the forest, and are organized to make the best use of their newly found source of income. One of the challenges the association faces is the lack of market for their honey. In addition, the production techniques of the honey are considered primitive and not meeting international standards. Therefore, considerable support is required for the project to adopt modern methods of honey production and processing in order to attract those markets that demand higher specification standards. If this last hurdle is resolved, the project will be a standing example of best practices in the conservation of important coastal habitats, while providing sustainable means of livelihood for the communities residing in these areas.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The sustainability of the economies of coastal states and livelihood activities of their people is dependent significantly on the health and proper functioning of the coastal environment and its resources. But the practices for their utilisation pose major challenges to the sustainability of the coastal environment itself. As illustrated above, the major challenge is to balance economic growth promotion and the health of the environment. But it is not often the case that when conversion of ecosystems need to be conducted, an environmental-social-economic analysis to help plan the conversions is conducted to assess direct and indirect implications, such as possible employment generating potential, benefits of conversion (large and sustainable) and valuation of the marketed and non-marketed goods and services, both within and outside the area.

The result is declining livelihoods and loss in revenue. Worse, many people faced with declining access/availability of coastal resources, and lack of alternative viable livelihood or income-generating activities resort to even more destructive resources exploitation techniques. Yet, the scale of destruction of the coastal environment and marine habitats as caused by local people may be less compared to the damage contributed by major national economic development priorities, such as industrialization, port development, tourism infrastructure and damming of rivers.

Many countries have initiated projects and programmes to handle activities leading to PADH. The best practices mentioned above are examples, some of which have indeed mitigated extensive damage due to PADH. Most of these measures are, however, *ex poste*, indicating a gap in identification of *ex-ante* measures possibly due to not only shortage of resources, but also to limited planning capacities and poverty. There is also a dearth of comprehensive studies on various social and economic dimensions and implications of PADH on coastal and marine environments in the region which impedes full understanding of the meaning of PADH.

The adoption of Integrated Coastal Zone Management (ICZM) strategies by all countries in the region indicates a promising commitment to a broad based multi-dimensional approach to management of the coastal areas. All countries in the region have also instituted policies and regulations demanding sensitivity to the environment by local people and developers. These include a requirement to conduct Environmental Impact Assessments (EIA), most of which entail a social and economic assessment component.

However, these institutional frameworks such as legislation and other regulatory mechanisms e.g. policing, if pursued in isolation, may not be a solution towards containing continued physical alteration and destruction of habitats within the coastal areas in the region. This is because often the pace of national economic demands and people's needs for coastal resources have overridden the capacities for national governments to put in place mechanisms of control. In addition, stakeholder responsibility to the environment falls short of the demands to secure sustainable and environmentally friendly use of coastal resources. In this regard, the need for broader based stakeholder participation strategies, such as social control mechanisms, awareness creation and co-management arrangements become necessary.

**Public sector-Private sector-Civil Society
Partnerships for Socio-economic enhancement of
coastal livelihoods**

Enhancing the capabilities of a range of stakeholders to manage the coastal environment is a strategic starting point. Currently, Private-Public partnerships have illustrated promising returns to both the coastal environment and the socio-economic status of local populations as some of the case studies on best practices illustrate.

The private sector has the advantage of being capable of rapid and flexible adaptive decision-making; it can be a source of complementary funds in the form of venture capital. Removing the barriers of effective participation by the private sector in the management of coastal and marine resources may, therefore, contribute to the success and sustainability of interventions [for coastal zone management. (Hewawasam, 2002)

Examples on sewage management from Kenya demonstrate this: The initiative of private sector participation in urban waste management as practiced in Mombasa, Diani and Malindi has the potential to reduce high loads of suspended solids, nutrients and other contaminants entering the sea through storm water runoff. For example, some tourist beach hotels namely Severin and Bamburi Beach in Mombasa and Travellers Beach at Tiwi near Diani in the southern coast have developed their own sewerage treatment facilities. Constraints of such kinds of initiatives include the lack of innovative and less costly ways of waste management to make it more attractive to investors and the poor awareness by private firms on problems associated with waste disposal in the marine environment (Kazungu *et al*, 2002).

A more radical strategy has involved employing pressure groups to oppose any threat to the coastal environment due to major economic activities, as was the case with the unsuccessful proposal to establish a shrimp farm within Rufiji Delta in Tanzania. In this incident, the liquidation of the investor, African Fishing Company (AFC) in August 15, 2001 on the order of the High Court of Tanzania implied that the company's proposed project to clear 1,200 hectares of mangrove on the rich Rufiji Delta for establishing shrimp farms and hatcheries etc was halted. This situation was reached after continuous pressure of disapproval by a range of stakeholders including local Rufiji residents, local academics, the National Environmental Management Council (NEMC), the Organisation of Environment Journalists (JET) and some international organisations dealing with environmental concerns. Local residents had also filed a case in the High Court wanting to sue the government on its approval of the project (WRM, 2001). This step implies that to a certain degree, stakeholders have long realised the implications of processes that lead to PADH. Strategic level recommendations are presented below.

6.1 Recommendations

Continued alteration of the physical environment and destruction of habitats in the coastal environments will require regional level management strategies for restoration, mitigation, and minimizing the damages done. However, more important is the need to design strategies that would enable stakeholders to handle the threat of PADH beforehand instead of addressing the

implications. These require an integrative approach such as that provided by the Integrated Coastal Zone Management (ICZM) programmes.

Specifically, therefore, there is need to:

- ❑ Address root causes – poverty, equity and redistribution in utilisation and access to resources.
- ❑ Prioritise research programmes that focus on understanding the ecosystem's functioning as the starting point to achieve conservation.
 - For example, identify analytical tools and methods to determine the full economic value – costs and effects of coastal investments e.g. tourism, ports – including costs of monitoring and assessment, and environmental costs etc.
 - Conduct comprehensive valuation studies to inform and guide integrative resource management planning.
- ❑ Identify and promote economic viable alternatives that are environmentally sensitive.
 - Diversification of livelihood opportunities, such as programmes that support seaweed farming, beekeeping.
 - Ecotourism.
- ❑ Conduct studies on innovative and less costly ways of waste management along the coast to contain pollution of coastal waters and environment.
- ❑ Harmonize policies for conservation of the coastal zone within the countries and at the regional level.
 - For example, agricultural policies should incorporate coastal zone management concerns. Sensitise and support farmers on appropriate farming methods to control siltation whose effects go beyond national borders.
- ❑ Integrate environmental concerns in national planning processes
 - Revisit Coastal Zone Management Programmes. For example, capture the potentials of ICZM – ‘balancing the competing demands of different users of the same resources and of managing the resources to optimise the benefits to be derived on a sustainable basis that is consistent with a country's goals’.
 - Integrate tourism planning into other national planning processes.
- ❑ Enhance the capacities of stakeholders (local communities, private sector developers, policy makers etc) to be able to handle or address PADH. The most strategic way is to design awareness and education programmes.
 - For example, address low sensitivity/low awareness resource users by enabling them to balance the need for profits with the necessity of maintaining coastal environment quality (e.g. salt makers, sand and aggregate miners).
 - Enforce and sensitise on guidelines for coastal environment management. For example, Guidelines for Coastal Tourism Development in Tanzania (TCMP, 2002) provide both technical and procedural guidance to tourism planners and potential investors in coastal tourism facilities, particularly accommodation establishments. They also cover relevant topics from siting of tourist facilities relative to the fragile coastal environment to tips on how to establish and

maintain strong relationships between hotels and coastal communities (TCMP, 2002:5).

- Give space for stakeholder mobilisation. Community-based initiatives are the most appropriate non-conventional best practices against PADH with regards to the people. Such initiatives may include:
 - Encouraging public disclosure processes (reporting on incidences of PADH and other forms of environmental destruction) e.g. community based committees or action groups for beach management, mangrove restoration programmes as watchdogs or engaged in activities against PADH.
 - Promoting collaboration between government, private sector, civil society, professional organisations etc. Waste management strategies employed by the private sector in Mombasa-Diani-Malindi area (Kenya) are some example.
- Strengthen enforcement of laws and institutions that are charged with the management of coastal resources.
- Improve and support the cultural tradition of fishing by enabling fishing communities to protect fishing environments and to improve fishing methods to reduce dependence on sensitive ecosystems such as coral reefs and mangrove areas.
- Identify and promote alternative and feasible/usable sources of household materials such as building materials (alternative to mangroves and corals), or for household energy (alternatives to fuel wood from mangroves).
- Improve the quality of development practices such as dredging, ports and harbour construction, mining etc to ensure that processes such EIA are made mandatory before and after each activity.

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