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WORLD MARITIME UNIVERSITY
Malmö, Sweden

**A BLUE PRINT TO EFFECT INTEGRATED
MANAGEMENT FOR SUSTAINABLE
DEVELOPMENT OF ZANZIBAR'S MARINE
ENVIRONMENT**

By

HAMZA MAKAME OMAR
United Republic of Tanzania

A dissertation submitted to the World Maritime University in partial fulfilments for
the award of the degree of

MASTER OF SCIENCE

in

**GENERAL MARITIME ADMINISTRATION AND ENVIRONMENT
PROTECTION**

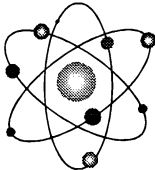
1995

DEDICATION

*I dedicate this work
to my beloved
wife*

KHADIJA

the inspirational force behind
everything I do.



DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously conferred on me

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

Thompson
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ABSTRACT

Like many other island states, Zanzibar has experienced very severe economic hardship in the past due to her dependence on the single crop of export. For centuries Zanzibar's economy has been monocropic in nature depending solely on the export of cloves. Fall of production in the 1970s accompanied with a drastic fall in the price of cloves in the early 1980s, prompted the government to look into ways to diversify the economy.

As the prospects for oil, minerals and other precious metals like gold and diamonds are slim, the only alternative is the development of the marine sector. Therefore the new economic policy introduced in 1984 liberalised trade, allow for massive foreign investment in the island in the tourism and fisheries sectors, and declared Zanzibar a Free Port and Free Export Processing Zone. All these developments have had a direct impact on the marine environment, which is the basis for their very existence.

Even before these new economic policies were introduced Zanzibar had been facing acute marine environmental problems which included degradation of water quality, and destruction of coral and mangrove ecosystems to name a few. The new economic developments could be catastrophic if not managed properly and in a sustainable way.

This dissertation analyses critically the relationship and importance of the marine environment to the islanders both socially and economically.

The marine environmental and developmental problems facing Zanzibar are analysed, and their causes are examined.

The pace of new economic developments and their likely impacts on the marine environment are also investigated. Analysis of national institutions which are responsible for managing the marine environment is carried out critically, and the methods which are being used to achieve integrated management in other countries are investigated. Finally the mechanism through which the problems can be alleviated to achieve sustainability, and the methods which can be used by the government and the people to attain integrated management are proposed.

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LIST OF ABBREVIATIONS

| | |
|------------------|--|
| CEO- | Chief Executive Officer |
| CoLE - | Commission of Land and Environment |
| CRC - | Coastal Resources Centre |
| DoE- | Department of Environment |
| DOS - | Department of Statistic |
| DG- | Director General |
| EIA | Environmental Impact Assessment |
| FAO - | Food and Agricultural Organisation |
| FKNMS - | Florida Keys National Marine Sanctuary |
| FKNMSPA - | Florida Keys National Marine Sanctuary and Protection Act |
| IMS - | Institute of Marine Science |
| NMSA - | National Marine Sanctuary Act |
| NOAA - | National Oceanic and Atmospheric Administration |
| UNESCO - | United Nations Education, Science And Cultural Organisation |
| UNEP - | United Nation Environment Program |
| ZTC- | Zanzibar Tourist Corporation |

INTRODUCTION

The intent of this dissertation is to analyse the relationship between the people of Zanzibar and their surrounding marine environment. It is also intended to evaluate the socio-economic importance of the marine environment, and critically examine marine environmental and developmental problems facing Zanzibar, and propose the mechanism through which they could be alleviated. The dissertation consists of six main chapters.

The first chapter explains the geographical position of Zanzibar, and examines the relationship between the people of Zanzibar and their surrounding marine environment. The chapter critically analyses the socio-economic importance of the marine environment to the people. Finally it tries to look at the reason why Zanzibar's marine environment needs to be protected and used sustainably.

The second chapter starts with the information on the distribution of the area of mangrove forests and their legal status as forests. Then it examines the values and different uses of mangrove products in the islands. The chapter also analyses the state of degradation of the mangrove forests, the causes of degradation, and the possible solution to prevent the mangroves from being degraded.

The third chapter dwells on the types and distribution of coral in Zanzibar, and analyses the socio-economic importance of the coral reef ecosystem to the islanders. The chapter also examines the destruction of coral reef ecosystems and the reasons which lead to their destruction. Finally the chapter proposes the possible solution which could be employed to control or halt the destruction.

The fourth chapter examines the pace of new economic development projects in the islands as a result of the implementation of the new economic policies and trade liberalisation. It also analyses environmental hazards associated with these new

projects. Finally it suggest the methods which could be used to prevent threats from causing danger to the environment and resulting in social strife.

The fifth chapter examines the national institutions responsible in one way or another for managing the marine environment. The chapter critically analyses the present national legislation and international conventions on environment protection and prevention of marine pollution; and proposes the changes to be made in the present legislation; and action which must be taken regarding the international conventions by the government.

The sixth chapter analyses the overall process to eliminate the problems highlighted in the chapters 1 - 5, this forms the basis of the recommendations made in the concluding chapter of the dissertation

CHAPTER ONE

1.0 ZANZIBAR AND HER MARINE ENVIRONMENT

Zanzibar became part of the United Republic of Tanzania on April 1964 after the union with Tanganyika.

Administratively Zanzibar has remained an autonomous state with her own President, Legislature and judiciary. All matters concerning Zanzibar which are not included in the Article of the Union are the responsibilities of the government of Zanzibar. One of them being the protection of the marine environment and control of pollution.

This chapter examines the relationship between the people of Zanzibar and the surrounding marine environment, and critically analyses the Socio-economic importance of the marine environment to the people. Finally the chapter looks at the reasons that necessitate the protection and sustainable use of the marine environment in Zanzibar.

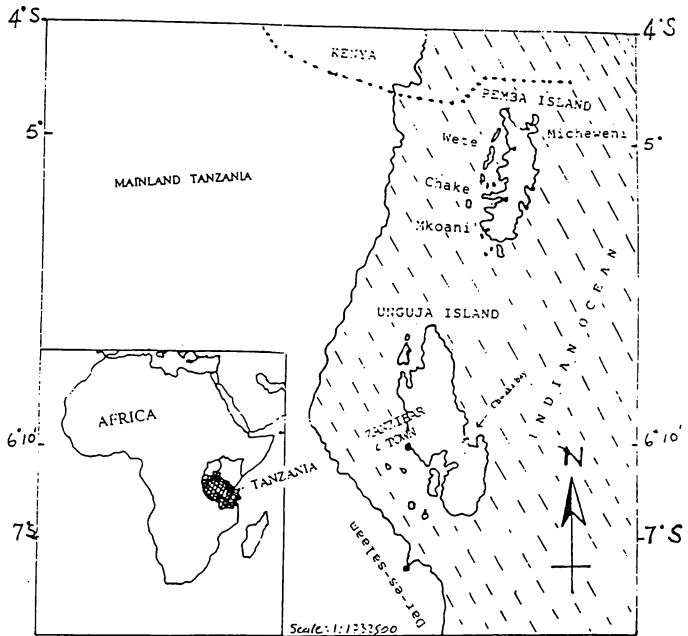
1.1 Geographical location

Zanzibar is comprised of two main islands, Unguja and Pemba and about fifty small islands and islets.

They are situated off the east coast of Africa just south of the equator. The islands lie at 4 degrees 50 minutes south latitude, and between 39 degrees 10 minutes and 40 degrees east longitude, between 30-50 kilometres off the coast of the mainland Tanzania. (Fig. 1.1). Zanzibar has a total area of 2332 square kilometres (ZTC 1993).

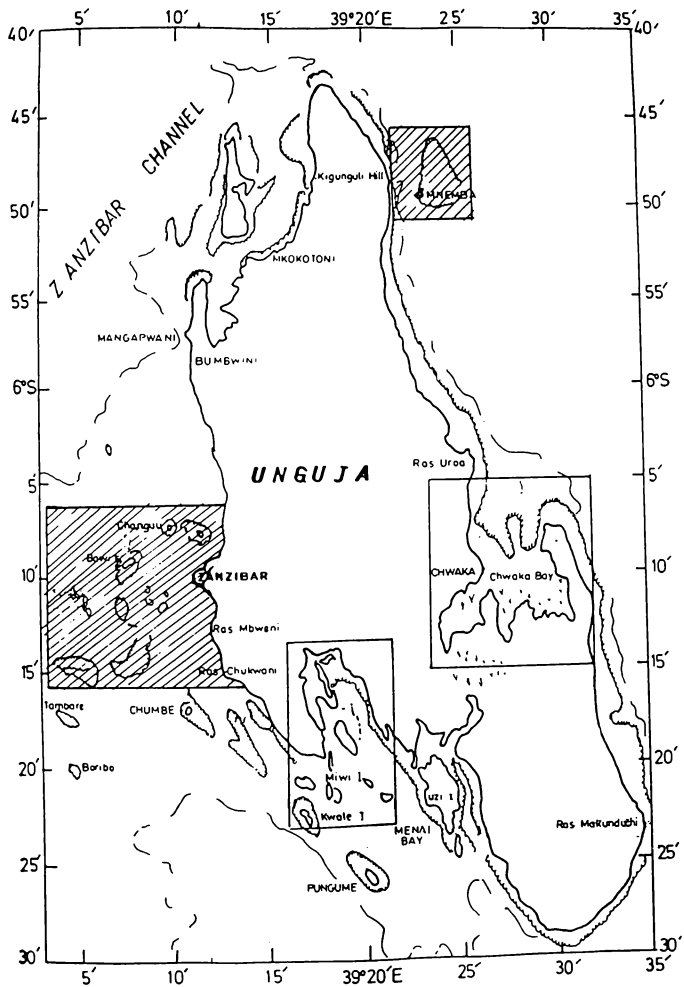
Unguja island has an area of 1464 square kilometres and lies between 5 degrees 42 minutes and 6 degrees 30 minutes, south latitude and between 39 degrees 10 minutes and 39 degrees 35 minutes east longitude. (Fig. 1.2)

Fig. 1.1



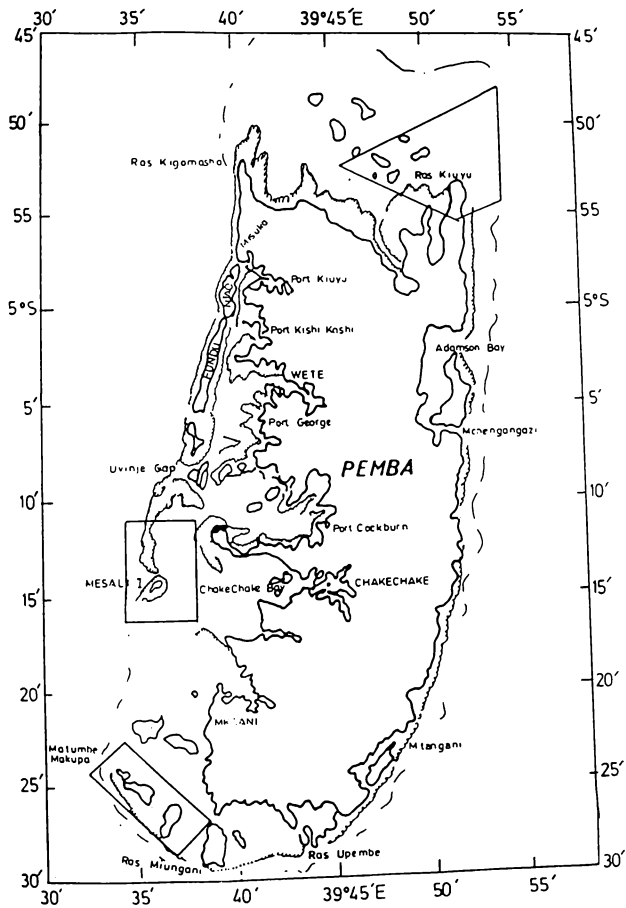
Sources- SM Nasser 1994.

Fig. 1.2 Unguja Island



Sources-Ngoile 1989

Fig. 1.3 Pemba Island.



Sources - Ngoile 1989

Pemba is smaller and has an area of 868 square kilometres and lies between 4 degrees 50 minutes and 5 degrees 30 minutes south latitude and 39 degrees 30 minutes and 40 degrees east longitude (Fig. 1.3)

The islands are comparatively, small, flat, coral islands and hence have no huge silt carrying rivers (Griffith, 1949) The 1988 census showed the population to be 640,578 inhabitants. (DOS, 1993 page 3) With the annual growth rate of 3.1 % the estimated population of the islands in 1992 is 723,300 inhabitants, out of which 51% are females and the remaining 49% are males (DOS, 1993).

Apart from the two major islands, there are number of small islands which are inhabited. They are Tumbatu and Uzi in Unguja, and Kojani, Makoongwe and Panza in Pemba.

1.2 MARINE ENVIRONMENT AND THE PEOPLE.

Historically the first people who came to the islands are said to be fishermen from the African continent. Then followed the Asians from the Persian gulf. The old settlements at Unguja Ukuu, Fukuchani, Mkokotoni Kizimkazi and others all along the coast even prove this.

These settlements have grown from very small fishing camps to big fishing villages and towns. The occupation of almost all the people in these villages is fishing and other marine related activities. The examples of these are Makunduchi, Mkokotoni, Uroa, Kangani, Kojani, Micheweni and many other townships and villages all along the coast. It is a reason why most of the activities of the Zanzibaris are of maritime in nature.

Man's activities to a large extent have been always influenced by the nature of the surrounding environment. This is true to the people of Zanzibar too. The Brutland's

commission explained that “ environment does not exist as a single sphere separate from human actions, ambitions and needs”. This means that man’s economic activities or development activities can not be separated from his surrounding environment. “Environment is where a man lives and development is what he does to improve his lot within that abode”. (Mrs. Brundtland, 1987, page XI)

It is man’s surrounding environment that provide source of living and earning. It is also the surrounding environment which dictates the life style of the people in the community.

In the case of Zanzibar and her small islands, about 80% of the population depends upon the surrounding marine environment for their living and earning.

For a large number of people the marine environment is a major source of protein, food and income (Shunula, 1990, Jiddawi & Muhando, 1990 and S.M. Nasser, 1994). A large number of people in Zanzibar are engaged in fishing (mainly subsistence and artisanal), seaweed, farming and in the trade of mangrove products.

The importance of the marine environment as a major source of income for the people in Zanzibar has been demonstrated by a recent survey carried out by SM Nasser.

The survey centred at two villages. Chwaka and Charawe both in Unguja.

This survey has shown that at Charawe village 41% of the total household income is generated from harvesting of the mangrove products. Only 7% of the household income is generated from other sources such as coral rags bush,(forests found in the limestone areas of Zanzibar). The remaining income also comes from marine related activities such as fishing and seaweed farming. At Chwaka 62% of the household income is generated from fishing activities associated with the mangrove ecosystem. Income from marine resources is attributed to the existence of mangrove forests. Thus the actual economic value to people go beyond that derived from direct harvesting of trees and other forests products. “The total gross income from mangrove ecosystem was estimated at 73% of the total household income for both

villages combined, when income from fisheries is included to mangrove components” (Nasser, 1994).

This survey is very significant to Zanzibar as most of the people (majority) live in the coastal fishing villages with almost the same type of socio-economic activities. Large portion of the population depends upon the marine resources for their earning and living.

A major source of animal protein

The marine environment has been and will remain a major source of food and animal protein for the people in Zanzibar. It is a major source of protein for about 94% of the population.(Jiddawi & Muhandu, 1990). As other sources of protein like beef become unaffordable for a large sector of the population because of the high prices more people will depend on the marine resources.

Molluscs of the genus *pyrazus* which is only found in mangrove vegetations, are cherished food at Charawe, Micheweni and other coastal villages in Unguja and Pemba. This is the major source of protein and main delicacy for the villagers (Shunula, 1990, page 18).

With the declining economy of the land base resources (example cloves), the fishery has also become increasingly important for the island's economy (Jiddawi & Muhandu, 1990, page 2).About 26,000 people are employed in the fishing industry. There are about 20,000 fishermen and over 6000 others are employed in supporting services such as boat building, bicycle traders (those who use their bicycles to send fish to the remote areas), traps makers and fish mongers.

The above figures do not include those who take part in subsistence fishing for household consumption.

Subsistence fishing is supposed to be the largest in the islands. So far no effort has been made by the fishery department to collect data and information which could help

in assessing the importance of this sector to the national economy. This is because subsistence fishing does not have any direct contribution to the treasury. But it is beyond doubt that in the real economic terms subsistence fishing is of great importance to the islanders.

Subsistence fishing involves almost every household in the coastal villages. A large proportion take part in the collection of shells, crabs, octopuses and catching sardines and prawns using mosquito's net type of gears. It is mainly done by women and children.

AQUACULTURE

Another activity which connects Zanzibaris with their marine environment is seaweed farming. Seaweed collection or harvest from the seabed has been going on in the islands for many years. But in the past it did not involve many people, and the industry was not organised. There were no companies which were dealing with the buying and exporting of seaweed. The production was very minimal as the seaweed was collected from the seabed depending on the natural growth. It was only in 1989 that the art of seaweed farming began in Zanzibar. This is the first type of aquaculture ever to be carried out by the islanders.

According to Mr. Mortensen, the Director of ZANEA seaweed company Ltd., which is one of the companies dealing with the export of seaweed, there are about 7,500 registered farmers with this company alone.

The seaweed is mainly exported to USA, France, Denmark, Hongkong and the Philippines; with USA being the major importer. The industry has created job opportunities for over 20,000 people. Seaweed farming has completely transformed the life of the villagers in their earning power. It is a golden star! Explained one cheerful villager of Uroa village. According to the villagers interviewed by the author, every household at Uroa has one or more members taking part in seaweed farming. The earning is between Tsh.14,000-20,000 per household per month.

Table 1.1 and 1.2 show the amount of seaweed sold by four villages to ZANEA seaweed company and the value obtained by each village in T.shs.

Table 1.3 shows the number of the households in each village.

Table 1.1 Amount of seaweed sold by the villagers in metric tons

| Month | JAMBIANI | PAJE | P/MCHANGA NI | UROA |
|--------------|---------------|---------------|-----------------|---------------|
| January | 63.39 | 20.00 | 15.00 | 35.83 |
| February | 76.72 | 60.00 | 60.00 | 26.05 |
| March | | | | |
| April | | | | |
| May | 61.13 | 40.00 | 45.00 | 13.64 |
| June | | | | |
| July | 20.38 | 70.00 | 80.00 | 21.00 |
| August | 21.81 | 20.00 | 12.50 | 19.04 |
| September | 36.04 | 20.00 | 10.00 | 20.20 |
| October | 49.05 | 30.00 | 18.00 | 14.88 |
| November | 93.57 | 29.60 | 18.00 | 17.61 |
| December | 136.37 | 8.00 | 28.00 | 55.64 |
| TOTAL | 557.71 | 276.60 | 286.50 | 235.85 |

Sources-Natural Resources Commission (Fisheries 1994)

Table 1.2

No of households in each village

| Village | Jambiani | Paje | P/Mchangani | Uroa |
|--------------------------|-----------------|-------------|--------------------|-------------|
| No. of households | 441 | 262 | 423 | 319 |

Sources (DOS 1993)

Analysis of table 1.2 and 1.3 provides the annual income per household in each village generated from the sale of seaweed;

Each household in Jambiani gets average of about T.sh.64,503.23.

In Paje each household gets average of about T.sh.73,167.94.

In P/Mchangani each household gets about T.sh.43,262.41.

In Uroa each household gets about T.sh.47,903.31.

Sources of building materials

Mangrove poles are the most favoured building materials used in housing construction in the islands. Many houses are constructed using entirely mangroves poles, from walls, to roofing and ceiling. Because of this reason many people are engaged in a trade of mangrove products.

There are a number of mangrove poles selling centres scattered all over the islands. Due to the high cost of other building materials a large part of the population use mangrove poles in the construction of their houses.

Table 1.3**Value obtained in T.sh. by each village**

| Month | JAMBIANI | PAJE | P/MCHA- NGANI | UROA |
|--------------|-------------------|-------------------|-------------------|-------------------|
| January | 3,745,550 | 1,200,000 | 900,000 | 2,150,000 |
| February | 4,981,080 | 3,600,000 | 3,600,000 | 1,563,000 |
| March | | | | |
| April | | | | |
| May | 3,667,746 | 2,400,000 | 2,700,000 | 818,220 |
| June | | | | |
| July | 1,426,915 | 4,200,000 | 4,800,000 | 1,470,245 |
| August | 1,526,910 | 1,200,000 | 750,000 | 1,332,625 |
| September | 2,522,905 | 1,500,000 | 1,350,000 | 1,414,410 |
| October | 3,433,185 | 2,250,000 | 1,350,000 | 1,041,320 |
| November | 7,017,525 | 2,220,000 | 2,100,000 | 1,320,450 |
| December | 10,249,875 | 600,000 | 750,000 | 4,173,000 |
| TOTAL | 28,446,806 | 19,170,000 | 18,300,000 | 15,283,070 |

Sources-Natural Resources Commission (Fisheries)

Mangrove forest is also a major source of domestic energy. It is used in the making of charcoal and firewood for cooking and heating and lime burning for house constructions and painting.

1.3 MEANING OF SUSTAINABLE DEVELOPMENT

The Brundtland's Commission defined sustainable development as meeting "the needs of the present without compromising the ability of future generations to meet their own needs". Therefore, it has to be made clear that the natural resources must not become depleted. They should be managed in such a way that they are sustained for those who will come later. Any development which lead to the destruction, depletion or exhaustion of the resources is not sustainable.

This means that development projects which are carried out to meet the present needs should neither result in resources exhaustion, nor should they cause environmental destruction. In short for any development to be sustainable it should meet the following:

- be environmentally sustainable
- be economically viable
- be socially acceptable.

In her foreword, Mrs. Brundtland defined sustainable development as "the one which is economically forceful and at the same time socially and environmentally viable". This means that sustainable development should lead to economic growth without compromising the environment, or causing negative impacts on the tradition and culture in the society. It is development in which the resources are managed in such a way that the needs of the present are met, and at the same time it is ensured that the future generation is in a better position to meet its own needs.

According to the World Commission on Environment and Development "Sustainable development is not a fixed state, but rather a process of change in which the exploitation of resources, the direction of investment, the orientation of technological development and institutional changes are made constant with future as well as present needs".

In their use of natural resources, the people of Zanzibar perceive these resources to be inexhaustible. Because of this perception no effort has yet been made towards sustainable development of the resources. This is the reason why many marine resources have already been over exploited and are nearing depletion. What is even worse is that no actions can be seen to be taken to manage the sustainable use of these valuable resources.

The evidence of over utilization of natural resources can be seen everywhere in the islands at the coastal villages of Zanzibar. For instance at Chokocho village in Penba, the author witnessed a number of fishermen coming back from a day fishing without any catch. Many of them had one or two sea cucumbers (bechdeemer). This area was very rich in different types of fish species, seashells and molluscs about 15 to 20 years ago. It is surprising that today one can walk along the whole mangrove stand at Chokocho, a distance of about six kilometres without catching even a single crab. In the past crabs were in abundant in this area. This is only one place which the author visited, but it is almost the same story everywhere in the islands, and in some places it is even worse.

The author is of the opinion that this trend will continue if no steps are taken to educate the people to abandon the mythical idea of inexhaustible resources. Any development which leads to depletion of the resources and environmental degradation is not sustainable. One of the major obstacle towards sustainable development is the rapid population growth. Rapidly growing population can increase pressure on resources and slow any rise in living standard. Thus sustainable development could

only be pursued if population growth and size is in harmony with the changing productive potential of the ecosystem.

In the case of Zanzibar the last three decades have witnessed a tremendous increase in population. Within this short period of thirty years, that is 1964-1994 the population of the islands has increased more than double. The population was 300,000 in 1964, and the estimated population in 1992 is 723,000. (DOS, 1993) If the present growth rate of 3.1% continues unchecked, the population of the island will be more than 1.5 millions in another thirty years (2025). This will mean more food, more energy and more shelters which will result in the depletion of the resources and hindrance to sustainable development

In planning for sustainable development in the islands of Zanzibar one of the major problems which need to be addressed by the policy makers is the rapid growth in population.

1.4 REASONS FOR SUSTAINABLE DEVELOPMENT OF THE ZANZIBAR MARINE ENVIRONMENT

It is clear that the coastal ecosystem of Zanzibar is an important national resource, degradation of which will have social as well as economic implication for the nation. Therefore it is very vital to develop a strategy which will ensure conservation and sustainable utilisation of the resources, for the benefit of the present and future generation. It is very evident that the current status of the coastal waters of Zanzibar has now become critical. The waters especially around Zanzibar City is highly polluted. The untreated domestic sewage from the urban centres enters the ocean directly as there are no sewage treatment facilities in the islands. The preliminary Study on Environmental Pollution on Zanzibar carried out by J.J.A Van Bruggen in

1990, showed the presence of heavy metals at many places along the coast surrounding the city. Bruggen reported that the water is at many sites not suitable for swimming. If no timely actions are taken to save this situation the condition will be even worse in the near future.

Hence the new approach is needed for the management of the marine environment, monitoring and maintenance of the water quality.

This new approach is specially important for Zanzibar because the population is so very dependent upon coastal and marine resources. To the Zanzibaris, destruction or mismanagement of the marine environment will lead to the destruction of their own lives. As it has been reported by Jiddawi et al (1990) about 94 % of the per capita protein intake is derived from the fisheries. With the increasing pressure on the already overstretched resources resulting from over exploitation, use of destructive methods of extraction, coupled with a rapid growth of population, it is important that practical management system for sustainable development of the marine environment be adopted. Otherwise, the country will witness social as well as economic disaster in the near future.

For centuries Zanzibar economy has been monocropic in nature depending solely on the export of cloves. For a decade and a half Zanzibar has been in economic doldrums experiencing severe economic hardship and a negative balance of payment. In the mid 1970s production of cloves fell miserably due to the outbreak of diseases such as sudden death and die back.

These diseases were called sudden death and die back due to the speed at which the cloves trees were dying. In addition the price of cloves fell drastically from US dollars 9000 per ton in late 70s to US dollars 2500 per ton in 1983. This prompted the government to look into ways to diversify the economy. Since then the price of cloves has not recovered and has continue to fall to the low of US dollars 850 per ton in 1994.

Geological investigation conducted in Zanzibar in the early part of this century has revealed the presence of such minerals as cobalt, gypsum, iron and titanium. But according to the Department of Statistics the proportions were found to be insufficient to warrant any economic exploitation. As for deposits of petroleum, gold and other precious metals, prospects are said to be remote.

Therefore, it is quite clear that the only economic alternatives left for Zanzibar are the resources available within her marine environment, hence a need for sustainable development of these resources.

In the wake of economic hardships, Zanzibar made a U-turn and reformed its economic policies in 1984. Trade liberalisation was introduced and local as well as foreign private investments were allowed. To back up these policies the Zanzibar House of Representatives a legislative body enacted the legislation known as the Investment Promotion Act No. 2, of 1986.

With the new policies and authorising legislation, a number of economic development projects have been approved, or are in a process of being approved. In this very short period of six years from 1987 to 1993 98 Hotel and Tourism projects have been started. Of which 74 are already operational.(ZIPA, 1995 & ZTC, 1995) Together with these projects 17 fisheries projects have also been approved. Most of these new projects are not planned and no EIA was done prior to their approval. There were cases when applications were sent to the authority after the completion of construction phases of the projects. No National Policy on Tourism exists in the islands This was reported to the author by tourist officers at ZIPA and Zanzibar Commission for Tourism. The new projects can have devastating effects on the marine environment as there is no mechanism in place for monitoring the environmental changes caused by these projects. In the case of Fisheries the policy gives more emphasis on increase production to earn more foreign currencies. The fishery Policy does not consider at any time the question of stock management to

ensure sustainability of the industry. This is another reason why Zanzibar must embark on a sustainable development of her marine environment.

As there are no mountains or other attractive natural resources like wildlife which could attract tourists to Zanzibar, all tourists projects and hotels are located along the coast. It is beach tourism. This can have a negative impact on the marine environment which may result to the degradation of water quality, pollution of the beaches and destruction of coral reefs and the coastal ecosystem. It is the virgin sand beaches, unpolluted sea, and healthy coral reefs which attract the developers and tourists to the islands.

This can be maintained through sustainable development of the resources. However Tourism has the tendency of killing itself and conflicting with other marine related industries like fisheries if not properly managed.

The importance of a tourist industry to Zanzibar's economy is quite obvious. Out of 204 development projects which have been approved by the government, under the new Investment Promotion Act of 1986, Hotel and Tourism projects accounts for the majority (Fig 1.4)

Analysis of Fig 1.4 shows the number of projects approved by sector as follows:

Hotel and Tourism - 53.4 %

Industries - 13.2 %

Agriculture and Fisheries - 8.0 %.

Tour Operation - 6.3 %.

Business Services - 6.3 %.

Transportation - 5.7 %.

Others - 1.1 %.

From this data it can be seen that Hotel and Tourism projects and other tourist related activities account for 59.7 % of the approved projects.

Table 1.4 shows the sectoral distribution of the investment.

| SECTOR | APPROVED PROJECTS IN US DOLLARS |
|-----------------------|--|
| Agriculture Fisheries | 13,637,360 |
| Business & Services | 3,796,759 |
| Hotel & Tourism | 168,813,173 |
| Industries | 15,096,429 |
| Tour Operators | 5,074,348 |
| Transport (Air & Sea) | 59,366,334 |
| TOTAL | 265,784,397 |
| | |

Sources - (ZIPA-1994)

Analysis of the Table 1.4 indicates that the Tourism sector is leading all other sectors in the amount of money invested. It accounts for 174,000,000 US dollars of the total invested. For the Tourist industry to flourish without conflicting with other marine related industries, effective programmes and policies are needed for sustainable development of the marine resources.

Another marine related industry which is emerging and is of great importance to the economy of Zanzibar is seaweed farming. The importance of seaweed farming to the local economy has been explained in 1.2 above. It is a major source of household income in the coastal villages in the islands.

At present seaweed farming is the second major export and foreign exchange earner after cloves. Table 1.5.

Table 1.5. Amount of seaweed bought by ZANEA.

| YEAR | SEAWEED IN METRIC TONS | VALUE IN US DOLLARS | |
|--------------|-------------------------------|----------------------------|--|
| 1990 | 808 | 26,066 | |
| 1991 | 2,497 | 228,334 | |
| 1992 | 2,123 | 266,733 | |
| 1993 | 2,042 | 295,240 | |
| 1994 | 3,562 | 384,200 | |
| TOTAL | 10,517 | 1,200,574 | |

Sources - (Natural Resources Commission).

Analysis of the table shows the increase in the production of seaweed in successive years and the increase in the taxes paid to the government.

Table 1.6

Export of seaweed for a period 1991-1993

| YEAR | VALUE IN US DOLLARS |
|--------------|----------------------------|
| 1991 | 276,753 |
| 1992 | 682,222 |
| 1993 | 655,556 |
| TOTAL | 1,554,566 |

Sources - (DOS, 1994)

Analysis of the table shows the increase in export of the seaweed in successive years. Within this very short period export of a number of non traditional marine products has been increasing. They includes Bechedemer, Lobster, Sharksfins, Skar (Nzio) Dry fish, Shells, Conches, Crabs and Squids. Bechedemer `s export value has increased from 12.7 millions T.sh. in 1991 to 29.3 million in 1992. The sustainable development of Zanzibar marine environment is essential in order to maintain these industries which are of paramount importance to the economic life of Zanzibar.

CHAPTER TWO

2.0 THE MARINE ENVIRONMENTAL PROBLEMS ASSOCIATED WITH MANGROVE FORESTS

2.1 The Mangrove Forests

Mangrove forests are ever green forests between the land and sea, found essentially in the intertropical zone, and occupying large tracts along sheltered coasts, estuaries and in deltas where they are influenced by tides and widely differing conditions of salinity and rainfall regimes.(UNESCO, 1981)

Distribution and area

The mangrove forests in Zanzibar are situated in the coastal creeks of the islands. The total area covered by the forest is about 40,000 acres. 10,000 acres are in Unguja, and the remaining 30,000 acres are found in Pemba island. Those in Pemba are generally well distributed round the island, while in Unguja they are localised. With the exception of Muwanda, the rest of the forests are located in the southern and south eastern part of the island. The boundaries of the forests are generally the low water mark on one side, and the high water mark on the other side. In Zanzibar there are comparatively few fresh water swamp mangroves.

Legal position

By law the mangrove forests in Zanzibar are government lands, as provided for under the wood-cutting Decree No 8 of 1945 paragraph 2, interpretation which states that "government lands for the purpose of this Decree shall mean public land as defined in

the Public land decree and shall include the area of the foreshore between high and low water mark”.

Mangroves are the forest associations of the tidal areas and are dependent on the mud deposited from land by runoff of the rivers and the rain. With coral islands such as those of Zanzibar the mud on which the mangroves grow is the direct result of the erosion of the surface soil inland. This erosion is very serious, particularly in Pemba which is aggravated by the cultivation of the steep slopes. Here the mangroves forests play an important role in countering the rate of soil erosion. They hold the eroded soil from the steep slopes and prevent the ocean waves from carrying them away. Had it not been for the presence of mangroves all along the coast of Pemba, the beach erosion could be even worse than what it is today.

Species

Nine species of mangroves are found in the islands and each will now be described

i. Rhizophora Mucronata

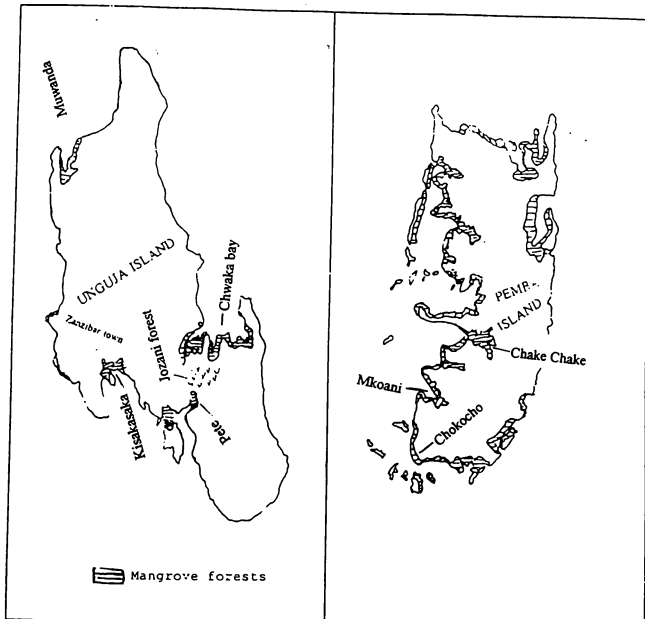
This is locally called Mkoko or Mgando. It attains a height of some 30 feet and can easily be recognised by its aerial bowed stilt roots many of which arise from quite high on the trunk and branches, and by its viviparous seedlings. (Griffith, 1949 & Shunula, 1990)

ii. Bruguiera Gymnorhiza

Locally known as Msinzi, Mchonga in Pemba and Muyu in Unguja. This grows up to the height of 70 feet. It can be recognised by its buttressed trunk, close-set foliage, dark bark and viviparous seedling. It has kneed roots which appear sporadically out of the soil.

(Griffith, 1949 & Shunula, 1990)

Fig. 2.1- Distribution of mangrove forests in Zanzibar.



Sources- SM Nasser-1994

iii. *Ceriops Condotlena*. Locally called Mkandaa Mwekundu. It is not tall it grows up to the height of 15 feet. It can be recognised by its reddish bark and angular character of the long viviparous radicle. (Griffith, 1949 & Shunula, 1990)

iv. *Avecinia Marina*

Locally called Mchu. It is a spreading tree with willow-like yellowish green foliage. It has long spreading horizontal roots and from these arise small vertical pointed leafless suckers in great abundance. It has a smooth greenish yellowish bark when young and becomes variegated green and reddish in older trees.

(Griffith, 1949 & Shunula, 1990)

v. *Sonneratia Alba*

Locally known as Mpera and Milana. This is a small tree which can be recognised by its reddish trunk and branches, also its flowers which consist of a white stamen which are quickly shed, the top-cup-shaped starlike fruits and the stout vertical pneumatophores which serves as breathing organs for the underground roots.

(Griffith, 1949 & Shunula, 1990)

vi. *Ceriops Tagal*

This is locally called Mkandaa. The only difference with *Ceriops Condotlena* is in colour. It also grows up to the height of 20 feet. (Griffith, 1949 & Shunula, 1990)

vii. *Carapa Oborata*

Locally known as Mkomati. It is a small tree of about 20 feet high found scattered throughout the mangroves and usually associated with the higher areas. The old name of this species was *Xylocopus Oborata*. (Shunula, 1990)

vii. *Heriteira Littoralis*

This tree is locally known as Msikundazi. It is a tall tree and can be easily distinguished by the silvery scaly undersurface of its simple, oblong or elliptical leaves. (Griffith, 1949 & Shunula, 1990)

Fig. 2.2. *Rhizophora mucronata* trees at Chokochi mangrove sand plot (10m x 10m).



Fig. 2.4. Avicennia Marina plants at Kivaka mangrove sand plot (10m x 10m).



ix. *Lumitreza Racemosa*

This tree is locally known as Kilalamba. It is a small tree with thin trunk. (Shunula, 1990)

2.2 RANGING VALUE OF MANGROVE FORESTS

Local uses of mangroves in Zanzibar

The islands of Zanzibar as it has been explained in 2.1 above are covered to a considerable degree by mangrove forests. These forests are of paramount importance to the traditional life of the people in the islands. They provide the most needed domestic energy (wood fuel and charcoal) for a great section of the population, both for people in urban and rural areas.

The forests are also the major source of building poles, the demand for which is ever increasing due to high population growth and rapid rate of urbanisation. Apart from these uses, mangrove forests have a wide range of uses locally in different parts of the islands. These include leather tanning, medicine production, furniture and boat construction and many more. Table 2.1 shows different species of mangrove with their local uses.

Coastal Protection

Mangrove forests in Zanzibar play a major role of protecting the coast against erosion caused by strong ocean waves and heavy downpours. An example is found in the Muwanda area in Unguja which has a non-rocky sandy soil which can be easily washed down during heavy rains or when hit by strong ocean waves. This area which stretches from ras Uso wa Membe to Tumbatu island has no coral protection. "This leaves more or less the whole of Makoba Bay exposed to strong ocean waves which are reputed to be particularly strong during the north-east monsoon period" (Shunula, 1990 page 11).

Importance to fisheries

Mangroves are a vital component in the coastal ecosystem. Many species of commercially importance depend on the mangrove forests for at least part of their life cycle. The forests offer a breeding and nursery ground for different fish species and provide shelter to many juvenile fish. The species includes paneaid prawns like *P Indus* and *P Monodons*. The mangrove formations support an extensive food web through their high production of detritus. Hence they serves as a source of food for fish and other marine life.

There is a direct link between subsistence and artisinal fisheries in Zanzibar with the adjacent mangrove ecosystem. Mangroves support the basket trap fisheries. The main species caught in this type of fisheries are *Chanos Chanos*, Parrot Fish, Haraks and Milk Fish who are all the mangrove associated species. Even the bait used in the trap is a type of shell which is obtained from the mangrove vegetation. The ecosystem is also important to commercial fisheries, though there are no data to prove this at present as no research had been carried out so far in the islands. The mangroves ecosystem in Zanzibar are rich in prawns and shrimps which could be of great importance to commercial fisheries. In the countries like Indonesia, it has been reported that about 550,000 tons of fish, worth US dollar 194 million caught in 1978 were species directly linked to mangrove ecosystem. This was reported by Rodney V. Salm & John R. Clark in their book *Marine and Coastal Protected Areas*.

Some of the fish species associated with the mangrove ecosystem in Zanzibar include- "Lethrinus, *Chanos Chanos*, Haraks, Parrot fish, Milk fish Rabbit fish, *Signus* species deferent species of crabs molluscs, shrimps oyster and other shells fish."(Jiddawi et al, 1990, & Shunula, 1990)

Life support for terrestrial animals

There is some vital ecological interaction between the fauna resident at Jozani forest and the flora and fauna of the mangrove swamp at Chwaka. The Red Colobus

Table 2.1

| Scientific name | Local name | Local uses |
|------------------------|------------|--|
| <i>Avecinia Marina</i> | Mchu | charcoal, firewood |
| <i>R Gymnorhiza</i> | Mfunzi | house construction poles, firewood and charcoal |
| <i>L Racemes</i> | Kilalamba | charcoal, firewood, house construction straps (fito). |
| <i>C Tagal</i> | Mkandaa | roofing poles (mapau), straps |
| <i>S alba</i> | Milana | house construction poles (boriti), charcoal, boat building, furniture |
| <i>R Mucronata</i> | Mkoko | house construction poles (wall), roofing poles, dye making for colouring, leather tanning, firewood. |
| <i>C Oborata</i> | Mtonga | medicine for treating stomach pain, house construction poles. |

Sources- villagers interviewed at Chokocho and Kisakasaka 1994, and Shunula 1990.

It is the mangrove forest present in the area which acts as a shield against the sea waves. It is important for the mangrove stand at Muwanda to be protected as suggested by Shunula, as they are playing an essential role in protecting the coast against otherwise very severe erosion.

In Pemba the situation could have been even worse had it not been for the presence of mangrove forests all along the coast. Because the coastline in Pemba is characterised by very steep slopes, the mangrove forests are responsible for holding an otherwise very rapid overwash and erosion of the side of the creeks during downpour. They also protect the coast from very severe ocean waves during the monsoon period.

monkeys (Kima Punju) endangered species found only at the Jozani forest in Zanzibar, are always seen in the mangrove forests at Pete. The Mangrove is a major source of food for these monkeys destruction of which could lead to their extinction. Therefore in order to protect these rare species the mangrove forests at Chwaka and Pete are in particular need to be protected.

Many beehives are also found in the mangrove forests. Production of honey could be a significant economic alternative to the local population if well organised. This should be encouraged to minimise the chopping of mangrove wood, and could ultimately slow down the cutting of the forests.

Trapping of debris

Mangrove traps debris and silt, thereby stabilising the nearshore environment and clarifying adjacent open water. This facilitate the occurrence of the process of photosynthesis in marine plants. The result is the production of oxygen which is needed by minute marine organism such as and zooplanktons.

The fringing network of mangrove buffers natural forces such as wave action, tidal change and rain run-off, preventing soil loss a with firm but flexible barrier.

Sources- The Reef Relief Agency, Key West, USA.

Mangroves are nutrient producers

In South Florida, USA, researchers have shown that mangroves ecosystems are extremely productive, due mostly to the sustained export of detritus such as leaf and root litter. Mangroves shade and drop about seven and a half tons of leaf litter per acre per year. While in Indonesia and Malaysia it is estimated to be three tons per acre per year and five tons per acre per year respectively. Reported Rodney V. Salm & John R Clark. This huge amount of constantly-shed leaves are then quickly broken-down by bacteria and fungi and released into the water providing food for the marine life.

Mangroves as important filters

“Mangroves filter land based pollutants from ground water and storm water run-off that contain harmful pesticides, herbicides, hydrocarbons and heavy metals preventing them from entering the marine environment”. (Reef Relief Agency, Key West; USA). Therefore it is worth noting here that mangroves provide a natural way of marine environmental pollution control, and hence maintain the quality of coastal waters. Mangroves also recharge underground water supplies by collecting rain water and slowly releasing it.

Scientific research and education

Mangroves provide good ground or scientific and educational researches because of the presence of different species of flora and fauna in the ecosystem. “The diversity of life in the mangroves ecosystem is spectacular, invaluable to the mankind, and likely essential to the maintenance of life on Earth”. (Sobel, 1993, page 20)

2.3 DEGRADATION OF MANGROVES FORESTS

Mangrove forests are being degraded and destroyed globally on a large scale like tropical rain forests, through overexploitation of their potentially renewable product and through conversion to a single-use option such as agriculture. This is due to the assumption held by many regional, national and international planners and administrators, that mangroves are “wastelands” that are of no value until they have been developed through conversion to some other methods for exploitation of cash crops. However, this assumption is no longer valid. Many people in different countries have realised the wide ranging values and importance of mangrove ecosystems to mankind.

In south Florida USA, for example, mangroves are purposely planted or protected under government mandate to minimise shoreline erosion and provide habitats for sports and commercial fisheries.

There should be no doubt that mangroves are too valuable to allow them to be lost to other forms of land use except when overriding national priorities are involved and no other alternative are economically and environmentally feasible.

In coastal areas with mangrove ecosystems, services such as storm protection, erosion control, wastewater cleanup and leisure activities are provided by the mangrove forests. The forests are also used as an important and potentially sustainable source of fuelwood and charcoal to meet the increasing needs of developing countries for domestic fuel. Despite their importance, mangroves are often undervalued. This has led to their extensive destruction and degradation.

Like in many other countries destruction of mangrove forests in Zanzibar is very severe as it has been reported by the forestry officers interviewed by the author. (Shunula, 1990) reported that "the mostly affected areas are Kisakasaka, Unguja Ukuu, Chwaka, Uzi, Pete and Muwanda in Unguja". In Pemba island with the exception of Chokocho and Matumbini islet where the destruction is very severe, it is less intensive in the rest of the areas.

The most serious case of mangrove destruction in the islands of Zanzibar took place in the 1950s at the Muwanda mangrove stand. During this time great quantities of firewood were needed in the boiling preparation of Holothurians (Bechdeemer) for export. Another major destruction of mangroves happened in the 1970s in the same area. This time there was an acute shortage of salt in the islands and Muwanda was the main base for local production. Hence great quantities of firewood were needed for the rapid production of salt. The result was clearfelling of mangrove forests in the area. At present destruction of mangroves in Zanzibar is not confined to one area. On a visit to Kisakasaka and Chokocho mangrove stands the author witnessed

massive destruction of mangroves which is still going on at an increasing scale. The destruction is due to a severe cutting done by the people who take part in the trade of mangroves poles, firewood and charcoal, and lime burning.

2.4 CAUSES OF DEGRADATION

The reasons or causes which lead to the destruction of mangrove forests in different countries are not necessarily the same. Therefore it is worth noting that there are diverse solutions for their conservation. Threats to mangroves ecosystem can be either natural or caused by human activities.

In the United States of America major threats to mangroves ecosystem include Hurricanes and Shoreline development. Hurricane Donna which hit the southern part of the USA in 1960 damaged an area of about 100,000 acres of mangroves in south Florida. Loss of trees ranged from 25 % to 100 % from shearing the trunk above the ground, complete overwash of the islands and prop roots damaged from marl and fine organic matter coating the roots.

Shoreline development

This has replaced mangroves with marinas, dredged channels, airports, seawalls filled lots and other commercial and residential constructions. Sixty per cent of shallow water open mangroves in the upper Florida Keys were lost between 1955 and 1985. Forty per cent was due to dredging. This loss is not restricted to Florida keys, other areas such as Tampa Bay, and the lower east coast of Florida have lost mangroves. Approximately 11,000 acres of mangroves were lost between 1943 and 1970 in Collier Monroe and Dade county alone of a total 430,000 to 500,000 acres in all Florida as reported by Peter G. Wells & Peter J Rickens 1994.

“In Ecuador and Indonesia the brackish pond aquaculture primarily of shrimp is the most damaging cause of mangroves destruction”.(Wells et al, 1994) Shrimp culture

not only replace existing environment , it also has significant effects on other resources beyond its boundaries. It has been reported that the Indonesian's Five - Year plan of 1984-89 promoted the opening of thousands of square kilometres of mangroves for conversion into ponds.

In countries like India, Bangladesh and the Philippines agriculture has been the major cause of mangroves destruction . Large areas of mangroves have been cleared to give way to rice fields.

Wood extraction has been the cause of mangroves degradation in many countries in the past. There was a lot of clearcutting for timber, firewood and charcoal. In Sabah for example, about 40 % of its mangroves were set aside for wood chip production alone. Reported Wells et al 1994.

In Zanzibar the major causes of mangrove forests degradation includes the following :

- i. Intensive cutting
- ii. Debarking
- iii. Pollution
- iv. Other causes

i. Intensive cutting

Cutting of the mangrove forests in Zanzibar is going unabated. It is very intensive in many areas. The cutting is done because of the following reasons.

1. High demand for building poles.
2. High demand for firewood and charcoal.
3. Lime burning

1. High demand for building poles

As the demand for mangroves poles for housing construction increases, the cutting of mangroves forests will increase even further.

Fig. 3. 3. Logging of mangrove forests at Krakauk-ephe



The increase in demand for the poles is due to the fact that there is no any other alternative cheap building materials for the people. This problem is aggravated by the fast rate of urbanisation which has been witnessed in recent years.

This has resulted from the rapid growth in population in the islands. Due to this reason it will be unwise for the government to stop people from cutting the mangrove poles without giving them an alternative for their needs. Many people are also involved in the trade of mangrove poles in the islands. It is a thriving industry employing a reasonable number of people. Many mangrove selling centres can be found almost everywhere in the islands.

2. High demand for firewood and charcoal

As it has been stated earlier mangrove forests are the major sources of fuelwood (firewood and charcoal) for domestic uses for a great number of the islanders both in urban and rural areas. It is worth noting that this increase in demand has been triggered by the sharp increase in the price of electricity, and increasing numbers of households which has resulted from the rapid growth of the population. The increase in the price of electricity has forced many people who were using electricity before to revert to firewood and charcoal. This increase in demand has made this use of mangroves lucrative and therefore many people are now involved in the trade.

Firewood and charcoal making is one of the major reason which encourages the cutting of mangrove forests and causes it to continue in the islands. This is very destructive as it is being done deep inside the forests.

3. Lime burning

This is another activity which encourages the cutting of mangroves. Lime is also used in the housing construction. It is mixed with clay and used in the joining of stones when bricks and cement are not used. Most of the islanders like to use lime and clay especially in the foundations of their houses even if the walls are constructed

Fig. 2. A view of a forest in Krakow, Poland.



by using bricks and cement. Lime is also cheaper than cement which acts as an incentive for many people to use it.

Even the government itself uses large quantity of lime in the rehabilitation and restoration of old Stone Town in Zanzibar which is of historical importance to Zanzibar. This causes the demand for lime to increase each day. As long as the demand for lime in the islands increases, there is no doubt that the demand for mangrove wood needed in lime burning will also increase. Like charcoal, lime burning is also being carried out deep inside the forest on the boulders. This is very destructive as it destroys live trees in the vicinity. Because of the above mentioned reasons the cutting of the mangroves cannot be simply stopped by laws and regulations, as it involves the socio-economic life of the local population. The only action which the government could take is to come up with a proper management plan which allows the people to use the forests in a sustainable way. In Zanzibar at present such a management plan is not available.

ii. Debarking

This activities affect only those species whose bark is used for dye-making, colouring and leather tanning. It simply involves removing of the bark from the trees leaving the trees to die slowly. Debarking is very common in Pemba where the bark is used for leather tanning to support the local shoe factories which make the traditional makbadhi sandals. Barks is also used for colouring different household items.

iii. Pollution

The main sources of pollution which affect mangroves forests in the islands are oil spill and pollution from industrial wastes



-oil spill

There are two fuel discharge points in Zanzibar. These are submarine discharge points for refined fuel products and they are located at Mtoni in Unguja and at Wesha in Pemba respectively. There is a continuous oil spillage that occurs during discharge operations at both sites. At Wesha the area is highly polluted with oil which make the local population to think the oil which they always see in the nearby mangroves stands comes from under the ground. A large mangrove stand has been completely destroyed at Wesha and it is no longer there. Beach erosion is very severe now as the area which was covered by the mangroves is now exposed to direct wave action.

“ In Unguja the spill coats the beaches at Mtoni during south monsoon and the mangrove forests to the south of the discharge point during the north monsoon “ (UNEP, 1989, page 55)

It is very unfortunate that nobody seems to care about what is going on at these two discharge points.

The cases of oil tankers flushing their tanks in the area is the order of the day. They do not even think of the consequences of their acts. It is evident that authorities responsible are unaware of the damage which is being done to the marine environment and the coast the country will have to pay for clean up in the future.

iv. Pollution from industrial wastes

Zanzibar at present has no major industries. Hence there is no major threat of pollution which could affect the mangrove forests resulting from industrial wastes. The only pollution related incident noted in the islands was from the state leather and shoe factory at Mtoni. This factory when it was operational used to discharge its wastes directly into the stream 100 m. from the sea. The stream was highly polluted to the extent that the water colour was changed to brown and there was a nasty foul odour all over the area. The process chemical in the tannery operations includes chromic acid. Another source of industrial waste is the Cottex Textile mill located

some 2 kilometres from the sea which discharges its wastes into the same stream. This factory also has no treatment facilities. "The factory discharges 300 cu. Metres of liquid waste per day which includes hydrogen peroxide, soda ash, caustic soda and various dyes."(UNEP, 1989, page 54) With the present new policy of trade liberalisation and the development of many industries, it is very important for guidelines to be given by the authority to make sure that all the industries treat their wastes before discharging them.

Other causes

Other causes of mangrove degradation in Zanzibar which could have devastating effects if allowed to be carried out include clearing of mangrove forests for agricultural purposes and land reclamation. There have been some recorded incidents of clearing mangrove forests to give way to rice field in Pemba. This activity should be discouraged and stopped forthwith as the benefits of having mangrove forests both socially and economically outpace those of clearing them for rice fields.

In the case of land reclamation no incident which involves mangrove has been reported so far. But there are reports which show that the Ministry of Communication and Transport in its plan for port development intends to reclaim an area of land from Malindi wharf to Mtoni which encompasses a large area of mangroves stand of Mpiga duri and Maruhubi.

This should not be done without first carrying out a proper Environmental Impact Assessment. It is only through a proper EIA that the predictions of environmental changes which are expected to occur during the implementation and operational phase of the proposed action could be determined. The EIA should be included in the approval process to give the decision makers insight to the environmental hazards involved in the propose project. The EIA should include Environmental Auditing and establish a baseline study prior to the start of the project. Government should be always reluctant to approve a project of such magnitude if EIA is not included in the

approval process for review. This because the investors normally try to get away from spending development capital on environment protection.

It is now clear that the causes behind mangrove destruction have changed overtime. Therefore there is a great need to consider simultaneously the biological and economic factors when planning activities in the mangrove areas. It is also beyond doubt that the primary reason why mangroves regions are being degraded arises out of the fact that they are undervalued as an ecosystem.

The importance of mangrove forests in Zanzibar warrant their conservation and sustainable use. Both sustainable use and preservation can be incorporated an effective management policy if it has the following goals:-

- i. To prevent further destruction of mangrove by halting all unjustifiable conversion.
- ii. To provide for contemporary human needs while ensuring that the diversity plant and animal life is adequately protected within the reserve.
- iii. To manage mangroves as renewable resources on a sustainable use basis for direct and indirect products as well as the free environmental services they provide. Management on sustainable use basis often does not involve added costs, at least in the long term.
- iv. To manage mangroves as integral part of the coastal zone, rather than an ecosystem surviving in isolation. Decision concerning the mangroves should be made in the context of their dependence on the adjacent water catchment, land use and their interrelationship with adjoining coastal waters and associated tidal marshes, seagrass and the coral reef.
- v. To conduct impact assessment for projects in and adjacent to mangrove on the basis of the dynamic nature of this ecosystem with particular emphasis on the vital external process related to the supply of both fresh and salt water, the supply of nutrients and the stability of the substrate

CHAPTER THREE

3.0 MARINE ENVIRONMENTAL PROBLEMS ASSOCIATED WITH CORAL REEF

The chapter discusses the types and distribution of coral reef in Zanzibar, and analyses the socio-economic value of the ecosystem to the islanders. It also examines the degradation of the coral reef ecosystem and problems which lead to their destruction. Finally the chapter proposes the possible solutions which could be employed to control or halt the destruction.

3.1 THE CORAL REEFS

Coral reefs are massive deposits of calcium carbonate built over centuries by living organisms; with contributions from algae and other organisms. The essential conditions to reef growth are water temperatures above 18 degrees, water depth shallower than 50 metres, constant salinity, and the circulation of clear, pollution free water. Rodney V Salm & J Clark have defined coral reefs as "tropical shallow water ecosystem that flourish best at temperatures between 25 and 29 degrees Celsius." This is because extensive reef development is seldom found in the regions where temperatures fall below 20 degrees.

Coral reefs usually tend to be restricted to a certain belt between latitude 30 degrees North and 30 degrees South, although some coral assemblies are found at 35 degrees North of Japan and 32 degrees South in Tasman Sea. As the reef-building coral need sufficient light, their significant developments are restricted to shallow water. It is due to this reason that reefs are often found closer to land, frequently forming a continuous band parallel to the shore. "Coral is a general term used to describe a variety of related forms belonging to the phylum coelenterate" (Dr. Elizabeth Wood,

1993). “ The reef- building corals are animals that collectively deposit calcium carbonate to build ornate and sometimes colonies” (Rodney et al, 1984, page 94). The coral polyps protrude their tentacles at night and sweep the sea for passing plankton's on which they feed. “ A coral reef is a complex, highly stratified ecosystem” (Carl Rossler, 1993 page 23). They rank among the most biologically productive and diverse of all ecosystems, sometimes supporting as many as 3,000 species. The high productivity of this ecosystem results principally from its flowing waters, efficient biological recycling and high retention of nutrients.

Coral Reefs in Zanzibar

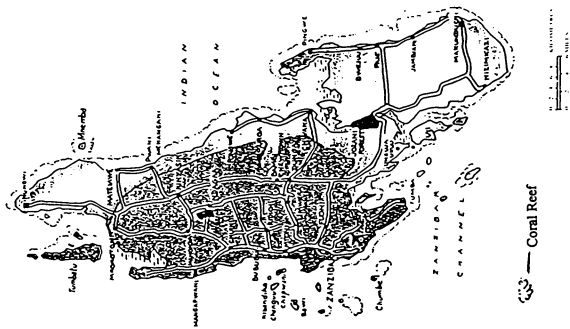
Zanzibar has about 228 kilometres of reef. “The coralline zones cover an area of about 218,596 hactres around Unguja, and 117,586 hactres around Pemba (Jeddawi et al, 1990, page 2).

Several islands of Pleistocene coral origin can be found to the west of Unguja island. These islands are surrounded by extensive coral formations. They are Kibandenko, Chapwani, Chango, Bawi, Kwale and Pungume. To the north is Tumbatu island, which was believed to be connected to the main islands in the past. It is separated from the main island by a channel, 1.5 to 3 nautical miles wide with a maximum depth of 8 fathoms.

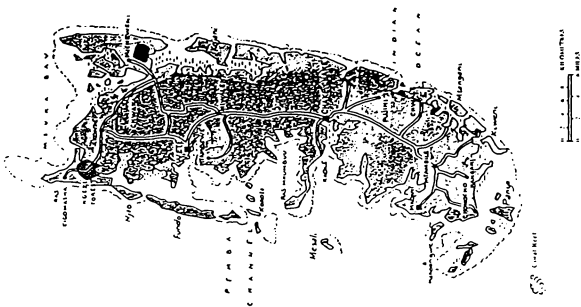
The east coast of Unguja is generally straight. To the north east is a small Pleistocene coral island (Mnemba), which is also surrounded by extensive coral formations. There is a continuous fringing reef which is fronting the east coast from Ras Nungwi to the north and Ras Kizimkazi to the south. “This is a high energy reef, backed by a small reef lagoon system that may dry at low water spring”(UNEP, 1989, page 46)

Pemba island consists of a narrow fringing reef all along the east coast with a 100-fathom line lying just 1 to 2 nautical miles offshore. The coast consists of Pleistocene reef structure between Ras Kiuyu to the north and Ras Upembe to the south. Between Ras Upembe and Matumbe Makupa there is a drying bank area with a series of dissected coral islets. “The west coast of Pemba from Matumbe Makupa to Ras

ZANZIBAR



PEMBA



Kigomasha in the north, is a unique indented coast fronted by a low lying Pleistocene coral island (Mesali, Fundo and Njao)". (UNEP 1989, page 46). The coral reef seaward of these islands consists of narrow ribbons of fringing reef from Mesali island to Ras Kigomasha.

The coral reef fronting Unguja island from Zanzibar town and extending to the south-west of the island can be represented by three rings.

I. The first ring is the one formed by the islands of Chapwani, Kibandeko, Chango to the north, and the reefs of Fungu Chawamba, Pange and Kisiki arching to the south-west.

ii. The second ring consists of Danzi reef, Bawi island, Murugo reef, Nyange reef and the reef and islands formations of Chumbe and Kwale.

ii. The third ring is formed by Fuwatu reef, Fungu Mapepe, Mwamba Mapepe, Pwakuu reef, Tambare reef and Boribo reef.

In Pemba there is a fringing reef running southward from Ras Kigomasha fronting Njao island including the Njao Gap, fronting Fundo island and Fundo Gap, the Uvinje Gap and Mesali island.

3.2 VALUES OF CORAL REEF ECOSYSTEM

Like the mangrove forests, the coral reef ecosystems of Zanzibar support a diversity of marine resources. These resources are sources of income to the coastal communities and are also of great importance to the national economy. The ecosystem is also a source of food and animal protein for the people.

Importance To Fisheries

The geographical position of Zanzibar hides the islands from any natural upwellings. Therefore it is a fact that the fisheries biomass is highly restricted to coralline zones around the islands and pelagic species as may be found in Unguja and Pemba. The coralline zones as explained in 3.1 above cover an area of about 218,596 hectares around Unguja and 117, 586 hectares around Pemba. "Over the past six years the total annual fish catch of Zanzibar has fluctuated between 10,000 and 20,000 tons"

(Jiddawi, et al, 1990) . A large portion of fishing is confined to the depth of less than 10 fathoms within the reefs. These figures do not include those of subsistence fishing, which is mainly for domestic consumption.

The reef resources in the islands are exploited by the use of local traps such as basket traps (Dema, Towe), hand lines and anchoring nets. The light attraction is also used to catch small pelagic species such as sardines, scads, and mackerels throughout the year. The principal reef species in Zanzibar includes Lethrinidae, Lutjanidae, Siganidae, Serranidae, Nimipteridae, Mullidae, and Labridae (Jiddawi et al 1990). The reef limits the trawlable area and therefore commercial trawling is not common in Zanzibar. The potential yield of demersal trawl fish within the Zanzibar and Pemba channels was estimated at slightly above 3000 tons .

The coral reefs in Zanzibar as the case with mangrove ecosystems support both artisanal and subsistence fisheries and have great potential for commercial fishery. Though commercial fishery is not well developed as yet, there are signs that this will play a major role in the national economy in the near future. The species of commercial importance include Octopus, Squids, Spiny Lobster, Holothurians, Shells, Skip Jack Tuna, Sharks and Sail fish. The records show that 200 tons of Octopus and over 300 tons of Squid were caught in 1988/89 .

Holothurians are collected by reef divers and dried for export mostly to Hong Kong and other far Eastern countries. There are five types of Holothurians which are commercially exploited from the islands.

Coral reefs also play a major role in providing food and protein to the people of Zanzibar. There are 40 edible species found in the reefs (Ngoile, 1990). Shells collections all over the islands are mainly done for food. Collections for commercial purposes are limited to small collectors and most of the time is done for ornamental purposes.

Another species which are of ecological value found in the coral reefs in Zanzibar are Sea Turtles. The important ones are - Chelonia Mydas, (The green Turtles) Eratmochelys Imbricata, (the Hawksbill turtles) and the Ridley's Turtles.

In short, coral reefs in Zanzibar provide habitats for commercially important fish as well as important fish for local consumption. The reefs also provide habitat for rare and threatened species like sea turtles.

Coastal Protection

As in many other countries, coral reefs in Zanzibar play a major role in protecting the shoreline from severe erosion resulting from strong sea waves and heavy downpours during monsoon periods. In areas like Nungwi, Pwani Mchangani, Matemwe, Uroa and Fumba where there are no mangrove ecosystems, the coral reef ecosystem is the only protective barriers against the erosion caused by the wave actions. The Eastern coast of the islands of Unguja and Pemba is surrounded by fringing reefs which act as natural barriers against very strong ocean waves. These are locally called "Mwamba Mkuu". Though they are situated some miles offshore, the water in the reef is very shallow and provide good fishing ground for octopus and other different fish species.

Potential for Tourism development - "Corals reefs are extremely important tourist attractions in many tropical areas" (Horrill, 1992). The example can be found at many places like the Maldives Islands, Indonesia (Bali), Mauritius, the Florida Keys in the USA, Thailand and many other parts of the world. In Zanzibar coral reefs have great potential for the development of the tourist industry. With its clean and pristine coral reefs there is every possibility for the industry to develop. In the Florida Keys about 4 million tourists visit the reefs annually injecting billions of dollars in the economy through different services such as hotels, diving, sports fishing and catering. But tourist will not be attracted to the islands if the reefs are destroyed. Therefore it is very important that the coral reefs should be protected as tourism has emerged as one of the major foreign exchange earner.

3.3 DESTRUCTION OF CORAL REEFS

The destruction of coral reef ecosystems has been going on at different places in the world unnoticed. As of today 10 % of the world coral reefs are estimated to have declined beyond recovery and an additional 30 % may be in danger of reaching this state within the next 10 years (CRC, 1994). This was due to lack of awareness with the public on the significance and importance of these fragile ecosystems to mankind. The direct and indirect benefits of the coral reefs were not known in the past. Because of this man continue to dump every kind of wastes and garbage directly into the ocean unaware of the damages they would cause to the marine environment and the consequences man would have to face. Coral reefs have been damaged severely at many places in many parts of the Globe. Example of these damages can be found in Sri Lanka, Thailand, Indonesia, Mozambique, Tanzania, US Virgin islands, Florida, Hawaii and many other places.

The degree of destruction varies in different places from minor to major destruction. The reasons, which lead to the destruction of the coral reef ecosystem, just like the mangrove forests, were their being under-valued as an ecosystem. This trend has changed now as there has been growing awareness as to their importance to the economies of the surrounding local population and to the national economies in general. Many countries have initiated proper management plans which aim at protecting and conserving coral reef ecosystems and allow for the multiple use of the resources. The approaches ensure the conservation of the ecosystems and at the same time allow for the sustainable use of its resources. The uniqueness of the coral reef ecosystem has now been recognised almost everywhere in the world.

Spurred by the increasing recognition of the decline of these invaluable resources, governments have initiated programs and projects, which aim at conserving and protecting coral reefs. The long-term vision for initiative is a global effort to

conserve, restore and effectively manage coral reefs ecosystems, including where appropriate, mangroves and seagrass beds.

In the USA for example, over 70 government and private organisations sponsored have come together under the University of Rhode Island Coastal Resources Centre to look at the opportunities for collaborative action and expanded programs. This US initiative has three major elements:

- a strengthened US domestic reef protection program
- a program of training and technical assistance to help other governments
- a strategy to improve monitoring and research on the decline of coral reef ecosystems. After recognising the degradation of the coral reefs in the Florida Keys, the US Congress passed the Florida Keys National Marine Sanctuary and Protection Act of 1990 (Public Law 101-605) designating the Florida Keys National Marine Sanctuary. The Act requires the National Oceanic and Atmospheric Administration (NOAA) to develop a comprehensive management plan with implementing regulations to govern the overall management of the sanctuary and to protect the Sanctuary resources and qualities for the enjoyment of present and future generation.(FKNMS, 1995). NOAA is placing the greatest emphasis on the primary areas of research and monitoring, and on improving the health of the US coral reef ecosystems through partnership with US states, territories and commonwealth.

In countries like Australia, Thailand, Kenya, Ecuador and Maldives Marine parks have been designated for the same aim of conserving and protecting coral reef ecosystems and come up with the comprehensive management plan which will allow multiple use approaches and sustainability of the resources. (Kenchington, 1990)

It is worth noting that as coral reef ecosystems do not live in isolation independent of other coastal ecosystems, its destruction would automatically lead to direct and indirect destruction of other coastal ecosystem like mangroves and seagrassbeds. "Coral reefs, Seagrassbeds and Mangroves are closely linked, that the health of one is directly dependent on the condition and health of the others" (Horrell, 1992). These linkages include recycling of food and nutrients, animal migration,(for example many fishes of commercial importance spend different stages of their life history in more

than one of the ecosystems) and effects of human impact. The loss of coral reef ecosystems can result in the loss or alteration of mangroves, seagrassbeds and or coastal land. Horrill 1992 reported that destruction of coral reefs near Dar Es salaam has resulted in severe beach erosion at Kunduchi and other nearby areas. In coastal areas without mangrove ecosystems, coral reefs play an important role of protecting beach erosion which could be caused by severe wave action with direct impact on the coast.

In Zanzibar destruction of coral reefs varies from place to place, with heavily affected areas to be those which are closer to the coast. Though many coral reefs around the islands are said to be in pristine condition, yet there are areas of concern where the damage is very severe. The result of recent a survey of the coral reefs in the Fumba area has shown that a number of reefs examined were totally damaged with a majority of others having significant level of damage. The areas with severe destruction are Taani and Kipwani with 95 % of the reefs damaged, Ukumbe 70 % damage, Fumba and Komunda with 35 % of damage each, Kwale with 30 % damage and the rest of the reefs had below 20 % of damage. Of the reefs surveyed only two sites were found to have suffered no damage at all, (Horrill, 1992). Another work carried out at Chapwani, Chango, Bawi, Mnemba and Mesali islands coral reefs has revealed massive damage at Bawi, and Chapwani and significant damage at Chango, While the coral reefs around Mesali island are slightly damaged.

The socio-economic importance of the coral reef ecosystems to the people of Zanzibar has also been explained by Ngoile (1990) as not only providing 95 % of the island's animal protein intake, but also important to the economy. Therefore, conservation and protection of the coral reef ecosystems is a must in order to protect the fishery, a large portion of which is done within the coralline zone.

3.4 CAUSES OF DESTRUCTION

Coral reefs may be damaged or destroyed by a number of natural events, such as hurricanes, temperature and salinity changes, sedimentation and a host of biological

factors, but many of the most serious threats come from man himself. (Wood, 1983). Coral reefs are exploited for food, trophies and building materials just to name a few. They are abused by dynamite and other destructive fishing methods. They are choked by silt washed into the sea by erosion, dredging operations or sand extraction. Like the mangrove forests coral reefs have been under serious threats and pressure from human activities world wide, which has resulted in severe destruction of this fragile and most important ecosystem. Destruction of coral reefs by human activities is just but one of the evident reasons that man has always been the creator of his own destruction. The causes which lead to the destruction of coral reefs may not be the same everywhere. They vary from country to country. But in many cases the activities associated with coastal area development and tourism have played a major role in this regard.

In Sri-Lanka mining is a major source of destruction. Extensive mining of coral reefs on high energy shorelines on the east coast resulted in severe erosion of the shoreline which caused trees and coconut palms to fall into the sea (Salm & Clark, 1984)

In South Florida USA though there has been some occurrences of natural events, such as hurricanes, yet physical impacts resulting from human activities are the major causes of destruction of coral reefs of the Florida Keys. They include vessels grounding, anchorage damage, destructive fishing methods, trash and offshore oil and mineral mining.

Vessel grounding is the major problems in the Florida Keys. For instance, centuries of coral can be destroyed or broken into fragments in the first moment of a collision with a large ship. The framework of the reef can be damaged from the sheer weight of the vessel. Attempts to free the ship result in additional harm caused by prop wash. Further damage can occur from the spilling of cargo or fuel onto the reef or from the break up of the ship. Grounding by smaller boats are also a major problem because of their frequencies, chipping away at shallow water reefs. The harm from grounding is prolonged as disease and algae invade the damaged area and young corals are unable to grow on the unstable rubble. It may take decades for the reefs

damaged by vessel grounding to regenerate. In order to control this Florida Keys National Marine Sanctuary has banned ships of 50m and above to sail through the sanctuary area. The area to be avoided has been marked, and any ship found violating is heavily fined. (FKNMS, 1994).

In Indonesia and French Polynesia The major causes of reef destruction is accumulation of sediment from dredging activities. While sewage discharged near reefs has killed coral in the US Virgin Island, and in Hawaii; including those in the protected area around coconut island. Sewage discharge has also been a major problem in the Florida Keys.

Chronic pollution from oil phosphate fertiliser shipments killed a mile of reef in a reserve at Eilat in the Red Sea. In Mauritius, Tanzania, and throughout Southeast Asia destructive fishing methods, especially the use of explosives are creating wastelands of once productive reefs.

In the Kingdom of Thailand major causes of reefs deterioration includes among others, illegal fishing techniques such as using chemicals, trawling over reefs, trampling, anchoring damage and littering and solid waste disposal. It has been reported that trawling damage, sedimentation and waste water pollution associated with rapid coastal development is increasing in all regions including offshore islands (Hale & Oslsen, 1993 page 32).

In Zanzibar major causes of destruction of the coral reefs which have been reported include the following:

- i. Destructive Fishing Methods
- ii. Pollution
- iii. Anchorage Damaged
- iv. Shells Collection
- v. Other causes

i. Destructive fishing methods

Destructive fishing methods commonly practised in the islands are Juya, the use of Dynamite and Kojani techniques. Dynamite fishing has subsequently decreased in the

islands, though traces of it have been found in the Fumba are as reported by Horrill 1992. This is no longer a major problem as the government on its part took steps in banning this type of destructive method. Juya and Kojani are similar in the fact that they both employ a large number of fishermen using two boats. Of the two the, Kojani technique is more destructive just like the use of dynamite. In this technique after laying down the nets, which are up to 200 metres long, the divers are then sent down to the reef bottom to scare the fishes by pounding on the reefs using sticks. This causes severe damage to the coral reefs. The divers themselves cause great damage by standing and walking on the reef tops. The Kojani is extremely destructive to fragile system such as coral reefs. This transforms the productive picturesque coral reefs, as seen in Fig. 3.1, to unattractive and unproductive rubble, as seen in Fig. 3.2. Coral reefs are living systems and have the ability to replace a small amount of damage, but with such a severe destruction as caused by the Kojani fishing technique, it is unlikely that the reefs will be able to regenerate.

Another type of traditional fishing method, which destroys coral reefs is the use of poison. This is commonly practice in Pemba. The fishermen use special types of poison extracted from the leaves of certain trees locally called Utupa. This poison is then put in the reefs cavity to sting the fish. No research has been carried out to see the extent of damage caused by this technique, in most of the areas where this technique has been practice there has been a marked deterioration of catch. It is possible that this poison is strong enough to kill the coral polyps. It was also reported by the villagers interviewed by the author at Chokocho that the use of chemicals, such as DDT to sting the fish in the area, has been going on. If allowed to continue, these techniques, that is Kojani and the use of poison will result in the collapse of a once productive fishery and will reduce the potential for future economic development. In some areas in the islands the result of this destruction is already in evidence.

ii. Pollution

The main sources of pollution in Zanzibar is sewage. This is another major problem of concern not only to coral reef ecosystems but to coastal ecosystems as a whole. In Zanzibar especially the heavily populated areas around Zanzibar town, raw sewage is discharged directly into the sea without being treated as there are no treatment facilities in the islands. The study carried out by J.J.A. Van Bruggen in 1990 indicated that the water of Zanzibar channel is at many locations polluted with Faecal Coli. It is evident that the pollution originates from the discharge of raw sewage which is done at many places along the coast. Horrill reported in 1992 that the coral reefs around Chapwani island is suffering from pollution and the most likely cause of this pollution is sewage from the old Stone Town. A significant number of dead colonies were recorded around Chapwani island. Another problem which was observed in the area was the presence of the crown-of- thorns starfish which kills coral reefs. This can be the result of pollution caused by dirty ballast. If prompt actions are not taken to arrest the situation , pollution will effect more coral reefs fronting Zanzibar Town, as well as other coastal ecosystems. This will eventually lead to the collapse of the resources and the loss of much needed source of income.

Anchorage Damage

Another activity which causes severe damage to coral reefs is anchoring. Careless dropping of anchors by fishermen results in significant damage to these fragile ecosystems. This damage is more evident on the shallow reefs of Chango, Chumbe and Pungume islands. The officers at the Institute Marine Science interviewed by the author confirmed that anchorage damage is one of the problems which happens almost daily as the fishermen do not have any other alternative but to drop their anchors while fishing. The damage can be observed in many places where there is concentration of fishermen, like Chumbe coral reefs and the coral reefs around Pungume. (Fig. 3.3)

Fig. 3.1

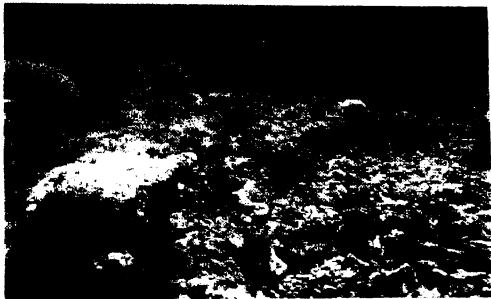


Sources-Horrell 1990

Shells Collection

This activity is going on in all Unguja and Pemba coral reefs. The method employed is very destructive and there is no control as to size and amount. Even the tiniest shells are being collected. The reefs suffer both mechanical as well as physical damages as the shells collectors use sticks to break the shells from the reefs, and by walking on top of the reefs. There are reports that the severe beach erosion along the coast of Nungwi is the result of the damaged caused to the reefs by shell collectors. The rate of erosion along this coast is about 3.5-4 metres annually (UNEP, 1989, Ngoile, 1990 & Horril, 1992)

Fig. 3.2



Sources-Horrid 1992

Other uses

Lately there has been a tremendous increase in the use of spear guns by the fishermen. In the past only local made guns were being used. This is destructive and should not be allowed to continue.

Coral Reefs Mining

The coral mining is done to get the stones for building purposes and for lime making. People believe that stones from the seabed are the best for lime making. There are reports that exportation of stones from the islands has been going on for some time. "At least 264 tons of stones were exported in 1993" (DOS, 1994).

Fig 3.3



Sources- Horril 1992

The stones were mined from the coral reefs down the seabed or along the coast. This has been stopped already. But mining for local use is going on unabated. The most effected areas are Matumbi, Makapa, Kisiwa, Panza and Chokocho all in Pemba. There is a severe and rapid beach erosion at Liko Kuu in Chokocho after the removal of the sea rocks, which lie between the low and high water mark. The sea has now crossed to the rice fields about 150 metres to the point where the water never reached in the past ten years. The author witnessed this situation on a visit to the area. Coral mining is being done almost everywhere in the islands. This activity should be stopped forthwith as stones to meet local demand can be easily obtained in the islands on the land area as there is no shortage of stones in Zanzibar.

It is obvious that the reasons why coral reefs are being destroyed in the is attributed to the ignorance and lack of awareness on the part of public on the importance of these

fragile ecosystems. This problem cannot be simply solved by enactment of stringent laws and regulations. A proper management plan is needed which will have more emphasis on educating the communities and involvement of the user in the management approach and planning. The plan should aim at conserving and protecting the coral reef ecosystems and at the same time meet the demand of the communities on food and income. This could be achieved through the creation of Zanzibar National Marine Sanctuary Program or Marine Parks.

For Zanzibar, Marine Sanctuaries will be most appropriate as opposed to Marine Parks. This is because unlike Marine Parks, Sanctuaries allow for multiple use approach and sustainable utilisation of the resources. Both recreational and economic activities to support local population can be carried out within the Marine Sanctuaries. Socio-economic needs of the society can be achieved while at the same time the ecosystem is being protected. The emphasis here is the habitat protection as opposed to stock protection in the case of Marine Parks. The multiple use approach will ensure both sustainable development of the resources and protection of the marine environment.

Creation of national marine sanctuaries will be the best way to avoid the reoccurrence of the problems as those of Mnemba and Chumbe, where the right of the local communities to use the area was ignored. Mission of the proposed National Marine Program should be the establishment of national marine sanctuaries based on the identification, designation and comprehensive management of special marine areas for the long-term benefit and enjoyment of the public.

National Marine Sanctuary Program Goals

- to enhance resources protection throughout the implementation of a comprehensive long-term management plan tailored to specific resources.
- to promote and co-ordinate research to expand Scientific Knowledge of Significant marine resources and improve management decision making

-to enhance public awareness, understanding and wise use of the marine environment through public interpretative and recreational programs; and

-to provide for optimum compatible public and private use of special marine areas.

To achieve these goals a comprehensive management plan should be drafted to:

-facilitate all uses consistent with resources protection

-consider ocean are zoning within the marine sanctuaries

incorporate regulations to Enforce a water quality protection program

-ensure co-operation between sanctuaries management and other central, regional and local authorities

-promote education about coral conservation and navigational safety

-identifying research needs and establish long-term monitoring program

-identifying funding sources to implement plan.(FKNMS, 1995)

CHAPTER FOUR

4.0 MARINE DEVELOPMENTAL PROBLEMS.

This chapter examines the pace of new development projects in the islands as a result of the implementation of new economic policies and trade liberalisation. It also analyses the possible environmental and social problems associated with these new projects.

4.1 TOURISM DEVELOPMENT

The islands of Zanzibar have been witnessing a rapid increase in the number of hotels and other tourism development projects. Since the beginning of the implementation of the new investment policies and trade liberalisation stipulated under the Investment Promotion Act No 2 of 1986, over 95 new major tourist projects have been approved and 74 out of these are already operational. Apart from these there a number of new guest houses mushrooming all along the coastal belt of the islands. Currently, tourism is one of Zanzibar's top earners of foreign currency, major employer, major revenue contributors to the treasury and powerful stimulus to economic development. As has been explained in the first chapter, the total capital already invested in this industry is about 174,000,000 US dollars. But the honeymoon can be short-lived if the existing trend of unchecked tourism development along the isle coastlines will continue. Mr. Nico Viccer from the Royal Netherlands Embassy in Nairobi while addressing a workshop on ecotourism in Zanzibar on March 1994, warned that unchecked tourism development could soon become unsustainable for the people of Zanzibar and their natural environment. (Daily News, 23 March, 1994)

Under the new economic policy tourism is by far the main growth sector. It is surprising to see that tourism development is completely unplanned, and those

responsible for the approval of the projects are just reacting to applications as they come. "Even the tourism development plan prepared by World Tourism Organisation has never been followed", (CoLE, 1991). Most of the tourism projects like hotels and guest houses have been constructed on the plots obtained through the back door without consultation of the Department of Land and Survey. Applications are sent to the approving authority on the completion of the projects. Therefore no measures are being taken with regard to the protection of the environment and prevention of marine pollution.

Unplanned tourism development in many third world countries has had negative environmental, social and cultural impacts. As it has been reported by John Lea that international tourism results in a form of imported development with physical and social repercussions in the third world.

Impact on the environment

The first impact on the environment caused by tourism development are changes causing permanent restructuring of the environment. This occurs as a result of major construction activities like a new highway or resort complex or even construction of a new airport as in the case of the Maldives. Besides the various physical effects on the natural environment, such developments result in the removal of large quantities of land from primarily its undeveloped status as natural habitat. In the case of Zanzibar this situation is already in evidence as original greenery scene has started to disappear and gives ways for new complex especially along the east coast. Dr. Ahmada Hamadi of the Zanzibar Commission for tourism confirmed this during an interviewed with the author.

Generation of Waste Products

Both the built environment and transport effects of tourism produce various residual products in the form of waste. These have effects on water and air quality. The Mediterranean Sea has to cope with a vast amount of waste materials from the tourist development which crowded its shores. "Much of the damage done to the marine

environment as a result of tourism is caused simply by the volume of visitors arriving at destinations which are not used to supporting people in such great numbers” (Sinclair & Stabler, 1991). As tourists seek more exotic and remote destinations, the likelihood of environmental suffering as a result becomes even greater. There has been a tremendous increase in the number of tourists visiting Zanzibar shores for the last 10 years. With the development of more infrastructures this number is expected to rise even more within a very short period. (Table 4.1)

Table 4.1

International Tourists Arrival 1984-1993

| YEAR | No of Tourists |
|--------------|----------------|
| 1984 | 8,962 |
| 1985 | 16,268 |
| 1986 | 19,064 |
| 1987 | 20,013 |
| 1988 | 32,119 |
| 1989 | 37,850 |
| 1990 | 42,141 |
| 1991 | 50,827 |
| 1992 | 59,747 |
| 1993 | 65,597 |
| TOTAL | 366,722 |

Source - Zanzibar Commission for Tourism

Analysis of the table indicates a steady increase in the of tourists visiting Zanzibar from 8,962 in 1984 to 65, 597 in 1993

Marine Pollution

The main problem here is the pollution of from raw and untreated sewage. This has adverse effect on both the marine environment and the industry, as tourism depends on a healthy environment and clean ocean. As it has been observed in the third chapter that in Zanzibar pollution caused by discharged of raw sewage into the sea is already a problem. Therefore development of unplanned tourism can make it more complicated. This will cause deterioration of water quality which may result in degradation of coastal ecosystems like mangroves and coral reefs. The main reason for this is the addition of nutrients to water which not only because of the sewage discharge, but also because of the use of detergents and other domestics chemicals. This leads to excessive weed growth (algae bloom) and consequent reduction in water oxygen because of the rise in biological oxygen demand (BOD), and have negative impact on fishery.

The quantitative effects of such tourism related environment stress are neither known nor have they been studied as a priority in Zanzibar because of the following reasons:

1. Inefficiency of responsible agencies, due to lack of environmental experts; especially experts on marine pollution.
2. Lack of awareness of the consequences associated with these developments
3. There are no facilities to deal with pollution of any kind, let alone tourism.
4. Economic pressure resulting from decline of major source of foreign currency revenues like cloves. This forces the government to accept the projects as they come, as it is in a vulnerable position fearing that if it try to resist based on the environmental considerations the developer may abandon the projects and go to the neighbouring countries.
5. Lack of expert on environmental matters (Interviewed, January, 1995)

Stresses from pleasure activities

Tourism development can cause serious damage to the marine environment. Examples can be found in the Florida Keys USA, Kenya and Thailand. The pleasure diving activities resulted into severe damage to the coral reefs due to anchor damage, divers walking on the reefs and boat grounding. As there were no mooring buoys, the boaters dropped their anchors carelessly on the coral reefs. In the USA, this problem has been solved through introduction of mooring buoys, channel marking, zoning and educating the divers to avoid standing or walking on the reefs. Not only that but a very effective monitoring and enforcement organ is in place. (FKNMS, 1995, & Reef Relief Agency, 1995).

In Zanzibar before 1988 there were no pleasure diving activities. But with the introduction of new policies a number of diving centres have come up and started operation. They include Pemba Channel Diving Club and Pemba Reefs Diving Club among others. The signs of destruction from these activities are already in evidence. There is severe damage to the reefs around Changu island resulting from diving activities and anchor damage. As there are neither regulations or guidelines to direct these activities, nor is a system in place to monitor the extent of damage done is not known. But one thing which is very clear is that the reefs are being damaged severely. The study carried out on the coral reefs at Mnemba, Chango, Chumbe, Bawi and Chapwani has revealed this, as has been explained in detail in the previous chapter. Another activity which has a great and negative impact on the marine environment is souvenir collection and trade. There has been an increase in shell collection, selling them to tourists as souvenirs. This activity is more predominant all along the east coast from Bwejuu to Matemwe. The method used is very destructive as was explained in the previous chapter. If no actions are taken to stop this, more damage will occur to the reefs, which in turn will have subsequent effects on other coastal ecosystems as they are all dependent on one another.

Impact of Tourism on Society and Culture

In many third world countries tourist development has resulted in negative impacts on the society and culture. "The transformation of a society based on traditional form of employment to one with employment based on a resort can place the local culture in volatile position as the local economy often becomes dependent on tourism", (Sinclair & Stabler, 1991). This makes economic survival very sensitive to the tourism industry. Examples of this can be found in many coastal villages with tourism projects where youngsters leave the agricultural sector to work in tourist hotels and resorts in their areas.

Secondly socio-cultural impacts can be devastating to the local community. This is because with the influx of tourists, young people are exposed to the often uninhibited leisure behaviour of outsiders. When young people are employed to perform ceremonial rituals for tourists, like young girls taking part in cabaret dances they become vulnerable to prostitution. In many third world countries tourism development has resulted in child prostitution. Example of this can be found in Mexico, Thailand and Brazil. (Lea, 1988). No research has been carried out in Zanzibar so far to see the impact of tourism on culture and society, but with the uncontrolled and unplanned tourism there is every possibility to have negative impact. Many villagers interviewed by the author at Uroa explained that they are very much offended by the tourists walking along the beach adjacent to the village half naked.

Major Weaknesses of Tourism Development in Zanzibar

1. Lack of clear and well defined national policy on tourism

At present the government does not have a defined policy on tourism. This has been confirmed by the officers at both the Zanzibar Commission for Tourism and Zanzibar Investment Promotion Agency interviewed by the author. Dr. Ahmada of Zanzibar Commission for Tourism and Mrs. Hindi Nassor of ZIPA explained to the author that

the aim of the government is to encourage first class tourism. But with no clear policy this is not possible. It is worth noting here that this lack of policy is a big drawback which need to be addressed at the earliest possible. As there is no policy it will be very difficult for tourism development in the island to be controlled or regulated. The evidence to this is very obvious, even the Promotion of Tourism Act No 9 of 1991 did not mentioned anything with regard to policy. It is always the policy which leads to the enactment of the law in order to give legal power on the implementation of the said policy. The Act talks only on the procedures for issuing licences and on the creation of a tourism board. There is no mention of the government policy to be implemented. Even Part IV of the Act, which stipulates the duties of the hotels owners, give no obligations to them with regard to environmental protection and pollution control. Therefore the hotel owners will continue discharging untreated sewage and other domestic wastes directly into the sea as long as no legal action could be taken against them according to this act. It is worth noting here that as long as there are no regulations to regulate the industry, the marine environment which is the foundation for the tourism industry will deteriorate.

What is happening in the islands now is typical of what happened in the Kingdom of Thailand in the early 1980s and in neighbouring Kenya in the 1960s. For ten years Thailand experienced extraordinary economic growth, much of which came from rapid, unmanaged, and unsustainable exploitation of the Kingdom's rich natural-resource base. "The consequent pace and extent of environmental degradation is enormous" (Hale et al, 1993). There was an especially great need for effective integrated resources management when the projects began. But this was missing and nobody seemed to have noticed. Tourism was booming, and pristine coastal areas were rapidly being developed as resorts with little regards to impacts upon environmental qualities; often the same qualities that draw tourist in the first place. Mangrove forests were being lost to other forms of coastal development, and other coastal ecosystems were being destroyed as well. This has resulted in a decline in the environmental qualities, and economic decline from tourist sector and shrinking of

coastal fisheries. Government efforts to stem these trends are ineffective because when the marine ecosystems are once destroyed it is very difficult to regenerate. The same problems are being experienced at Malindi in Kenya. Therefore Zanzibar is at a good position to learn and avoid these mistakes. This can only be achieved through proper and effective integrated management of all the marine sectors.

2. Lack of trained personnel

Another problem which hinders development of sustainable tourism in Zanzibar is lack of trained personnel. It has been reported that less than 15 percent of the employed in the tourist sector have basic training in tourism and tour operations. The Zanzibar Commission for Tourism has 12 well trained officers, but almost all of them are trained in hotel management and not in tourism, and none of them has any idea about environment protection. It is very important for this sector to have its own expert on pollution control and environment protection as it fully depends on the healthy environment and ocean for its sustainable development.

3. Conflict with other sectors

- conflict with local population
- conflict between the Tourism and Natural Resources Commission
- conflict between Tourism and Fisheries

All those conflicts could be avoided through integrated management.

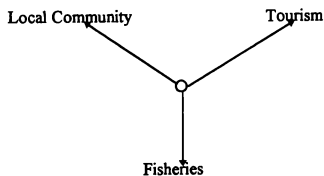
An excellent example of these conflicts is the Mnemba island problem. Mnemba island located North-east of Unguja, is surrounded by extensive hard reef formation. First it was suggested by the department of Environment that because of the presence of rare species of both flora and fauna, the island and its surrounding marine environment be protected and turned into a marine park. But before initiatives were taken towards this goal, Zanzibar Investment Promotion Agency granted a lease to a foreign firm to construct a tourist hotel on the island. The lease included a 200 metres exclusion zone surrounding the island.

Under the term of the lease, the island and all waters contained in the 200 m. is for exclusive use of the hotel and out of bound for local fishermen.

Mnemba island for time immemorial has been used by the local fishermen of the nearby villages from the main island as an overnight camping site whilst fishing the surrounding water. The effect of this change of management on local fishermen's access to the island, meant no more overnight site for camping. As if that were not enough, the hotel staff in practice attempted to stop fishing activities beyond the 200 metres of this reef area. This resulted in a hardship for the fishermen.

The compensation given to them was very inappropriate, as it did not compensate what they have lost. The main problem here is that the Sub-commission for Fisheries which could have stood and negotiated on the side of the fishermen was not involved. Neither was the Department of Environment involved in the decision to lease the island for tourism development. This shows a lack of integration, which is very important in managing the marine ecosystem which has diverse user interests.

The above example shows clearly the existing conflicts between the users of the marine sector in the islands.



The conflict could be represented as shown in the diagram above:

The centre represents the ecosystem, while the three lines represent the conflicting forces applied to the ecosystem which could result in the destruction of ecosystem if not well managed.

4.2 FISHERIES DEVELOPMENT

The major problems to the marine environment resulting from fisheries in Zanzibar as we have seen in the previous chapters include the use of destructive fishing methods such as explosives, poison, and traditional fishing techniques like Kojani and Juya.

Secondly most of the fishing grounds have been over exploited because of the fishing pressure on few areas. This is due to the fact that local fishermen are not capable of going farther out for fishing because of the type of boats they are using. They have very small canoes or Ngalawa. As a result they concentrate on the near shore areas, fishing on the shallow reefs. This cause severe damage to the coral reef ecosystem.

National Fisheries Policy

Unlike tourism there is a national policy on fisheries development. Although the policy itself is weak in certain aspects, yet it is not a problem as the weaknesses could be pointed out and amended from time to time to fit with the requirement of the management plan. The main weakness of the policy is that it gives more emphasis on increasing catches through the supply of more gears and boats to the local fishermen. It also encourages commercial fisheries with the same aim of increasing catch in order to earn more foreign currency. Although the policy advocates the research on fisheries resources, yet conservation and protection of the ecosystem upon which the resources depend is not mentioned anywhere in the policy. Management of the fish stock is also not known as there is no data available which shows either the allowable catch or the maximum sustainable yield. More emphasis on the increase of catch without proper management of the stock will result in the depletion of the stock itself.

The national fisheries policy has banned the use of destructive fishing methods, such as the use of explosive, poison and Kojani. They are also prohibited under Article 15 and 18 of the Fisheries Act No 8 of 1988. It is then surprising to see them being used in full though not permitted under the law. What is evident here is the poor enforcement of the law, which is caused in part by the ambiguity of the law itself. The

law is not clear with regard to enforcement organ. Another reason is lack of political will on part of the government. The failure of the Fumba village management approach to stop the destructive methods in the area is an exhibit to this. It is quite obvious that the Kojani fishing technique is very destructive and major cause of destruction of the coral reefs. Four villages started the scheme 1982 with the aim of reversing the sharp decline in the fish catch from once very rich fishing areas. After the good work done by the fisheries officers of educating the villagers, there was a wide spread agreement that illegal methods should be eliminated. Therefore the community based management approach was introduced and the majority of the fishermen respected the community management procedure. But because of the lack of enforcement, hard-core fishermen decided to go fishing in a group of up to six boats with a large number of fishermen ready to fight with local villagers. The matter was reported to the local as well as central government. But no action was taken to help the villagers and hence the failure of their management approach, which could have been a model for other villagers to follow.

4.3 URBANISATION

Among the most critical issues associated with expansion of towns is beach erosion caused by quarrying. Beach erosion is caused by removal of sand from the system and to damage protective barriers from the sea, such as coral reefs. The removal of rocks can be easily stopped as it is unnecessary given the abundance of rocks on land. Sand removal from the foreshore and the beach is a major problem. Although sand is also available on land, many users prefer beach sand as it is coarser. The problem becomes more acute as the main user of the sand is the government itself which uses the sand for construction work and brick making. It should be understood that whilst the uses are important for Zanzibar, the environmental consequences are costly. Another problem of urbanisation is the discharge of the raw sewage directly into the sea. Most of the urban areas are centred along the coastal areas with no treatment

facilities for sewage and other domestic wastes. Because of the increase in urban population the problem regarding municipal waste have become more acute.

4.4 NEED FOR INTEGRATED MANAGEMENT

The coastal zone of Zanzibar as explained above and in previous chapters is an area of great ecological diversity. It supports multitudes of economic and social activities, which are always in conflict. It is also a focus of numerous environmental issues caused by the conflicting interests of differing development activities. The ecological interdependence of the many components of the coastal zone demands an integrated approach to management. This is because a unisectoral approach to management always tends to ignore the requirements and existence of other sectors and should therefore not be allowed. Unplanned, and uncontrolled development of individual sectors within the coastal and marine ecosystem will have a devastating effect on the marine environment and subsequently on the communities which depend upon these fragile ecosystems. Hence, a need for an integrated approach to the management, so that sustainable development of the marine environment could be achieved.

At present there is little awareness of the need for integrated coastal resource management and little experience in implementing such programs in the islands. But that should not be a problem as the islanders are now in a better position to learn from other countries, especially from the island states which have already embarked on such management approaches.

The first step which should be taken here is a program to heighten the people's awareness, specially planners to recognise the seriousness of the environmental situation which will result from the unplanned and uncontrolled coastal development, like tourism, fisheries and urbanisation, and the threats they pose to both the economic and the Zanzibar quality of life.

This program should also be aimed at heightening community awareness of the existence, beauty and significance of Zanzibar's ecosystems, such as mangroves, sea grass beds and coral reefs, and their links to the economic life of the Zanzibar's.

The second step should be to define the goals of such management approach so that they be understood by the planners and everyone in the society, especially the affected communities.

The goals should be as follows:

- To protect and provide for sustainable use of the coastal ecosystems and their resources.
- To use relatively simple and non-controversial issues associated with the protection of coastal ecosystem to build local, and later national support for addressing other coastal management issues.

The third step which should be taken is building support for management initiatives. This can be achieved through media campaigns, community outreach programs and distribution of brochures.

Management objectives and strategies should aim at

- maintaining and promoting multiple and sustainable use of coastal and marine ecosystem;
- promoting the recovery and enhancement of marine habitats such as coral reefs, sea grass beds and mangroves;
- enhancing local commitment to, and participation in coastal zone management - that is community based management approach;
- protecting the marine environment and preventing pollution resulting from development activities.

The fourth step should be the formulation of policies to be implemented in order to achieve integrated development of the marine environment.

Policy :1 Manage the marine ecosystem according to their different ecological and economic values and maintain a balance of use.

Policy :2 Reduce degradation of the ecosystems by increasing effectiveness of existing laws and measures.

Policy :3 Build and maintain public support for the marine environment in Zanzibar.

Policy :4 Make revisions to existing laws, administrative directives, and institutions required to make effective management practically feasible.

Policy :5 Monitor and evaluate progress in accomplishing the objective of the national coastal zone strategy.

Policy :6 Support management through scientific research and innovation.

Policy :7 Encourage high class tourism through guidelines, control and planning.

Policy :8 Encourage multisectoral planning by involving resource users and local community in planning process from the initial stage

CHAPTER FIVE

5.0 NATIONAL ORGANISATION

This chapter examines the national organisations that are presently responsible in one way or another for managing the marine environment, and those that should have a responsibility to do so. The National Organisation which would be discussed below include the following:

Commission of Land Environment

Department of Environment

Natural Resources Commission

5.1 Commission of Land and Environment (CoLE)

At present the main national agency which has sole responsibility for environment protection in the islands is the Commission of Land and Environment. This Commission which is under the Ministry of Water, Energy, Construction, Land and Environment is also supposed to be responsible for the protection of the marine environment in the islands. The Department of Environment was created as an offshoot of the Commission of Land and Environment in 1989. During the first year of its inception the Department of Environment drafted the national environment policy which was approved by the government in 1992. The primary objective of this policy is to protect and manage the countries environmental assets, such that their capacity to sustain development is unimpaired, and the Zanzibar's rich environmental endowment is available for the future generation to enjoy and use wisely.

The minister of Water, Energy, Construction Land and Environment explained in his introductory note at launching the policy that the scope of environment concern is broad and embraces the following:

- maintenance of ecological process
- sustainable use of renewable resources and rational use of non-renewable resources
- preserving biological diversity, cultural riches and natural beauty, and
- protecting the quality of life of the people of Zanzibar including present and future generation.

Organisational structure the of CoLE

The Commission of Land and Environment has two functional departments.,

1. The old Department of Land and Survey and
2. Department of Environment

The Department of Environment is not independent, it is still part and parcel of CoLE. Therefore the department does not have any autonomy. From the name itself it is quite obvious that environment issues cannot be given required attention from this organisational set up. The two departments have different and conflicting interests to implement. Therefore the matter concerning land survey and plot allocation always takes precedence over environment protection issues. The primary goals of the Commission of Land and Environment will be those matters concerning the land and survey, and environment issues are relegated to secondary importance.

Robert Bensted-Smith, 1994 in his analysis of the institution and policies explained that the function and technical fields of DoE are quite different from those of land. He further explained that the work of CoLE is dominated by the task of land administration and management, plot allocation, leases and disputes among others which are all sensitive, easily politicised and sometimes controversial and demand

close supervision. As environment activities expand, it will become more difficult for the person in charge of CoLE to give sufficient attention to the diversity environmental matters, while giving land matters adequate supervision. The author is of the opinion that the complexity and nature of the environmental issues require special and separate supervision.

The present organisational structure of the Department of Environment consists of four main functional divisions as follows:-

1. Natural Resources Management division
2. Pollution control division
3. Environmental Education and Training division
4. Environmental Evaluation and Monitoring division

(see Annex for organisational chart of DoE)

Under the Natural Resources Management there are two sub-divisions, one deals with marine and coastal resources management; and the other deals with terrestrial zone management.

It is the opinion of the author that DoE should not involve itself in the management of the resources. Instead it should act as a watchdog so that the individual sectors responsible take appropriate measures to manage the resources sustainably. Once DoE involve itself in the management of the resources, there will be no one to see that the environmental concerns are being incorporated in the management strategies.

Another reason why DoE should not involve itself in resource management is a fact that this will result in conflict with the interests of other sectors. For instance in coastal zone management, if DoE manages the resources, what will be the functions of the Fisheries and Forestry sub-Commission under the Natural Resources Commissions. This may create confusion. The best DoE could do is to get the sectors involved in the development of coastal zone, like Fisheries, Tourism and

Forestry and other marine users, including local communities, into an integrated approach to the management of the marine sectors.

The main task of DoE should be conservation and preservation. Department of Environment objectives here should be protection of the marine environment and the coastal ecosystem. This can be done through regulations and guidelines issued by the Department and through an effective monitoring system. DoE will be in a better position to achieve this goal if it is not itself involved in the management procedure.

The second division is that of Pollution Control which also has two sub-divisions

- a sub-division which deals with toxic chemicals, and
- a sub-division which deals with environmental sanitation

The author is of the opinion that DoE has not addressed the question of marine pollution which is the global issue at present. Zanzibar being an island state, its primary concerns should be prevention of marine pollution and readiness for any oil and chemical hazard response. With the implementation of the new economic policies, Zanzibar has seen tremendous increase in the shipping activities. The possibility exists for these activities to increase even more because of the introduction of free port and free export processing zones. There is every possibility of different types of dangerous goods and hazardous chemicals needed for industrial use to be transported to Zanzibar. Apart from that, preliminary study conducted by Bruggen in 1990 have shown that Zanzibar waters are highly polluted as the results of discharge of raw sewage direct into the sea, and the water quality is highly degraded. Therefore DoE should prepare mechanisms for monitoring and improving water quality, and oil and chemical response. The author is of the opinion that there is a need for a creation of a national response team for oil and chemical spills, which should include DoE, and a maritime law enforcement organ in the islands, and other government and non government agencies which have interests in marine environment.

5.2 Department of Environment (DoE) and its functions

The guiding principles upon which the national environment policy of Zanzibar is based are as follows:-

- i. To ensure maintenance of basic ecological process upon which all productivity and regeneration on land and on the sea depend.
- ii. To promote the sustainable use of renewable resources and rational use of non-renewable resources, and to minimise irrational use, contamination or destruction of the resources.
- iii. To preserve the biological diversity, cultural riches and natural beauty of Zanzibar land and sea.
- iv. To ensure that the quality of life of the people of Zanzibar, at present and in future is not harmed by destruction, degradation or pollution of their environment.
- v. To strengthen both institutional mechanisms for protecting the environment and the capability of the institutions involved. (ZILEM, 1992)

Environmental problems are multidimensional in nature and cut across traditional division of responsibility between various government departments. "The prospects for sustainable development which is inseparable from good environmental management, will be better if we can abandon old habits of compartmentalised thinking and fragments decision making," (Zanzibar Minister of Water, Construction, Energy, Land and Environment, 1992). Therefore, it is worth noting that DoE has a major task of drawing all sectors together to encourage and co-ordinate efforts to implement the policy. Its functions should include the program for community outreach. At the same time it must be a watchdog monitoring implementation and curbing activities that contravene the policies.

Bensted-Smith 1994 in his analysis of the Department of Environment pointed out that the present Zanzibar environment situation points to the need for an environmental agency capable of carrying out the following functions:

- Co-ordination- where environmental planning or management involves several different sectors. This could include a mediating role where one sector's activities are harming the environment needed by another sector. This is something which is very common in the coastal/marine ecosystem.
- monitoring/enforcing/watching to ensure that environmental factors are incorporated into projects, disputed environmental recommendations are presented to decision making bodies, environment protection measures are adhered, reports of violations are responded to, violations are prosecuted and good environmental actions are publicised.
- Technical implementation- to provide advice to government or the private sector on environmental policies, management and monitoring, setting standards and guidelines, setting up environmental impact assessment systems and evaluating environmental impacts statements, carrying out research and environmental monitoring.
- Education extension- to increase understanding about environment and to provide training to people in the environmental management, facilitating people 's participation.

At present DoE is not capable of performing the above functions and will never be in position to do so without first changing the existing organisational set up. DoE functions include co-ordination and enforcement. These roles are very important and can only be performed by a powerful national environmental authority, well equipped with both legal and administrative powers. Therefore the author is of the opinion that environmental responsibilities should be taken away from the Commission of Land and Environment and delegated to a separate national body that is responsible for environment protection. An independent body should be created that is capable of carrying out its duties without any hindrances. The author is hereby suggesting the creation of Zanzibar Environment Protection Agency under the Presidents Office to be lead by a director general.

The benefit of separating the responsibilities for environment protection from the Commission of Land and Survey are many and outweigh those for keeping them together. Inappropriate allocation of land has been in many countries a major cause of environmental degradation, especially in the catchment areas and in the cities. In this regard Zanzibar is not an exception. To enable the new proposed environment protection agency to carryout its duties properly it should be separated from the Commission of Land as suggested by Bensted-Smith. This is because the activities of the Commission of Land and Survey need to be subjected to stringent environmental assessment and monitoring

In many countries environment protection agencies are either under the special ministry responsible for environment or under the President's Office and report directly to the President. In the case of Zanzibar keeping the proposed agency directly under the President Office could be the most appropriate. This would help the Head of State to have first hand information on environmental issues associated with new development. Under the Presidents Office the agency will be in a Supra-Sectoral position of authority to require consultation or action on specific environmental problems. This could facilitate innovative approaches, such as a scheme for community environmental actions or nature conservation areas or water catchment by protection, which might be otherwise be slowed by bureaucratic concerns or other interests.

The proposed environment protection agency for Zanzibar should have the following main functional departments:

1. Administration Department
2. Natural Resources Department
3. Environmental Auditing, Monitoring and Supervision
4. Information and Community outreach
5. Research and Development

6. Environmental education and Training
7. Pollution Control Department
8. Energy, Transport, Waste and Water management

A new environment protection agency would make it easier for Zanzibar to cooperate with EPAs of other countries and other international environment bodies. This would enable Zanzibar to have easy access to technical and advisory assistance from these agencies and other international organisations.

5.3 NATURAL RESOURCES COMMISSION

Another institution which should have responsibilities in managing and protecting the marine environment is the Zanzibar Commission of Natural Resources which is under the ministry of Agriculture , Livestock and Natural resources.

The Commission has two sub-commissions

1. Sub-Commission for Fisheries:

This sub-commission is responsible for all matters related to fisheries and fishing activities in the islands. The powers to manage and formulate development plans for fisheries are not vested under the responsibilities of this sub-commission by law. Instead they are vested under the Director of Fisheries in the ministry of Agriculture, Livestock and Natural Resources, as provided under Article 5(1) and 5(2) of the Fisheries Act No 8 of 1988. It is the Director for Fisheries who is responsible for all management measures as provided under Article 6(1) of this Act. Due to the above facts the Sub-commission for Fisheries is not in a position to do any thing about the conservation of the resource's base and protection of the marine environment as they have no legal backing. Therefore there is a need for the Act to be amended to give legal power to the sub-commission for Fisheries to perform it duties.

2. Sub-Commission of Forestry

The Sub-commission is responsible for all matters related to the protection and conservation of forests in the islands. This does not include the mangrove forests as the present forestry legislation does not cover them. The present situation is that there is no Agency which has legal responsibilities for managing these important resources. The Sub-commission is led by an Assistant Commissioner.

Problems facing the Natural Resources commission

- Lack of defined plan.

At present the commission does not have a set management plan for conservation of mangrove forests. The management activities are being carried out on a reaction basis.

It is very important that the Sub-commission should have a management plan with clear and well defined goals. With regards to conservation there are signs that the commission could initiate significant progress community based management approach. A pilot project of this approach is being tried at Kisakasaka. It has shown that it is possible to do things well by involving the users of the resources. Despite minor problems that have been observed there are signs of hope that conservation could be achieved if the users (i.e. the local community) are involved in the management of the resources.

-Lack of resources

One of the major problems facing the commission is the lack of funds and resources to carry out scientific research and monitoring.

5.4 Environmental Laws

Zanzibar has a variety of legislation covering some aspects of environmental issues. Many of these are very old laws which date back to the time of colonial rule. They were enacted at the time when the environment was not an issue globally and have absurdly low financial penalties. The best example is CAP 160 Carriage of Dangerous Good Decree of 1921. Under this decree the highest fine which can be charged to the offender who causes an oil spill at sea is Shillings 2000/-. This amount was too high and was a deterrent in 1921. Today the amount is equivalent of about 4 US dollars.

A second drawback with this decree is that it does not cover any other dangerous goods apart from petroleum products, and therefore no legal action can be processed against pollution resulting from other chemical hazards. The author is of the opinion that the legislation should be amended to meet the present situation and brought into conformity with required international standards for carriage of goods by sea. (IMDG Codes).

Another example is CAP 121 Woodcutting Decree of 1946. This decree has defined the mangrove forest to be government land. But there is no clause in the decree concerned with the conservation and protection of the mangrove ecosystems.

1. National Legislation

Commission of Land and Environment Act.

The Act establishing CoLE authorises legal actions to be taken against people misusing the land or causing environmental problems. As the Act did not give clear definition of environmental problems or of the word "misuse", successful prosecution of offenders would be very difficult. The Act has also completely ignored the protection of marine environment and control of pollution having no provision related

to that purpose. Therefore, conservation of the marine/coastal ecosystem can not be enforced under the present CoLE Act. The Act does not have any provision obliging investors to carry out Environmental Impact Assessments (EIA) of development projects, or Environmental Auditing of approved projects. The importance of two management tools have been explained in the previous chapters.

An argument by CoLE that legislation to incorporate EIA within the approval process for development projects should wait until a time when there is more experience in the practice of EIAs in Zanzibar is not logical, and misleading. This is the same as saying that there is no need for EIAs in Zanzibar. No experience will be gained as no one will agree to an EIA process if it is not required by the law. (ZILEM, 1992)

The author is of the opinion that EIA for Zanzibar are a necessity, looking at the pace of the uncontrolled and unplanned development projects and the corruption of some of the responsible authorities. Investors should be required by laws to include the EIAs right from the initial stage of the approval process. Many countries have already done this. It is very important as it helps to avoid the decision makers from being cheated by unscrupulous investors and bureaucrats.

It is quite obvious that CoLE does not have any legal power to prosecute the polluters of the marine environment under its own Act. This is a very dangerous situation. CoLE being the national body responsible for protection of marine environment, including prevention of marine pollution; it should have legal power to carry out its responsibilities.

2. Zanzibar Investment Promotion Agency Act.

The Investment Promotion Act No 2 of 1986 requires investors to minimise pollution, as provided under PART V Article 20 which states that every investor shall be required to ensure that:

- a. Provision are made to minimise pollution of the air, sea, rivers and land by providing acceptable sewage disposal arrangements and
- b. chemical, physical, biological substance and agents under an investor's control are utilised without risk.

The vagueness of the law lies with the word "minimise." As there is no minimum level of pollution which could be taken as a basis, how will the investors know that they have crossed the permitted limit. By using the word "minimise" the Act contravenes the International Convention on Prevention of Marine Pollution, MARPOL 73/78 which obliges states to take appropriate measures to prevent pollution of the marine environment. The Act should require the investors to prevent the pollution of marine environment and air, and not just minimise pollution.

Another problem is with the phrase acceptable sewage disposal. This needs to be clearly defined. The discharge of untreated raw sewage should not be permitted under any circumstances. ZIPA itself does not have any monitoring mechanism to oversee the implementation of these requirements by the investors.

Although the investors are required by law to minimise pollution of air, sea, and rivers, failure to do so is not an offence. Therefore this is the same as saying there is no law which prohibits the investors from actions which could result to environmental degradation. As long as these people cannot be prosecuted, they will not spend their money on environment protection. Under Investment Promotion Act No 2 Of 1986, there is no clause which stipulates that failure of the investors to take action to minimise the pollution is an offence. Therefore no penalty can be impose upon investors who do not comply with the law.

The Act should have a clause which requires the investors to carryout an EIA and conduct an Environmental Audit. It is very unfortunate that there is no mention of the two. It is impossible to think of sustainable development without first amending the

law which will give legal power to ZIPA to prosecute those who failed to follow established guidelines and regulations.

3. Legislation on Fisheries

The fisheries legislation, Fisheries Act No 8 of 1988 has the possibility for conservation and protection of the marine environment and coastal ecosystems if well implemented. The Act requires development plans to be based on the available data and also provides the Minister of Agriculture, Livestock and Natural Resources, and the Director of Fisheries the power to regulate the fisheries. The main weakness of the Act is its failure to give any regulatory authority and management powers to the Natural Resources Commission, which is actually responsible for managing the fisheries in the islands.

Some of the positive provisions of the Act are as follows:

- Marine parks, sanctuary and controlled areas may be created under the Act, although these entities are not defined
- The Act mentions prevention of the marine pollution.
- It has strong provision against the use of dynamite and other destructive fishing methods.

The major weakness of this Act is related to enforcement. Example for any enforcement measure to be taken, prior permission need to be obtained from the minister as the act does not designate an organ for enforcement of the law. A definite order is required to arrest a fisherman engaged in destructive fishing activities. This is a drawback. Once a method has been classified as destructive the law should give full authority to the maritime law enforcement organ in the country to take action and prosecute those who commit offences under the law. For instance dynamite fishing is prohibited and it is an offence under the Act. There should be no need for an order to be obtained from the director or the minister to arrest the offenders.

4. Legislation on pollution

At present Zanzibar has no legislation aimed at preventing marine pollution. Marine pollution is just mentioned in the Fisheries Act No 8 of 1988 without specific provision.

The only Act which covered some aspect of marine pollution was the Towns Act (Cap 79). This had provision dealing with sewage disposal and drainage. This Act was repealed in 1986 by the new Local Government Act. The new Act has no provision with this regard and therefore new legislation is needed.

Specific laws are needed in the case of industrial wastes. At present there is no legislation which control industrial waste disposal. It has been explained in chapter two that industries discharge their untreated wastes in the rivers and the streams. This has been proven by the study carried out by Bruggen in June 1990. The study revealed the presence of heavy metals in the water near the shoe factory at Mtoni where the river enters the ocean. Heavy metal were also found in the small lake at Sebleni into which a stream from the Small Scale Industrial Estate enters.

Toxic chemicals are also not covered by any legislation. The Dangerous Goods (Act Cap 160) and the Carriage of Dangerous Goods by Sea (Cap 155) were not intended for regulation of Chemicals and are not adequate for that purpose. Therefore a complete new set of rules are required to deal with toxic chemicals and other hazardous materials. This needs to be treated as an urgent requirement given the pace of industrial development and the tremendous increase in the transport of chemicals and other dangerous goods to and from the islands.

5. Legislation relating to Construction

One of the major threats to the marine environment in Zanzibar at present is the rapid and unplanned construction work which is going on all around the islands. Construction too close to beaches blocks access, spoil the scenery, degrade the beach

and marine ecosystem in general. As there is no control over construction some of the buildings are being built just a few steps from the foreshore. Another problem here is the denial of access for recreation and fish landing facilities for the local communities. Private developers raise fences and walls to protect their properties. This already is in evidence all along the coast from Mbweni to Chukwani. The repeal of the Towns Act has further weakened the control over construction which was already inadequate

The Act establishing CoLE is not strong enough. It has too many ambiguities. These have been discussed in detail in 5.4(I) above.

Cap 105 gives government control over the foreshore, but does not establish the minimum distance that construction must be set back from the beach.

A major impact on the marine environment is caused by construction through the collection of building materials like sand, gravel and rocks. There is no legislation which prohibits or controls these activities at present.

The Public Land Decree (Cap 93)-Removal of Natural Resources Rules, only requires that a permit be obtained prior to collection of sand, gravel and rocks. The author is of the opinion that specific legislation to prohibit the collection of coral rocks (alive or dead) from the sea or inter-tidal zone should be enacted. There is also an urgent need for new legislation to be enacted for the purpose of controlling construction work in the islands.

6. International Conventions on Pollution

Zanzibar cannot be a party to any international convention by itself. It is not a member of any international organisation. Its membership to an international organisation is through the United Republic of Tanzania. This is because foreign affairs and international relations fall under the union government as provided for in the Constitution of the United Republic. This is a big drawback to the islands because those international conventions ratified by the Union Government are not extended in their jurisdiction to Zanzibar. For those laws to be applied in the islands they have to

be passed through the House of Representatives. Although Tanzania has signed some of the international conventions, and is a party to a number of conventions, Zanzibar is not a party to any. This was confirmed by the Zanzibar's Attorney General Honourable Idi Pandu when interviewed by the author in January 1995. "We are not party to any international convention", said the Attorney General. (Attorney General, 1995)

During the interview the Attorney General confirmed that arrangements are being made for the international conventions ratified by the Union Parliament to be applicable to both sides of the Union. It is worth noting that this arrangement will be of no value to the islands if the union government will not involve the Zanzibar government in the ratification process of the international conventions.

As environment protection is not union matter, it is very important for Zanzibar to be aware of the international efforts in the environment protection and pollution prevention. The author is hereby suggesting that arrangement should be made to enable Zanzibar to attend the meeting of the International Maritime Organisation and other specialised organs of UN as an associate member or as a party to the delegation of United Republic. This arrangement can be worked out without contravening the Articles of the Union.

Some of the International Conventions and Agreement dealing with Pollution.

-Treaty Banning Nuclear Weapons Tests in the Air, Space and Under Water, Moscow, 1963.

Tanzania ratified this treaty in 1964. But no legislation has yet been enacted.

-African Convention on the Conservation of Nature and Natural Resources, Algiers, 1968.

Tanzania accepted this agreement in 1974. The objective of this convention is the adoption of measures necessary to ensure conservation, utilisation and development

of soil, water, flora and fauna resources. There is no legislation to cover this convention as well.

-The United Nations Convention on the Law of the Sea (UNCLOS)1982

Tanzania has signed and ratified this convention. A Parliamentary Act has been enacted to cover it.

-International Convention for the Prevention of Marine Pollution from Ships, MARPOL 73/78.

Tanzania has signed this convention but has not ratified it as yet. It is hesitating to accede to this convention because it feels that it will be faced with a heavy financial burden to satisfy Annex I and Annex II which are compulsory. These annexes include the provision of reception facilities at oil loading terminals, repair ports, and in ports where vessels have residues to discharge. Therefore Tanzania has chosen to pollute her marine environment rather than spending money on providing the facilities. This shows that the Authority (i.e. Ministry of Communication and Transport) is not aware of the danger which exists and the consequences which the country will face in the future.

-International convention for the Safety of Life at Sea (SOLAS) 1974

Tanzania has not signed and is not a party to this convention.

-Convention on the High Seas, Geneva, 1958 and the Convention on the Continental Shelf.

Tanzania has not ratified either of these conventions.

- Convention on the Prevention of Marine Pollution by Dumping of Wastes or other matters, London, 1972 and the BASEL convention on Transboundary movement of wastes

London Dumping convention regulates the disposal of all wastes and other matters at sea, Whereas the Basel convention primarily addresses the transboundary movement of hazardous wastes,

London Dumping convention recognise the rights of a state to exploits natural resources while prohibiting damage to environment of other states. The convention lists prohibited items (mercury and mercury compounds) and other substances such as lead, arsenic among others, which are allowed to be dumped with specific controls.

Tanzania has no legislation regarding dumping and transboundary movement of the hazardous wastes, and views this as a problem of industrialised states.

It is the opinion of the author that that Tanzania must accede to these conventions for her own protection. It is wrong to view the dumping as the problem of the industrialised states. These states have the capabilities of dumping their wastes anywhere, and Tanzania is not an exception. Therefore it very important that the national legislation be enacted to deter dumping by foreign vessels. Without legislation it will be impossible to prosecute the offenders. Once it is known that there is no law which prohibit dumping in Tanzania's water, the country can be turn into dumping ground by industrial nations.

-Treaty on the pollution of the Emplacement of the Nuclear Weapons and other Weapons of Mass Destruction on the Seabed and other Ocean Floor and in the Subsoil Thereof, Washington, London, Moscow, 1971.

Tanzania has accepted the treaty but has not ratified it as yet.

The analysis has revealed many areas where legislative reform will be needed. The legislation should be tailored to support the national environmental policy, and help in the achievement of sustainable development in the islands.

CHAPTER SIX

6.0 OVERALL PROCESS TO ELIMINATE THE PROBLEMS

6.1 Management Approaches

"Conceptually, the logic of management planning is simple." (Kenchington, 1990, page 42). It consists of two steps:

-problem definition - this involves identification of the impacts related to each activity and

-problem rectification - incorporating suitable controls and limitation in management plan.

In this case, the first step of problem definition has been discussed in length in previous chapters 1-5 above. From the discussion and analysis it is quite obvious that the basic requirements for the marine environment and resources protection is the management of the human uses and impacts in very large scale. This can be seen from the fact that major problems facing the marine environment are those caused by human impacts, and the conflicting interests of the users. Kenchington explained in 1990, that because of the scale and linkages of the marine environments, their conservation is more clearly a matter of broad-based management of human uses and impacts.

There are two requirements which are necessary before initiating any management plan in the marine environment. The first and foremost is for understanding of the uses. In this a manager needs to know clearly the historic and current extent and impact of each use; and extent and likely impact of future use on the basis of user

expectations; the interactions of the range of present and likely future uses; the apparent capacity of the system to sustain used and option for management of each use.

The second important requirement for the manager is to be able to persuade the users that their long-term interests will be served by the management of the marine environment. He should be able to convince the people that management of the marine environment is the only way to sustain their social and economic needs. In doing so ecological criteria should sometimes take priority over short-term social and economic criteria. This should be preceded by the strategy to address the short-term social and economic needs identified by the users, as long-term management is unlikely to be effective without first taking care of those needs. "If the people closest to the marine environment do not or can not economically afford to accept the need for management, it will either fail or be extremely costly to enforce" (Kenchington, 1990, page 39). Therefore one of the most important steps which the manager should take is the identification of the users.

In the marine environment there is always two types of types user to be taken into consideration. They are :

- Direct users- those whose primary purpose depends directly upon the quality and productive capacity of the marine environment. For these users degradation of the marine environment will result in a heavy and direct effect to the users themselves and their socio-economic activities. These include fisheries, recreation and tourism.
- Indirect users- those whose primary purpose is not directly related to the quality and productive capacity of the marine environment. These users are not directly affected by the decline in the quality of the marine environment, and therefore they are least concerned about maintaining the environmental quality. Example of these include coastal development, waste disposal and transportation.

In the first case management requires control of demand and impact. It is very important to make sure that the supply or natural regenerative capacity of the marine environment is not exceeded.

In the case of indirect users, management requires co-ordination. Its object should aim at achieving the minimum practicable usage impact upon the ecological processes, natural resources and options for sustainable direct use of the marine environment.

It should be understood that in the long-term the economic and social consequences of environmental degradation and collapse may be severe for both direct and indirect users. The only way to avoid this is through co-ordination and collaboration of all the players involved in the marine environment.

There are three main tasks facing the manager in managing the marine environment. They are resources allocation, impact minimisation and pollution control. "Almost all management of the marine environment or natural resources, consists of limiting or eliminating human impacts, which arise through altering the pre-existing natural system by removing biological or physical resources or by introducing physical, biological or chemical factors that distort the process that maintains the system" (Kenchington, 1990, page 20). Therefore, establishment of effective co-ordination is the critical first step in achieving marine environment management. The key is collaborative approach between environment managers and economic managers, that ensures that coastal and marine environment are used sustainably, for the purposes for which they are suited. Hence there is a need for integrative management which should address the issues raised by all individual direct and indirect use sectors.

6.2 Actions Needed for integrated management

1. Developing awareness

The first step which should be taken is development of the awareness of the concerned community into adoption of a series of goals and objectives. These goals may be addressed by a single co-ordinating marine management plan or by

interactions between sectoral plans of competing agencies. This can be done through creation of a task force with representatives from all agencies involved. Socio-economic structure and decision making processes of the community involved will decide the approach to be followed.

Awareness is normally developed through the use of community outreach programs, as well as environmental education programs. Community outreach programs are always in the form of cultural activities, radio and television programs and brochures. The environmental education programs start at the grass-root level. This begins with the introduction of environmental education programs in the school curriculum. This has worked successfully in Greece, The HELMEPA junior program is an excellent example which could be followed. In the USA these types of programs have been very successful at Santa Barbara, the Everglades National Park and in the Florida Keys. At the Everglades an Activity Guides for Teachers has been developed to be used in the classrooms for teaching environmental issues concerning the Everglades, and a number of school visits are organised to give a chance to the young children to see by their own eyes what they have been learning in the classrooms. This is the best way to heighten the awareness of the young children with regard to environment protection.

At Santa Barbara and all over the Florida Keys coral reef classrooms for students at junior schools are conducted. The program at Santa Barbara is called An Investment in the Future of Our Oceans and our Children. (Everglades, 1995, HELMEPA, 1994, & FKNMS, 1995).

2. Formulation of the Legislative Base

Need for a policy

The second important step of developing people's awareness is the development of an overall policy on the management, use and conservation of marine estuarine areas (including mangrove forests) for a nation as a whole. Development of national policy should include and create legislative base for conservation. The policy should address

co-ordination with management of coastal land and wetlands. Kenchington explained that the process of creating policy, will contribute to the national recognition of the importance of conservation and management of the marine environment, to the selection and establishment of an appropriate system of marine protected areas, and attainment of a primary goal of management; i.e. sustainable use.

Statement of Objectives

Objectives encompassing conservation, recreation, education and scientific research should be written into legislation. Without this, setting aside of protected areas may be an empty political gesture. It is important that a primary conservation objective in resource management legislation must be recognised as essential to sustain use and enjoyment of the resource.

Sustainable Use

National legislation should then be enacted for the sustainable use of the resources. The most important thing here is that legislation should recognise the linkage between protection and maintenance of ecological processes and resources. Reference to the objectives and concepts of the World Conservation Strategy should be used to reinforce the legislation and its effectiveness. (The Biosphere Reserve Program of UNESCO).

The biosphere reserve concept seeks to promote management regimes based on long-term understanding of ecosystems and the concept that humans are an integral component of the natural system. The basis of biosphere reserves is stewardship providing for sustainable development through zoning plans in which different areas serve the roles of conservation and preservation of species and habitats.

Creation of multiple-use managed areas

In order to achieve integrated management, legislation should be based upon sustainable multiple-use of substantial managed areas as opposed to highly protected

pockets. In designing the umbrella legislation the following goals should be considered:

- Provide for conservational management over the large areas.
- Provide special zones for access by local community for fishing and collection of shell within a large area.
- Provide for continuing sustainable harvest of food and materials in the majority of a county's marine areas.

Example of multiple-use managed areas are found in the Florida Key National Marine Sanctuary in the USA, and in the Great Barrier Reef Marine Parks in Australia.

Co-ordination

Co-ordination of management and planning by all agencies, national and international, which have statutory responsibility within the areas to be managed, must be provided within the legislation. The law should have provision which defines the precedence of each legislation to be applied. As linkages exist between the marine environments, and between the marine environment and terrestrial environment, provision should also be included in the legislation for control of activities that occur outside the marine protected areas. This is important because many activities which have an adverse effect on marine ecosystems and national resources originate outside the marine environments.

Legal Power

The power to establish marine protection/conservation management programs should be provided by the law. The legislation should contain enough detail for :

- Proper implementation and compliance
- Delineation of boundaries
- Providing adequate statements of authority and precedence
- Providing infrastructure support and resources to ensure that the necessary tasks can be carried out.

An excellent example of such laws is the Florida Keys National Marine Sanctuary and Protection Act of 1990 (Public Law 101-605), designating Florida Keys National Marine Sanctuary. The Act requires NOAA to develop a comprehensive management plan with implementing regulations to govern the overall management of the Sanctuary and to protect Sanctuary resources and qualities for the enjoyment of present and future generations. The Act also establishes the boundary of the Sanctuary, prohibit any oil drilling and exploration within the Sanctuary, prohibits operation of tank ships or ships greater than 50 metres in the most sensitive areas within the sanctuary, and requires the development and implementation of a water quality protection program by the US Environment Protection Agency and the State of Florida, in conjunction with NOAA. (FKNMS, 1995).

Consistency with tradition

It is always good for the content of the legislation to consider the traditional values and social practices of the people affected by the legislation. An example in the South Pacific Island States is any fisheries legislation which will not take into consideration of the traditional ownership of the fisheries will not function. (Lecture's Handouts By Prof. South Robin, 1994). Therefore for any fisheries management to be successful in the island states of the South Pacific , it should be consistent with the customary marine tenure or ownership. This would be very important whenever there is customary ownership of an area or resources which are to be managed and this should be reflected in the legislation.

Public Participation

Public participation is also an important aspect in the management of the marine environment. Without active participation and involvement of the users the management is bound to failure. The public should take part in development of legislation in establishing, maintaining, monitoring and implementing management of

the marine areas. This is the key to acceptability and success of the management. It should be established in the legislation and procedures should be laid down sufficiently to ensure effective participation. The Public should be involved in the management plan. This can be done similar to the practices of the USA, where the draft management plans are distributed to the public, and the dates set for public hearings. Input from the public is then included in management plans for marine sanctuaries and other environmental protection legislation.

Monitoring and Research

Legislation should provide for monitoring and research. This helps to determine the condition of the managed ecosystems and their resources, and assists in the development, implementation and assessment of the management.

The primary goal of research and monitoring program is to provide the knowledge necessary to make informed decisions about protecting the biological diversity and natural ecosystem processes of the marine environment and its resources. The goals of monitoring and research as provided for under two Acts in the USA, i.e. National Marine Sanctuaries Act (NMSA) and the Florida Keys National Marine Sanctuary and Protection Act (FKNMSPA) are as follows :

- identification of priority areas for research
- establishment of ecological monitoring
- development of standards based on biological monitoring or assessment to ensure the protection and restoration of water quality, coral reef and other marine resources
- establishment of a comprehensive water quality monitoring program to determine the sources of pollution and evaluate the results of pollution reduction efforts
- evaluation of progress in achieving water quality standards and protecting and restoring the Sanctuary's coral reef and living marine resources
- co-ordination of research efforts to achieve the most beneficial results; and
- promotion of public awareness and resource stewardship

Regulations

Adequate regulations need to be formulated so that activities can be controlled or, as necessary prohibited. The authority to make regulation must be provided for in the legislation. The following types of regulations may be considered :

- Regulations to enforce plans
- Interim regulations to provide protection for an area for which a plan is being developed
- External regulations to control activities occurring outside of a managed area that may adversely affect features, resources or activities within the area.

Enforcement

Legislation must provide adequate legislative power to ensure effective management. The primary legal objective in managing the marine environment is to achieve resource protection by gaining compliance with a national marine environment protection act and any other statutes that may apply within the marine environment. Enforcement is one of the tools available to the managers of marine protected areas. Enforcement programs in a marine sanctuary can complement other management programs such as education and research which, in turn, can lead to increased levels of success. The goal of enforcement in a national marine sanctuary, marine parks and mangrove forests reserves is to protect the marine resources by :

- increasing public understanding of why it is important to comply with the sanctuary regulations;
- achieving compliance with applicable laws; and
- promoting public stewardship of marine resources through interpretative enforcement effort. The laws and Regulation should be translated and list of dos and donts be provided to the public. The first offenders should not be necessarily

prosecuted. They should be informed of their offences and be given written warning. (FKNMS, 1995)

The objective should be to educate rather than penalise the public into compliance with the laws and regulations. Incentive should be given for self-enforcement, local people should be encouraged to reinforce or provide enforcement, while continue their traditional use of the managed area.

Education

Education has an important role to play in making any management approach successful. It is through education that those who are involved in a plan understand their rights and responsibilities related to the implementation of the management plan. The educational goals of the marine environment management program should include:

- providing educational leadership in marine conservation and protection efforts throughout the nation's managed marine areas;
- linking the established sanctuaries and reserves program to each other through national environment program ; and
- establishing a standard of excellence of the management that is attained through the education program of all sites.

3. Implementation of Integrated Management process

The main objectives of all the actions explained in 6.2 above is to achieve integrated management of the coastal zone, and of the marine environment in general.

Ehler and Basta have defined management as a "set of related activities carried out to achieve desired objective". Coastal and marine management require diverse activities which include planning, assessing, implementing, enforcing, monitoring, evaluating and educating. These activities need to be integrated and performed continuously in order to be effective. They should have information feedback, for example, from

monitoring to planning, and from assessment to operations, built into a continuous management process.

In the context of coastal zone management , “integration” has at least five possible pathways:

1. Across management of regional economic sectors, such as agriculture, industry, energy, and recreation.
2. Among agencies responsible for coastal management activities such as natural-resources, environment protection, economic development, and-use departments
3. Among authorities and resources of federal, regional, district and local institutions.
4. Within management tasks themselves ; and
5. Across disciplines of management, including science, engineering and technology, economics, political science and law.

Why Integrated Management ?

Most coastal areas in the world are facing severe problems of increasingly rapid growth in human population, deteriorating environmental quality, reduced biodiversity, loss of critical habitats, diminishing level of fish and shellfish population and increases in risks from natural hazards. Some of the characteristics which are common in the management of coastal areas are as follows :

- increasing conflicts among economic development, environmental protection and natural resources management objectives,
- growing numbers of coastal resource users and increasing conflicts among them
- multiple-agency authorities and jurisdiction, and little or no co-ordination between levels of government and across agencies within the same level of government,
- limited or inadequate financial and human resources for management activities,
- incomplete data information and understanding of coastal problems
- public and political expectation that coastal problems have an immediate solution.

The above problems challenge virtually all institutions responsible for managing the coastal areas; which include public agencies, private sectors and the academic community. Therefore, an integrated and highly participatory management approach to involve all those facing the challenge seems to be the only possible answer. This should replace the traditional segmented approach through which each institution concentrates only on a part of a coastal picture. It is unfortunate that in many countries, including Zanzibar, that almost all decisions about coastal resource-use continue to be made within a single-sector, by a single-user or on a single-resource basis. It is time to introduced a process to determine the desirable mix of products and services that the coastal area can provide. That process is called Integrated Coastal Zone Management.

Step to make coastal zone management work.

1. Changing the management approach- i.e. from a fragmented to an integrated approach.
2. Collection and supply of technical data by an environment protection agency in collaboration with appropriate scientific institutions. This requires creation of institutional partnerships.
3. Commitment to a continuing management process that can accommodate future changes.
4. Increased participation by the general public and by a wider band of the scientific management community. This is absolutely critical for long-term success.

6.3 Experience of other Countries

1. One US experience in implementing the concept

The Florida Keys National Marine Sanctuary Management Plan

-In 1990, US Congress designated the Florida Keys National Marine Sanctuary.

-NOAA was required to develop a comprehensive Sanctuary management plan by 1993

- No additional funds were provided to NOAA by the US Congress for this work
- The Florida Keys Sanctuary encompassing 8,898.5 square kilometres of coastal water.
- The region is one of the most heavily used coral reef tracts in the world, attracting over a million divers a year
- The area has many competing, conflicting uses and overlapping agency jurisdictions.(FKNMS, 1995)

Steps

1. It was recognised that developing an initial plan was only the beginning of a continuing management process
 2. The second step was formation of working partnerships with relevant public agencies, private citizens and public interest groups. Public agencies included: the State of Florida- (Natural Resources and Environment Regulation Departments), Monroe County (the local government for Florida Keys), the US Environment Protection Agency (the federal agency responsible for developing a Florida Keys water quality management plan); and Natural Resources Managers including the National Park Service, the US Fish and Wildlife Service and the South Florida Water Management District and Citizen Advisory Council
 3. The third step was the creation of a clear integrated management framework
- This was followed by the formulation of clearly and well defined Strategy- Action Plans which included :
1. Channel Marking Action Plan
 2. Education Action Plan
 3. Enforcement Action Plan
 4. Mooring Buoy Action Plan
 5. Regulatory Action Plan
 6. Research and Monitoring Action Plan
 7. Submerged Cultural Resources Action Plan

8. Volunteer Action Plan

9. Water Quality Action Plan

10. Zoning Action Plan

4. The fourth step was formulation of a back-to-front process, one which began with developing a plan that could then be used for structuring data collection, analysis and research, instead of the other way round.

About 80 participants have served as the core working-knowledge base. Altogether some 350 individuals have been involved to some degree. The process has been completed and an integrated management plan for the Sanctuary is ready for public hearing. (FKNMS, 1995)

2. The experience of Thailand

The Phuket Demonstration Project

-The project started in 1987 by mobilising both private and public support to implement meaningful coastal management initiatives.

-It started with a co-operative Australia-Thailand Project to collect baseline information on condition and use of Thailand coral reefs

Phuket is Thailand's largest island, with an area of 555 square kilometres

Tourism is Thailand's largest single source foreign exchange, and Phuket is the premier destination

-Tourism began growing in 1985, simultaneously providing economic benefits and causing environmental decline. The traditional users of Phuket's coral were rapidly outnumbered by divers, tour boats and hotel operators. (Hale et al, 1993)

Goals of Phuket Project

-to protect and provide for sustainable reef use

-to built constituency over coral reef protection

Problems

- siltation from offshore tin mining operations
- siltation from runoff and coastal watershed erosion due to construction of tourism facilities
- increasing nutrient discharges from sewage
- maintaining and promoting multiple and sustainable use
- promoting the recovery and enhancement of coral reef habitats
- enhancing local commitment to, and participation in coral reef management

Management strategies to maintain water quality, sustain fisheries, and reduce tourism-related damage were set forth in an attractive, widely circulated document entitled Phuket Coral Protection Strategy.

-The first issues to be addressed were associated with recreation and reef tourism that needed no regulatory management techniques, but include educational activities and mooring buoy installations.

-Private sectors were mobilised to make monetary contributions.

When significant progress was made towards developing a constituency for coral reef management, attempts were made to improve laws, policies and procedures.

-The signs of success of this project stimulated other areas in Thailand to embark on the protection of coral reefs, this gave birth to a Thailand National Coral Reef Management Strategy. (Hale et al, 1993)

The strategy recognises that coral reef, like other habitats, must be managed according to site specific conditions and ecological status. Uses and development potential. Thailand's strategy divide the reef into three categories :

-reef managed for local benefits

-reef managed for tourism development and recreation, and

reef managed for national ecology and scientific benefits

Ten years of sustained activism could make Thailand a global leader in coral reef management and should produce concrete and much-needed results.

- A small but strategic network of marine scientific reserves will be created.
- The coastal community will be actively involved in maintaining and protecting the coral reefs
- A significant portion of Thailand's Coral reefs will be managed with a system of National Marine Parks
- Provincial government working in partnership with central government, will have undertaken a significant first step in assuming responsibility for habitat management. (Hale et al, 1993).

CONCLUSION AND RECOMMENDATIONS

Zanzibar's marine environment is a centre of both social and economic activities for the people and nation as a whole. For the majority, it is a major source of food and income. It is also a source of animal protein for about 94 % of the population. It is a source of energy, building materials and medicines.

With the decline of land based economic activities, such as production of cloves, the marine environment has become even more important to the islanders. It is the only economic alternative that have potential to safeguard the island's economy but only if properly managed. The marine environment has become a focal point for different economic activities and development projects, with development of tourism being at the forefront.

It has been established that apart from socio-economic importance, marine environment (i.e. mangrove and coral reef ecosystems) play even more important role

of coastal protection. Protecting the coast from otherwise very severe erosion from strong ocean waves.

A marked deterioration of these fragile and important ecosystems has been observed in the islands. It is fortunate that destruction and degradation of the coastal ecosystem is not a result of natural phenomenon like Hurricanes or Tremors, which are beyond man's control. It has been established that all the problems which cause destruction and degradation of marine environment in Zanzibar are the result of human impacts and uses. They include :

- pollution
- bad methods of extraction of the marine resources
- over exploitation of the resources
- unplanned, uncontrolled and uncoordinated coastal development

Further, it has been observed in the case of mangrove ecosystems that the major cause of degradation is severe cutting for firewood, and building poles. The cutting is not regulated or controlled, hence it is not sustainable. With the coral reef ecosystem, the major cause of degradation is the use of destructive fishing methods, like the Kojani and use of poison.

In the case of development activities such as tourism and coastal development, e.g. construction along the coast, the main problem is lack of proper land use planning, control and co-ordination of these activities. There are no well defined policies and no legislative basis for control.

Lack of legal authority on the part of government agencies charged with the control of these activities is also one of the major problems. This coupled with the lack of an efficient monitoring mechanism, makes the problem even more complex.

It has been well established that if the present trend of activities is left unchecked, the question of sustainable development of Zanzibar's marine environment will remain a dream which can never be realised.

There are many obstacles which hinder sustainable development of the marine environment in the islands, major among them is the rapid growth in population. This is a factor which needs to be treated urgently, as it is the root cause of other problems resulting from human impacts and uses.

It has been further established that the solution for conservation and protection of the marine environment in Zanzibar, lies on the management of human impacts on the environment and use of the resources.

This cannot be achieved through fragmented decision making, and uncoordinated development activities by individual sectors which have narrow interests in the marine environment. Hence there is a great need for integrated management of the Zanzibar marine environment.

Recommendations

Formulation of the legislative basis (Need for Policy)

Government should develop an overall policy on the management, use and conservation of the marine ecosystem. The policy must aim towards :

- integrated management and multiple use of the resources,
- protecting resources base and
- discouraging unisectoral approaches to management.

Government should develop national policy on tourism. National policy on fisheries should be amended to meet the management and conservation needs.

The proposed new policy will form a legislative basis for Zanzibar national environment protection and conservation laws.

Developing people's awareness

Government should initiate attractive ways to heighten awareness among the community. This can be achieved through community outreach programs, such as cultural activities, radio and television programs, T-shirts and badges, stickers and brochures. This should be the responsibility of the two relevant ministries, i.e. Ministry of Water, Construction, Energy, Land and Environment and the Ministry of Agriculture, Livestock and Natural Resources.

On rapid growth of population

Government should strengthen its family planning policy, by educating the people especially in the villages on the problems of over population and benefits of family planning to the individual family. This is the joint responsibility of the Department of Social Welfare under the Chief Minister's Office and the Ministry of Health. In order to make this campaign more easier religious leaders of different denominations should also be involved.

Enactment of national legislation on environment protection

Based on the national environment protection and conservation policies, government should take following actions:

Enact a National Environment Protection Act. This should be a framework law upon which other legislation on environment protection and conservation of the marine ecosystem can be based. Ministry of Water, Energy, Construction, Land and Environment should co-operate with the office of the Attorney General to make draft proposal of the laws.

Establish Zanzibar Environment Protection Agency.

The National Environment Protection Act should provide adequate legislative power to the new Agency to enable it to perform the duties entrusted to it.

On conservation of marine ecosystem and marine resources

Based on the management policy on the use and conservation of the marine ecosystem, government should enact a National Marine Sanctuary and Protection Act. The Act should designate Zanzibar National Marine Sanctuary And Reserve Program, under the auspices of a Natural Resources Commission and provide legal power to the Natural Resources Commission to manage, conserve and protect the marine ecosystems.

The legislation should contain enough detail for :

- proper implementation and compliance,
- delineation of boundaries; and
- providing infrastructure support and resources to ensure that necessary tasks can be carried out.

The Act should require the Natural Resources Commission to develop a comprehensive management plan, with implementing regulations to govern the overall management of the Sanctuaries and protect the resources and the quality of the environment.

The Act should be consistent with the traditional values of the people.

It should provide for sustainable use of the resources and should provide co-ordination of management and planning by all agencies concerned. It also should provide for public participation in the management approach

In case of mangrove forests,

Amend Forestry Decree to include the mangrove forests in the list of government protected forests. The amendment should provide adequate authority to the Forestry

Sub-commission to make regulation and overall guidelines for better management of the mangroves forests.

- regulate and control cutting of the mangrove poles
- employ sufficient forestry guards to patrol the forests
- involve local community in the management of the mangrove forests.
- research on alternative building material which could be used instead of mangrove poles.

On Fisheries management

The Ministry of Agriculture, Livestock and Natural Resources should carry out research on the fish stock available, and provide scientific data on the following:

- Maximum Sustainable Yield (MSY)
- Maximum Economic Yield (MEY) and
- Optimum Sustainable Yield (OSY)

Amend The Fisheries Act No 8 of 1988 to give more power to the Sub-commission of Fisheries to manage and regulate fishing activities in the islands.

On prevention of Pollution

Government should: Enact legislation to cover the carriage of dangerous goods and other toxic chemicals in compliance with the International Maritime Dangerous Goods codes (IMDG codes);

enact legislation to regulate the disposal of industrial wastes;

Ministry of Finance should amend Investment Protection Act No 2 of 1986 to include the following:

- provisions to make discharges of untreated sewage and other pollutants an offence by law, and provide for a polluter pays mechanism
 - provisions to require EIA to be included in the initial process of investment approval;
- Formulate a national response team for oil and chemical hazards response;

enact a legislation to regulate construction work and prohibit coral mining and sand extraction from the foreshore and intertidal zones.

On International conventions

Zanzibar should work together with the Union Government to see that important international conventions on pollution and conservation of marine environment are ratified or acceded to. Arrangement must be made to enable Zanzibar to attend IMO meetings either by having a representative in the Tanzania's delegation, or as an associate member of the IMO.

On Maritime laws enforcement

Ministry of State President's Office, Regional Administration and Special Department should amend Act No 13 Of 1979 establishing Zanzibar Coast Guard (KMKM) to include in its duties the responsibilities for:

-Marine safety and Environment protection

-to designate the Coast Guard as the maritime laws enforcement organ in the country

Other Ministry which have interests in the marine environment should be required by law to amend their relevant legislation to give legal power to the Coast Guard to arrest and prosecute the offenders with maritime offences.

On Integrated Mangement of the Marine Environment

Formulate a national body responsible for integrated management of the marine environment, (IMME) under the Chief Minister and he should be the CEO of IMME.

IMME body should have the following Ministers as members:

1. Minister of Finance
2. Minister of Planning
3. Minister of Transport and Communication
4. Minister of Water, Construction, Energy, Land and Environment
5. Minister of Agriculture, Livestock development and Natural Resources

6. Minister of Information Tourism and Youth

7. Minister of State President's Office, Regional Administration and Special Department

8. Attorney General.

IMME Executive Council should be formed by the Principal Secretaries of the relevant Ministries. There should be a permanent Secretariat of IMME located in the Chief Minister's Office. The chairmanship of the Executive Council should be rotational between the Ministers of the relevant ministries. This will remove the fear of Subordination among the members.

Once this body is created all proposals for development projects in the marine sector will have to be discussed at the Executive Council and then sent to IMME for review and approval. This is an effective way to avoid unisectoral management approaches and fragmented decision making.

IMME Responsibilities will include the following:

1. Development of a comprehensive Ocean Policy that embraces the development and environment protection concerns relative to the :

-shipping

-the national fisheries

-ports development, construction and uses

-tourism and hotels development

-national marine sanctuaries and marine protected areas

-non-point source pollution from agriculture and urban activities

-point source pollution from industries and urban activities including municipal wastes

-Exclusive Economic Zone uses.

2. Co-ordination of Inter-Ministerial activities to provide integrated management of the marine environment.

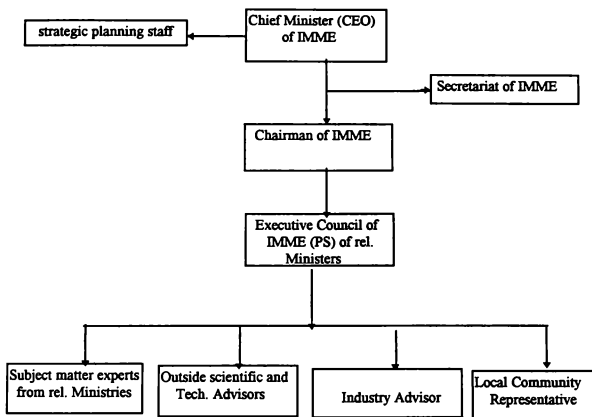
3. Review of all Ministries activities that have potential to effect the marine environment.
4. Drafting of legislation necessary to achieve sustainable development of the marine environment.

It is highly recommended that IMME should introduce a Strategic planning process in its organisational structure. This is an excellent tool for:

- assessing strengths and weaknesses of the organisation
- identifying the threats and opportunities caused by both internal and external factors
- analysing and evaluating the timing of the threats, probability of occurrence, impact on the organisation and the ability of the organisation to influence the concerned agency or national body in dealing with the threats.

Strategic planning would also provide the CEO the vision for the future which is an important factor for defining strategic goals of the organisation and for developing strategic policies needed to achieve integrated management of the marine environment.

Proposed model for integrated management of the marine environment in Zanzibar,
incorporating strategic planning.



This study has shown the critical position occupied by the marine sector in the economic and social life of the people in the islands of Zanzibar. It has evaluated the present marine environmental problems together with the future anticipated problems which could be triggered by uncontrolled and unplanned economic activities.

The question of sustainable development of the marine environment in Zanzibar is of paramount importance, and could be only realised through an integrated approach to management involving all parties having interest in the development of the marine sector.

It is expected therefore, that the islanders would take the above suggestions and recommendations seriously and take a timely action to implement them so that the national goal of attaining sustainability by the people and the government could be realised.

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Tourism versus the environment

From Ali Sulfan, Zanzibar

For the past 50 years, tourism is one of the world's largest growing industries. From the onset, it is important that everybody understands tourism as a vital economic activity.

This sector has more often than not been misunderstood, neglected and in instances referred to as the "cinderella" of the country's economy.

Currently, tourism is one of Zanzibar's top earners of foreign currency, major employer, major revenue contributor to the treasury and powerful stimulus to economic development.

According to 1993 figures, Zanzibar has earned 120.5 million United States dollars about 54 percent of gross domestic product (GDP) from tourism and hotel industry. The figure could be higher if not for dishonesty and cheating among private people conducting this business, and laxity in collecting revenues.

Though there are still no well-developed tourism infrastructures like high quality hotels and services, Zanzibar is increasingly becoming a very popular tourist destination because of various reasons.

These include peace and stability that has prevailed since revolution, and the all-year pleasant weather coupled with friendly people with unique cultural heritage. Most tourists like to see historical sites, unique architectural buildings most of which are more than a century old.

Because of the interdependency between tourism and environment, it is important that everyone in Zanzibar should know and appreciate that the future of tourism depends on lasting harmony between tourism develop-

ment and environmental protection, conservation and improvement.

This logic explains why environmental awareness is assuming such a high profile and priority in every tourism development activity. It is therefore in the best interest of the tourism industry and the country as a whole, not only to conserve and protect, but also to improve the environment as it forms the basis of the industry on which the whole tourism phenomenon takes place.

Moreover, Zanzibar has launched its tourism policy which promotes and dictates about high quality tourism as a means of achieving a balance between the needs and aspirations of tourists and investors on the one hand and those of local community and environment on the other.

We should bear in mind that the environment forms the basis of the tourist industry, hence the desire not to destroy the very foundation of the industry by realising that tourism is a sensitive friend of the environment.

Unfortunately, tourism industry has over the years earned a bad reputation as a polluter and destroyer of the environment. In Zanzibar, environmentalists have the opinion that rapid tourism development as another means of generating income after declining of clove price in the world market, would jeopardise the fragile Isles environment.

In some situations, even the economic benefits of tourism fail to flow to the local economies because of "leakage" to off-site and even out country control of profits.

Tourism, which exploits and

degrades the environment, will ultimately be self-defeating. Perhaps even more importantly, the government and local communities will have filed in their responsibility for passing on to future generations an environment and heritage capable of supporting the activities, enjoyments and benefits we have derived from that environment.

Zanzibar, like any other developing country, needs to balance its economic activities with sound sustainable development measures, including to regulate its tourism development policy to compromise with the environment.

Frankly speaking, the future of Zanzibar environment is bleak as tourism industry gains momentum and both institutions dealing with tourism development take little effort to rescue the environment.

It is obvious that in Zanzibar the concept of environmentally sustainable tourism (EST) which evolved from the UNEP in Stockholm in 1972, calls for planning and management of the tourist industry and the support of natural resources.

There are several reported cases related on environmental degradation since this industry took-off with a bang in 1984 and was later catalysed by Investment Promotion Act in 1986 aimed to accelerate investment opportunities in Zanzibar.

Beach erosion due to building tourist hotels just adjacent to the high water mark; exploitation of both marine and other resources; destruction of coral reefs caused

by diving and fishing adventures, are just some examples.

While in the southern parts of Zanzibar (Bwejuu, Jambiani and Makunduchi) the tourism industry is picking up quickly, beach erosion has been reported by hoteliers themselves as a most serious problem.

Some hotels have already been washed away by sea water particularly during high tides. It is believed also that destruction of corals reef due to diving and dynamite fishing are posing serious threat to the environment.

Most of the hotels have been constructed without following proper procedures albeit there were discussions and suggestions from Isles Department of Environment recommending that any hotel should be build not less than 30 or 60 meters from the high water mark as stated by UNEP.

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Daily News 23rd March
1991

Zanzibar warned over unchecked activities

From Correspondent ALI SUL-
TAN, Zanzibar

ZANZIBAR has been warned over possible environmental catastrophe if the existing trend of unchecked tourism development along the isles coastlines will continue.

A representative from the Royal Netherlands Embassy in Nairobi, Mr. Nico Viccer told participants at a four-day international workshop on ecotourism and nature conservation in Zanzibar that unchecked tourism development could soon become unsustainable for people of Zanzibar and their natural environment.

Mr. Viccer in his opening address to workshop participants directed that Zanzibar must tackle the problem of development arising from tourism expansion and environmental protection.

He said Zanzibar should learn from the experience of other

countries who embarked on tourism investment as an alternative foreign exchange earner advising to set out for a successful and sustainable tourism.

Mr. Viccer suggested that Zanzibar needed serious planning whereby the value of environment, social, culture and economy can be weighed against an influx of 'beach boys' who conduct tourism activities, and not real investors.

He cited Malindi, along Mombasa coastlines as the example of negative impacts caused by tourism, appealing to Zanzibar to keep its identity and stay really in control.

Mr. Viccer added that though 1987 was a booming year for Zanzibar tourism industry where over 100,000 foreign tourists visited the islands. The figure could fall due to bad publicity and the opening of Mozambique coast that had drawn away potential visitors.

Mr. Viccer, said the island once with a romantic name, had received bad publicity and reputation because of the presence of beach boys.

He predicted that the figure of tourists could drop by 50% in 1999.

The Royal Netherlands government is funding the workshop and recently granted Zanzibar a 313m/- (628,940 US dollars) in support of environmental education programme.

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