Problems of development and management of marine resources in Kenya

C.W. Muriuki

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PROBLEMS of DEVELOPMENT and
MANAGEMENT of MARINE RESOURCES
IN KENYA

by

C.W. Muriuki, Kenya.

A paper submitted to the faculty of World Maritime
University in partial fulfillment of the requirement for
the award of a master of science Degree

in

General Maritime Administration

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

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- Muriuki, Gichuru and Nyawira, my beloved family who gave me tremendous cooperation every moment of my training.
Gearing a Nation into an integrated marine policy is not easily achieved. The survey on the development of marine resources in Kenya has proven true to this statement. Tremendous effort and development planning has been employed, substantial funds spent but the desired goals have not been achieved.

An inventory of the resources, their potential use, and development problems have been made in this survey. Lack of good information base of the multiple existence of resources, and finances have been found to be some of the limiting factors. However, the major handicap has been found to be the existing fragmented policy based on sectorial decisions.

This survey has proposed an integration of all sectorial policies, encompassing all marine resources and space use, their conflicts and compatibilities and taking into consideration the environment under which they exist. This policy should reflect the country's ambition and should lead to a path of economic and social development and at the same time sustaining them.
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INTRODUCTION

Renewable resources of the coastal area (defined here as that transition zone between terrestrial and marine components of the environment) are often vulnerable to human activities. Those found on the waters adjacent to this zone are equally affected. The living and non-living resources within these two zones need a management that will harmonize their exploitation and at the same time sustain them for future generations.

However, 'gearing a nation for effective marine affairs management in an integrated policy-making and organizational effort is not easily achieved' (1). The concept is new and even those countries that have come up with marine development programmes meet a lot of challenges. For Kenya, even after twenty five years of independence, she is still struggling to put her economy in the right order. It has been rather difficult given that Kenya wholly relies on agriculture and heavy external borrowing for her development projects.

In recognition of the demanding economy, this paper is going to look into the development of marine resources in the framework of Ocean space under the National jurisdiction. The Ocean space will take into consideration the coastal area and the Exclusive Economic Zone (EEZ). This is because the characteristics of the coastal area and EEZ share a variety of issues of mutual concern, and there is a close relationship among them which give the planners of those two a common goal of resource protection and development.
Much has been done on all sectors of the economy which includes the improvement of agriculture and mobilising of industries on locally available materials to cut down on importations. The country has had to grapple with the ever growing population in terms of providing high social standards in health, education and the overall wellbeing of the society. Development plans have been geared towards the 'diversification of the economy' and 'mobilisation of domestic resources for equitable development' but so far no urgent need has been seen to look or to consider the marine resources as part of the whole development process. Need has been seen to come up with fishery legislation and licensing of mineral and oil exploration but no thought has ever been given to the follow-up effects of these activities. Hotel licensing, industrial development and urban settlement has gone on unhindered with little regard to the effect that they may pose to the coastal habitat or the marine resources that depend on the coastal ecosystem.

The government has continuously upheld the need to develop tourist hotels at the coast but little attention has been given to the tourist attraction in terms of preservations and conservations. Till very recently, no heed had been given to the sedimentation and siltation that Malindi, one of the Kenya's most active tourist centers was experiencing until the hotel owners noticed some decrease in their customers. According to a survey that was done for the hotel industry, the tourist decrease in Malindi had been caused by among others, the continuous deposition of sediment which left the waters of Malindi beaches 'chocolate coloured' throughout the year. This
created some awareness and an authority was established to look into the issue.

Considering the fore-going, this paper is going to focus on the whole area of marine resource and coastal development as one buffer zone comprising a multiple number of resources which interact and some having conflicting effects on each other on exploitation. An inventory of the existing resources, their development problems will be looked into with the aim of shedding some light into some critical areas that have not been given serious thought in the over all planning and policy formulation.

The paper appreciates the pressing need for the Government in meeting high social-economic standards to an ever increasing population. The need to meet these obligations has however gone on with little regard to the effects (negative or positive) that results from their related activity. Unplanned development of human settlement and associated infrastructure, generation of domestic waste especially due to population growth, inappropriate siting of industries and lack of attention to safe handling and disposal of their effluents, and over application of agricultural chemicals are the resultant factors that leads to the degradation of some marine and coastal resources.

In the light of these factors, and bearing in mind that Ocean development is a new concept, an attempt is going to be made to look at the whole nature of marine environment and the related resources, their use, threat
and finally attempt to integrate this whole spectrum of marine resources use, their conservation as part and parcel of the overall government development policy in an integrated manner for maximum results and at the same time sustaining them.

To achieve this, the survey will look at the Ocean development in the context of four problem areas:

1) Problem arising due to the need to develop many different activities along the coast and offshore, and the existence of a single use policy in the management of the interacting activities.

2) Problems of sustainable development based on resource conservation and preservation, and environmental protection and the economic implications on the overall development of the country.

3) Marine industries with a highlight to the problem of fisheries management within the EEZ

4) Problem of destruction of one unit in the development of another

5) Policy and planning

These problems have been looked into bearing in mind the depressing economic factors that may impede their alleviation and short term measures have been recommended. An attempt of drawing a management plan has been made by quoting various factors that should be taken into account.
in trying to resolve the multiple sea use and their conflicts. This has been done by quoting an example of (Sri Lanka) that has already come up with a coastal zone programme. The choice of Sri Lanka has not been picked because it is the best among the existing programmes, but was seen to serve as the best example of a developing country, having some basic characteristics of a marine environment which are similar to those found in Kenya. Although, the programme is for coastal management, its application could easily be applied on the extended jurisdiction.

The methods used in preparing this study included a review of the literature in the Ministry of fisheries, Tourism, Ministry of natural resources and all the relevant departments dealing with marine affairs. Interviews with staff working in the different marine departments were held. Site visit to Malindi, Lamu, Kenya fisheries institute and Mombasa provided abundant knowledge. However, data unavailability prevented a complete documentation of marine resources and their potential. Only resources which have contributed directly to the government budget are well recorded. Most areas on marine habitat have not been studied and hence no inventory of their existence. For this reason, this survey will concentrate on those resources that are economically viable under the existing financial constraints, and also those that are well recorded.

Note
1) A paper presented by the Secretary-General, Doc. Iomac-3/4, Nov 1988 Article 3
CHAPTER ONE

Introduction and Definition of the Area

1.1 Geography

Kenya lies between the Equator and latitude 4.50 degrees South and between longitude 37.30 degrees east and the Indian Ocean. The total area covered is 582,646 square kilometers (224,960 sq mls). The 640 kilometer coastline is bordered by Tanzania to the south and Somalia to the North. Most of the region especially the North lies at an altitude of between 0 and 200 meters above sea level. A bit on the southern side rise to between 200 meters and 1,000 metres above sea level with the Taita hills rising to about 1,500 meters above sea level(1).

The coastal region has a quaternary sediment of coral and sandstone. A narrow strip of this geology extends further inland but changes to a form of rock structures. The principal soil types in the region include a narrow coral rug, running almost the length of the coast, bordered inland by an even narrower strip of coastal sands, Southwards from midway between Malindi and Kilifi. This strip widens considerably to the North where it is permeated by narrow latitudinal bands of brown clay soils. These bands extend inland over the entire region and cut across other types of soils.

The area bordering the sea and extending to approximately 20-40 kms inland is typical, potentially
Fig. 1: Current system of the northern and central western Indian Ocean

[Map showing currents in the Indian Ocean, including the NE Monsoon Current, SW Monsoon Current, Somali Current, Equatorial Counter Current, and South Equatorial Current.]
good agricultural land with patches of forest, grasslands and bushlands. Further inland, there is a narrower strip of marginal agricultural potential bearing savanna type vegetation. The zone supports important agricultural activities including the production of food for local consumption and also supports the growth of export crops, like cashewnuts, coconuts, sisal etc... Rice, cassava, maize and cowpeas are grown for local consumption. Livestock is limited due to tse-tse fly infection but with more research, such a hazard is likely to be abated and more livestock will survive. (See Fig.1 above) showing the coastline of Kenya and the related districts.

1.2 General Condition Of Coastal Waters

In recent years, very useful information on the movement of the coastal water masses, the relation of the monsoon winds in determining the coastal current, the upwelling along the coast, and much more have been collected. These have helped in understanding the reasons for the high or the low productivity of important marine resources along the East Africa's coast.

1.3 Indian Ocean Monsoons

The two principal factors governing East Africa's coastal water currents are the south east trade winds and the location of Indian Ocean monsoon. The southeast trades serve as the principal driving force behind the south equitorial current (see fig 2). Off the coast of Tanzania, near 10 degrees, the current divides into northerly
Fig. 2: Coastline of Kenya showing location of districts.
(Eastern African coastal current) and southwesterly components (Mozambique current). During the months of June to September, solar heating of the Asian land mass creates a massive low pressure cell which results in prevailing southwesterly winds (sw monsoon). These winds drive the East African coastal current up to the Northern tip of Somalia before turning away towards the East.

During the winter cooling of continental Asia, the SW monsoon is replaced by the NE monsoon and the wind patterns reverse themselves. Northeasterly winds off Somalia drive the Somali current in an opposite direction down the East African coast, where upon meeting the remnant of East African coast, an easterly flowing current is created (the equatorial counter current) at approximately 2 degrees. (source Kollerberg 1979)

1.4 Coastal Currents

The effect of these seasonal wind and wind driven currents changes is easily noticeable off the Malindi coast. Current observations taken some 10 kilometers offshore indicate that it sets constantly in a northeasterly direction with a velocity as high as 3 kiloknots during the SW monsoon. During the NE monsoon, current speed is reduced to 1-2 knots. Closer to shore, however, an effect of the NE monsoon can be a southerly counter-current which appears to be most persistent during the months of Nov-Dec (source Delf Hydraulics laboratory 1970).
These Southerly current are obvious due to the transportation of sediment past Malindi into the extensive coral reefs located in the marine park. This is however seasonal, but over a long period of time, it has been extremely effective in distributing riverborne sediment to areas south of river Athi mouth.

1.5 Coastal Population And Land Use

Population growth is an economic indicator of economic development of a country. While the data for last year's (1989) census were not available by the time this research was done, the general feeling was that the number had reached to approximately 26 million. Mombasa, Malindi, Kwale, Lamu, and Kilifi all lying along the Kenyan coastline together have a population of over 1.5 million. This figure denotes a sparsely populated area but this is due to the fact that the area is semi-arid and most of the nutrients have been drained into the sea through soil erosion. It is therefore necessary that marine activities in the area are promoted to ease on the demands of the growing population. This further calls for the proper management of the surrounding area which is highly populated and appears to be contributing to the accelerated rates of erosion and high downstream sediment loads which affect the marine habitat.

1.6 Economic Base

Today, the economy of the coastal people is based on three principal sectors; ie agriculture, fishing, and tourism. The traditional agricultural sector continues to
produce subsistence crops like sorghum, maize, millet, cowpeas and rice while cotton and cashew nuts dominate the cash crop sector (2). The cattle industry recently assumed importance despite of tse-tse attack. This is due to meat demands in the neighbouring tourist hotels.

Fishing has been important to coastal people for centuries. However, fish landings have been relatively small due to lack of landing facilities and ground transportation to market centers. At present, the most important coastal fishing in Kenya is to the North of Ungwana bay and offshore near Lamu.

Tourism industry at Malindi can be traced back to the construction of the town’s first hotels in the 1930’s (3). At that time, the industry was based on the area’s assets of tropical climate, sandy-beaches, coral reefs, cultural attractions and its proximity to the large inland game reserve. The industry catered primarily for European settlers in East and central Africa in its early days but later with the introduction of European-oriented package tours, created a vast new market by the late 1960s (Norconsult, 1981). In the decade that followed, the tourist industry became one of the largest single employer at the coast with its accompanying related goods and services. Due to this, the government in response to the booming industry created the 1st marine park at Malindi in 1968. The designation of Malindi as a reserve park was to conserve a representative example of Kenya’s coastal and marine communities including beaches, coral reefs, marine grassbed, and mangroves. Today, the combined system known as the Malindi and Watamu marine national parks and
reserves consists of two core parks surrounded by a reserve measuring a total of 240 sq km.

1.7 Kenya’s Ocean Space.

The law of the sea Convention 1982, gave coastal states rights and responsibilities on waters within their own jurisdiction. These spaces are defined as;

1.7.1. Territorial waters
1.7.2. Contiguous zone
1.7.3. Exclusive Economic zone
1.7.4. Continental shelf

1.7.1. Territorial Waters

Article 3 of the Law of the Sea convention states that the territorial sea is to have a breadth of 12 nautical miles from the baseline. The sovereignty of the coastal state extends beyond its land territory and internal waters to its adjacent territorial sea and includes sovereignty on all resources as well as its sea bed and subsoil. The convention however accords specific rights to other states, the primary one being the right of foreign vessels to innocent passage.

Kenya’s territorial waters was defined in line with this principal even before the Law of the Sea guidelines. This area according to the Territorial Waters Act of 1972 (chapter 371, laws of Kenya) is defined as "those waters within 12 naut. miles of the mainland". Within this area,
more emphasis is given on matters pertaining to the security of the country and protective measures against pollution of oil from ships. It is in appreciation of the marine environment and the dangers that were posed by the oil tankers that frequented Kenya's coast that the law was enacted against pollution within the territorial waters act.

1.7.2. The contiguous zone.

Article 33 of the UN-Convention on the Law of the Sea provides:

A zone contiguous to its territorial sea, described as the contiguous zone, where the coastal state may exercise the control necessary to:

- prevent infringement of its custom, fiscal, immigration or sanitary regulations within its territory or territorial sea.

- punish infringement of the above regulations committed within its territory or territorial sea.

The contiguous zone may be extended up to a distance of 24 naut. miles from the baseline from which the breadth of the territorial sea is measured.

Kenya did not claim this area, but aware of the effects of oil pollution on the area adjacent to her territorial waters, she extended her jurisdiction up to 100 naut.miles from the land. This was the area within which prosecutions could be carried out incase of any oil
spill incident. This was perhaps seen to have taken care of the concept of EEZ which Kenya's delegate at the law of the sea conference is known to have initiated.

1.7.3. Exclusive Economic Zone (EEZ)

The principle of EEZ was based on the assumption that world wide development of marine resources would require much more initiative than it had under the 'open sea access'. The feeling was that bringing the resources under National jurisdiction would provide this initiative. The concept therefore left to the custody of the coastal state all living and non-living resources within EEZ.

Under article 57 of the Convention, a coastal state has the right to an Exclusive Economic Zone that shall not extend beyond 200 nautical miles from the baseline from which the territorial sea is measured. It accords to coastal state the jurisdiction to exploit, conserve and manage the living resources within the EEZ. It also leaves the responsibility in Article 61 to determine the allowable catch of the living resources and to ensure that the resource is managed to sustain a maximum sustainable yield of each species. To achieve this, they are required to acquire the best scientific evidence available to it, and to ensure, through proper conservation and management, measures that the living resources in its EEZ are not endangered by over-exploitation.

Motivated by the desire to regulate the exploitation of the resources within the 200 naut. miles Economic zone, and more so to prevent harmful activities like pollution
and over-exploitation of resources on this zone, Kenya proclaimed her jurisdiction on Economic Exclusive Zone. This jurisdiction was declared in a presidential proclamation issued on 28 February 1979 and it did adopt the standard language in Article 56 of the 1982 Law of the Sea Convention in that it permits third states and nationals to enjoy freedom of navigation and marine scientific research while it reserves to her sovereignty matters of resource exploration and exploitation.

1.7.4. Continental Shelf.

Under Article 76, of the convention, the continental shelf of a coastal state comprises the seabed and the subsoil of the submarine areas that extend beyond its territorial sea throughout the prolongation of, its land territory to the outer edge of the continental margin, or to a distance of 200 nautical miles from the baseline from which the breadth of the territorial sea is measured. Article 77, permits coastal states to exercise sovereign rights over their continental shelf for the purpose of exploring and exploiting their natural resources.

The continental shelf Act 12, Laws of Kenya, defines the rights in respect of the continental shelf and the natural resources. No delimitation had been given but it was assumed that the 100 nautical miles for which administrative measures were to be taken against any crimes committed took care of this zone. Kenya's continental shelf covers an area of 19,120 sq. Km and extends some 160 km into the sea with coral reefs straddling most of the coast. (3)
1.8 Delimitation of Maritime Zones

Note must be made here that much as Kenya had enacted law on her maritime zones, the area had not been delimited accordingly. This is the reason why only national laws appertaining to security on those zones was emphasized, regulatory measures for marine pollution control, and the traditional concept on innocent passage was maintained.

However, Kenya has now promulgated her legislation extending jurisdiction seawards. In the review of her maritime zones 1989 (Kenya Gazette supplement No 62 (Acts no 3,1989)), modifications were made to the earlier act to give effect to international agreements, and to provide for the delimitation of the maritime zones.

Measured from the baseline, the EEZ extends 200 nautical miles from the baseline of a low water marks or low tide elevations whichever is greater. The Southern boundary with Tanzania shall be on easterly latitude north of Pemba Island, and on the northern boundary, the EEZ shall be delimited pursuant to an agreement between Kenya and Somalia which will be done on the basis of international law. To avoid costs and considering the narrowness of her continental shelf, Kenya decided to use the inexpensive method of delimitation within which the continental shelf, the contiguous zone co-exists within one; the EEZ. (4)

It is to be considered an achievement in the delimitation of the maritime boundaries. This should be seen as an appreciation of what opportunities the maritime Zones hold. It is seen as a first step in the development
of marine resources under the national jurisdiction. However, this jurisdiction calls for technology itself. It needs organizational and legal structure within which exploitation of resources is to be considered. The capital factor on the investment will highly depend upon what the country is likely to achieve. A comprehensive cost benefit analysis of developing resources in this area is the first step to take before any meaningful exploration is done.

There is room for joint ventures and bilateral agreements in the development of these resources. This is what this paper is going to look at; how much has been done on the EEZ, in its wider context of maritime space, which will include its extended coastal area on which its development will depend.

Notes

1) Science and technology for development; a report of the National council for science and technology, May 1980, Nairobi, pgs 43

2) Unep Regional seas report and studies, no 12; on Environmental Problems of East African Region

3) Kenya marine and Fisheries Research Institute journal, no 27, 1985

4) United Nations Law of the Sea convention, Articles 3 on Territorial waters, 33 on Contiguous Zone, 56 and 57 on EEZ concept.

5) Chapter 371- Laws of Kenya on Maritime delimitations

6) 1989 Revised text of the same
CHAPTER TWO

RESOURCE IDENTIFICATION AND USE

2.1 It is difficult to classify the marine resources found on Kenya's coastline on generic or distribution aspect. This is due to smallness in nature coupled with the fact that enough research has not been done to determine what species are in existence, their lifestyle and their survival system. Little has also been done on resources within the EEZ due to lack of enough funds and expertise to explore and assess the economic feasibility for any profitable exploitation.

Not all ocean resources contribute towards a country's economy directly but they are by nature important for preserving and supporting a variety of coastal and ocean resources use. Sustained productivity and utilization of coastal resources is critical in the long run for the survival of valuable species of plants and fish that depend upon the richness of nutrients and energy only found in the land ocean interface. Need is therefore called for the preservation of certain coastal features which if destroyed would result to direct losses of other economic valuables like fish in the coastal reef.

The marine ecosystem in Kenya with valuable exploitable resource and serving any beneficial purposes includes among others the estuarine, mangroves, lagoons and coral reef.
2.2 Mangroves

Mangroves are typical littoral plants (trees or shrubs) occupying estuarine areas, bays and tropical coasts. They serve a multiple functions of great benefit to mankind. Apart from the traditional recognised fact of mangroves providing poles and fuel to the coastal community, they play another major role in acting as wave breakers. They help coastal community by reducing coastal erosion, flooding, and storm surge, dampening waves and high winds generated by tropical and sub tropical storms. Mangroves in Kenya occupy about 587 sq km and has been relied on for centuries by the coastal community to provide wood for house construction, fuel for cooking and planks for constructing fishing vessels (1).

The major threat to this ecosystem is the growing population which is always going out in search for agricultural land, fuel, and building materials.

2.3 Sea-grass Beds

Sea-grass beds are productive habitats for fish dugong and turtles. They support more than half the country’s nearshore fishery production. They also help minimize coastal erosion. Threats to sea grass beds include use of destructive fishing gears such as bottom trawling and drag net fisheries and the smothering of sea-grass by siltation and sedimentation.
2.4 Lagoons and Estuaries

Estuaries and lagoons are found at Vanga, Mombasa, Mtwapa, all at the mouths of Sabaki and Tana river. They are the most productive areas in coastal waters. An abundance of fin fish and shell fish flourish in these waters. In addition, they serve the special needs of migrating nearshore and Oceanic species that require shallow protected habitat for breeding or sanctuary for their larval stages.

Lagoons and estuaries are threatened by urban encroachment and pollutants of all kinds, siltation and overfishing. Domestic sewage, garbage and waste fuel disposol are the major causes of decline in productivity of lagoons near urban centers. Industrial effluents, agricultural run-off and increased sedimentation from poor upstream land and water management schemes are also contributing factors.

2.5 Coral Reef

Coral reef fringe the Kenya's coast. They provide an essential habitat to fish and help dissipate the energy of waves during monsoon seasons. They are threatened by mining activities for building, heavy collection of shells and coral for tourist souvenirs, siltation from main rivers and the ever pouring pollution from land.
2.6 Fisheries

The existing fish stock in Kenya is under utilized and there is a great potential for expansion. Fishing takes place mainly within the 12 mile zone with the use of beach seines, gilnets, and bottom lines. Fisheries is mostly occupied by artisanal methods and is mainly concentrated along the reef. The most common species include shrimps, sardines, king fish, mackerel and a multiple of other species of less density. The main fishing ground is found within Lamu, Malindi, Mombasa and Kwale. According to a survey carried out in December 1980, the estimated abundance of demersal species was judged to be rather low due to fish being generally at low density and in part to the continental shelf being somewhat narrow.

The fish stock is highly threatened by overfishing. Considering that enough research has not been done on the existing fish, little is known of what damage is being done so far. (More on fisheries dev on chapter 3).

2.7 Use of Ocean Space

2.7.1 Aquaculture

Aquaculture can be a relatively high cost activity. Appropriate technology is necessary with adequate inputs like seed stock, but also a stable market to absorb the product at a price that will make the operation worthwhile. Aquaculture depends on the maintenance of good environmental conditions, particularly water quality and
habitat for juveniles seed stock. It may also be in computation for space with agriculture and mangrove operations.

An aquaculture farm had been started at Malindi, but unfortunately failed because of lack of expertise and limited resources. The project had already been started by an international agency but when they handed over to the government, it has been going down and right now it is in the verge of being given up. The only successful aquaculture farm currently at the coast belongs to the Bamburi cement factory. They have been managing it with the right skill and expertise considering that being a private company, they expect high returns on any money invested. They grow fish for export to Europe.

2.7.2 Ports and shipping

Kenya has no fleet of her own but serves an important part in the trade along the East african coast. The tanker route is within the EEZ waters and therefore navigation channels are well developed. The port of Mombasa has been the most important in the region. It has a natural harbour and serves as a major point of commerce for the inland countries. In the past five years, mombasa has undergone considerable expansion, including the development of a container terminal which is going to increase the capacity of cargo handled. In 1988-89, Mombasa handled over 7.2 million tonnes of cargo in both exports and imports(1). The second port of Kenya with a natural harbour is Manda Bay in Lamu handling medium size ships and dhows. Here too, there are plans for
development so that large vessels may be handled. Other minor ports include Malindi which is a fishing port with plans for development, Kilifi, and Mide.

2.7.3 Mineral Resources

Enough study has not been done on what minerals exist but mining and quarrying goes on around Mombasa. Lime is quarried for use in the cement industry and also collected from coralline sources. There is some mining for some small scale production of barium oxides North of Kilifi and lead silver ores at Kinangani North of Mombasa.

Manganese nodules are by far the most important mineral found on the deep sea. However, not much can be said about it since the existence of the same has not been established. About 30% of the country is believed to have potential hydrocarbon deposits but feasibility study need to confirm this.

2.7.4 Oil and Gas

Oil exploration has been going on offshore Malindi since colonial days. No proper data is available of what the results of the exploration has been but the fact is that no oil has been found.

2.7.5 Tourism

Tourism industry has achieved a remarkable growth since independence. Visitors to Kenya have risen from 225500 in 1967, 305000 in 1970 to 604000 in 1986. This is
an estimated growth rate of 22% annually between 1983 to 1986. Hotel occupancy rates increased from 51% in 1984 to 53% in 1986. The number of hotel beds occupied increased by 191,000 from 1985, while the number of beds available remained at 9 million. Tourism receipts recorded an increase of 20% from ksh 209 million in 1985 to ksh 250 million in 1986. This marked a tremendous upward growth which has reached a total of ksh 1.7 billion in 1989 alone (2). This growth accounts for wild game and 40% for coastal tourism.

2.8 Economic and Social Values

Not all the marine resources show the economic benefit directly. It is always easier to describe the values of marine resources but it becomes difficult to show that the monetary benefits will exceed its financial costs put in for development. This makes it difficult for poor countries like Kenya to go into expensive research and exploration of a resource which they cannot quantify. It has already been indicated above of the major role tourism plays in the country. This trade blooms on account of the natural beauty, coral sand beaches, reefs and a rich natural history of national heritage.

The important role that fisheries has played in the country cannot be under estimated. Being the only resource so far exploited within the EEZ, fisheries has played an important role in the livelihood of the coastal community as a source of food nutrients and availing job opportunities in the fishing and related industries.
Coastal habitat which includes the mangroves, coral reef, the estuaries and lagoons play a major role in the survival of the coastal marine species. Coral reefs are appreciated more for their beauty and biological richness than the security they provide to coastal communities in Kenya. Ask a fisherman about coral reef, and he will say that, to him coral is of little value to him. Little does he know that this is the bed on which his fish breeds and survives on. They are said to support fish nurseries and provide substrates for many bottom living organisms like sea fans, and algae to grow. Apart from acting as a nursery ground for fish, it can be used for income generation, research, tourism and shore protection.

Mangroves on the other hand help the coastal community by reducing erosion, flooding and storm surge. They provide at no cost self repairing and natural breakwaters. They help to stabilise river banks, preventing erosion and protecting adjacent lands. They also like coral reef form a base of complex food web supporting estuaries, coastal and certain offshore fisheries. But the well known use of mangroves by the local community is the provision of fuel by burning it into charcoal, or as firewood, construction materials and the use of poles for making fishing equipments.

2.8 Tourism and shipping

Tourism earns the country the much needed revenue and most important it is in foreign currency. Ports and shipping help in the marketing of our goods and also earns foreign currency through the port dues and charges.
2.9 Threats

The multiple existence of different activities going on at the coast affect one another in one way or the other. The development of industries, human settlement, channelisation for shipping purposes all contribute negatively or positively to one another. Improvement in agriculture and rapid increase of population has contributed highly to marine pollution. This comes in terms of domestic sewage and agricultural run-off. (see more on marine pollution on chap 5).

2.10 Infrastructure and Frame Work for Management

Kenya's national conservation strategy is embodied in the policies and mandates of various government agencies such as the ministry of environment and natural resources, Ministry of tourism and wildlife, Ministry of water development among others.

The Ministry of environment and natural resources is responsible for co-ordinating all environmental and conservation matters in the management plan for protected areas the wildlife conservation and management department of the Ministry of tourism and wildlife has a management plan for national parks and reserves. The coastal protected areas include Malindi and Watamu marine parks, and others proposed for protection are Kiunga and Diani which hosts a variety of marine species. (See fig 3)
Fig. 3: Malindi and Watamu Marine National Parks and Reserves
2.11 Constraints

Little scientific research is undertaken before any designation of a marine park. This has therefore led to some areas being designated for a marine park when it houses only one type of ecosystem while enough study would establish which area encompasses all the endangered species.

Further, the field of coastal and marine protected area is rather new in Kenya. While the government has seen the need to protect and conserve coastal habitat, this need has not been reflected in the budget allocations and protected area managers have to lobby for money all the time when they need to improve anything and many times may have to do without.

2.12 Need for Conservation and Protection

The world conservation strategy defines conservation as 'the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations' (3). This definition underlies the main goals of conservation which are identical to those of development.

Coastal communities will continue to fish from reefs, get wood and charcoal from mangrove forests and throw
waste disposal into the ocean. Settlement and pressure on land will continue as population continues to grow. Conservation aims to satisfy these short term needs in a way that ensures the survival of resources in the long term. Of great economic importance is maintaining bioproductivity for fisheries. This is an example of an ecological process directly affecting people's well-being.

Naturally, a productive ecosystem such as estuaries, and coral reef, provide food free of cost, what expensive mariculture can barely match. Continued fish production means continued livelihood for fisherman and others in the fishing industry, including boat builders, trap and net makers, fish distributors and hoteliers. This means continued social, cultural, economic and political stability.

Another important and often underestimated function of habitat along wave swept shores is coastal protection against natural hazards. Barrier reefs, and mangrove forests help protect low lying coastal plains, plantations and coastal villages from ravages of tropical storms.

2.13 Economic Value

It is difficult to measure in monetary values the benefits of protecting coastal and marine areas but a number of parameters may be used.

These include;

1) Gate or licence fee totals, to indicate the economic
value of tourism to the protected area. These are also indicators of the willingness by the public to pay for recreation privileges at site.

2) The price and landings of fish would also help in calculating the contribution of a protected area to fishery revenues.

3) Total income from recreational and commercial equipment, lodgings, and food should be able to give an estimate of the contribution of a protected area to supporting industries.

However it becomes a difficult task for any government to inject in money to any project that does not show any returns. But we must bear in mind that as 'temporary custodian of the world's resource, we are privileged to use them. We are obligated to maintain them and pass them on undamaged to later generations'(4).

By realising that obligation, we shall achieve the three main goals of the world Conservation Strategy, which are:

1) To maintain essential ecological processes and life support systems on which human survival depends on.

2) To preserve genetic diversity on which depend the functioning of many processes and life support systems.

3) To ensure the sustainable utilisation of species and ecosystem which support millions of rural communities as well as major industries.
Notes

1) Unep Regional Seas Reports and Studies No41 pg40-52

2) Tourism Market Report 1986, Ministry of Tourism and Wildlife pg9

3) World Commission on Environment and development, 1987

4) Ibid pg 9
CHAPTER THREE

MARINE INDUSTRIES

3.1 Introduction

Kenya has not had the tradition of relying on its Ocean environment for economic activity. There are various reasons for this; the most important being that, prior to 1980, most of the countries had the control only over their territorial waters and they basically concerned themselves with the traditional fishing. Ocean transport needs were and still are being met by foreign shipping. The traditional focus for economic activities was on land based on agriculture with a social and cultural attachment to those activities. However, the export-import based pattern of growth emphasized during the colonial era, along with a dependence on imported goods, has resulted in the coastal regions becoming important regions for economic activity.

The major Ocean industries in Kenya have been fisheries, Ocean transport and tourism. Although some oil and gass exploration has been conducted, no data exists on the availability of any so far. Tourism is a highly developed industry in Kenya. Tourism earnings are focused to equal those of agriculture (leading earner of foreign exchange) in the near future. However, note is made here that tourism does not only rely on coastal facilities but 60% accounts for the wild game and national parks. A lot of effort is being made to develop and promote tourism.
The development of the port of Mombasa, the main port on East African coast has been going through major improvements in the last one decade. It serves as a major entry point for cargo destined for Uganda, Rwanda and Burundi. The port is going through a face lift now in trying to cope with the shipping demands.

Fisheries is the other sector which has not been developed even with the extension of the fishing zone to 200 miles. Fishing has been a traditional activity but the sector does not reflect a parallel growth as in other sectors. Noting that every effort has been made to develop the tourism and shipping in the country, this chapter will then devote time and research on the underdeveloped fisheries in Kenya.

It is admissible that there is great potential for fishery development in Kenya. However, considerable complexity in the management factors required for the efficient harnessing of the resource and the establishment of successful fishing industry requires more than just management per se. Management requires to address itself to all the social and economic problems and hence set objectives which will ensure that profitability and continuity for the renewable resource is maintained.

It is important to bear in mind the fact that fisheries resource is not well utilized not to mention the fact that enough scientific research on fisheries has not been undertaken. This makes it difficult for any management regulations or rules to be enforced. For any measures to be effective, proper data to ascertain the
behavioral patterns and mortality rates of the fish species in Kenya must be established. This has not been done due to various reasons ranging from lack of trained manpower, scientific equipment to the limited funds available in the country.

The fish stock has therefore been exploited without really calculating the objective it is aimed to achieve. The government has contended with the fact that as long as the coastal community can provide themselves with food and labour, the concept of maximum sustainable yield is not of vital importance at the moment. This reflects the old believe in fish as being an endless resource at sea and hence ignores the biological, economical, and environmental imperatives.

Kenya was at the forefront in the negotiation of for the 200 mile economic zone at the UNCLOS 3. At that time, the policy makers must have had a good reason on what benefits they were going to reap on this zone. While there are many other resources that could be exploited, the technical and financial estimates have been an impediment to start. It is in this line that fisheries having been a traditional activity, it needed to be promoted on the EEZ to ensure maximum yield. It is only through the development of the resources on the EEZ that Kenya would justify the fervor with which they claimed the zone in 1979.

Kenya’s fishery resource has been under utilized and it is only through proper management that the resource would benefit the country. This does not mean that other
resources are not important but currently the only tangible development would be on fisheries which does not need colossal sums of money to start. Fish has been exploited from long time and therefore what is needed is to improve on the existing traditional methods to ensure profitable exploitation and at the same time ensure sustainable growth.

3.2 Coastal Artisanal Fishing in Kenya

Fishing takes place along the entire 880 km (Coppola 1982) of coastline from the shore to the outer edges of the fringing reef, in waters generally not exceeding 20 m in depth. The main landing towns are Lamu, Mombasa, Malindi and Kwale. No comprehensive census of the fishermen has been undertaken to determine the number of those involved in the artisanal fishing. Assessment of the total landings has been given at 9.8 million kilograms (Mombasa marine fisheries institute monthly entry 1987, table 2). This is the total of all fish landings from all the four districts at the coast. The fishing activity is mainly done by artisanal fishermen which according to 1987 census was given as 5,898 persons. Unfortunately this figure was not arrived at as a result of head count for the fishermen, but by knowing the number of boats registered, an assumption of 2 persons for each was assumed.

3.3 Fishing Boats

These are the same traditional types of boats which have not changed much. They include mostly the dug-out
canoes powered by sail but the larger boats are generally planked. Attempt had been made by the fishery co-operative to encourage motorization of boats but according to the fishermen, this was found uneconomical due to the high price of fuel and the gears have remained the traditional and manually operated.

Table one shows the numbers of boats by district and gear type recorded

<table>
<thead>
<tr>
<th>gear type</th>
<th>Lamu</th>
<th>Malindi</th>
<th>Mombasa</th>
<th>Kwale</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>castanet</td>
<td>51</td>
<td>34</td>
<td>94</td>
<td>49</td>
<td>228</td>
</tr>
<tr>
<td>gilnet</td>
<td>164</td>
<td>120</td>
<td>42</td>
<td>78</td>
<td>404</td>
</tr>
<tr>
<td>beach seine</td>
<td>33</td>
<td>16</td>
<td>5</td>
<td>20</td>
<td>84</td>
</tr>
<tr>
<td>handline</td>
<td>111</td>
<td>127</td>
<td>121</td>
<td>155</td>
<td>514</td>
</tr>
<tr>
<td>other gear</td>
<td>37</td>
<td>58</td>
<td>139</td>
<td>235</td>
<td>469</td>
</tr>
<tr>
<td>lobster gear</td>
<td>112</td>
<td>6</td>
<td></td>
<td>21</td>
<td>139</td>
</tr>
<tr>
<td></td>
<td>508</td>
<td>361</td>
<td>401</td>
<td>558</td>
<td>1,828</td>
</tr>
</tbody>
</table>

source: carrara and coppola (1985)

N:B The abundance use of mainly gillnet, handline and beach seines. It is important to look at the monthly catches to be able to evaluate the reason why the three types of gears look common than the rest.
## Catch weights by month and gear type (1987)

<table>
<thead>
<tr>
<th>Month</th>
<th>Casta net</th>
<th>Gil net</th>
<th>Beach seine</th>
<th>Hand line</th>
<th>Lobster Gear</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>120</td>
<td>237</td>
<td>154</td>
<td>184</td>
<td>5</td>
<td>182</td>
<td>882</td>
</tr>
<tr>
<td>F</td>
<td>113</td>
<td>238</td>
<td>62</td>
<td>203</td>
<td>9</td>
<td>158</td>
<td>803</td>
</tr>
<tr>
<td>M</td>
<td>110</td>
<td>294</td>
<td>173</td>
<td>175</td>
<td>17</td>
<td>134</td>
<td>903</td>
</tr>
<tr>
<td>A</td>
<td>119</td>
<td>166</td>
<td>140</td>
<td>181</td>
<td>6</td>
<td>112</td>
<td>724</td>
</tr>
<tr>
<td>M</td>
<td>124</td>
<td>248</td>
<td>91</td>
<td>163</td>
<td>6</td>
<td>212</td>
<td>844</td>
</tr>
<tr>
<td>J</td>
<td>103</td>
<td>220</td>
<td>100</td>
<td>150</td>
<td>5</td>
<td>118</td>
<td>696</td>
</tr>
<tr>
<td>J</td>
<td>115</td>
<td>212</td>
<td>87</td>
<td>160</td>
<td>14</td>
<td>149</td>
<td>737</td>
</tr>
<tr>
<td>A</td>
<td>83</td>
<td>156</td>
<td>118</td>
<td>160</td>
<td>21</td>
<td>109</td>
<td>647</td>
</tr>
<tr>
<td>S</td>
<td>93</td>
<td>194</td>
<td>153</td>
<td>187</td>
<td>8</td>
<td>146</td>
<td>781</td>
</tr>
<tr>
<td>O</td>
<td>95</td>
<td>282</td>
<td>264</td>
<td>220</td>
<td>19</td>
<td>165</td>
<td>1045</td>
</tr>
<tr>
<td>N</td>
<td>66</td>
<td>189</td>
<td>137</td>
<td>211</td>
<td>8</td>
<td>200</td>
<td>811</td>
</tr>
<tr>
<td>D</td>
<td>96</td>
<td>254</td>
<td>321</td>
<td>166</td>
<td>9</td>
<td>144</td>
<td>990</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,237</strong></td>
<td><strong>2,690</strong></td>
<td><strong>1,820</strong></td>
<td><strong>2,160</strong></td>
<td><strong>127</strong></td>
<td><strong>1,829</strong></td>
<td><strong>9,863</strong></td>
</tr>
</tbody>
</table>

Source: Fisheries dept. (coast province)
1) Both tables 1 and 2 indicate that the catches are evenly spread across all months for each gear type once again noting that the beach seine, handline and gillnet are important because they catch most fish. One noticeable fact is that the three major gear types used and which seem to catch most fish are the major traditional gears and have not changed much. Noting the coastal fishing ground is quite shallow - the pelagic and demersal species are very common and hence the reason for the common gear types (gillnet, handline and beach seines).

2) The type of fish caught (reef-fish) with these gears are the most consumed locally. Due to lack of proper preservation means, the fisherman would only want to catch the fish that will be bought the same day.

3) There is need to employ measures to ensure that these common species are not depleted. It is unfortunate that proper data is not collected or enough information is not received from the fishermen to assess the existing potential and in turn come up with measures to ensure stock sustainability.

3.4 The Semi-industrial Shrimp Trawl Fishery

The medium sized trawling vessels are involved in this type of fishing. The fishing grounds for this type of fishing are principally located in Ungwana bay within 6 kilometres from shore in depths of less than 20 metres. An additional small amount of fishing is undertaken
adjacent to Lamu.

The boats are of medium size (10-20m) and single rigged. Six boats are foreign owned and four are operated by the Mombasa marine fisheries institute. Unfortunately, the four vessels owned by the institute have been grounded and only the foreign vessels are operating.

The catches in weight has been increasing remarkably in recent years (see table 3 below). The most productive months is in July-November during the warm monsoon currents. The catches are sorted on board and graded into various categories and sizes; some is marketed locally and the rest is exported outside.

Table 3 shows catch weights by year from shrimp trawlers.

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Trawlers</th>
<th>Shrimps (tonnes)</th>
<th>Fish by Catch (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>9</td>
<td>142</td>
<td>183</td>
</tr>
<tr>
<td>1982</td>
<td>11</td>
<td>167</td>
<td>385</td>
</tr>
<tr>
<td>1983</td>
<td>6</td>
<td>211</td>
<td>467</td>
</tr>
<tr>
<td>1984</td>
<td>6</td>
<td>294</td>
<td>445</td>
</tr>
<tr>
<td>1985</td>
<td>5</td>
<td>194</td>
<td>331</td>
</tr>
<tr>
<td>1986</td>
<td>6</td>
<td>397</td>
<td>496</td>
</tr>
</tbody>
</table>

Source: Fisheries Dept. (Coast Province)
There has been no attempt in trawling the deep water shrimp, since it is felt that this would prove unprofitable.

3.5 Shallow Water Lobster

The commercial exploitation of lobster occurs along the entire Kenyan coastline. The main fishing grounds are in the North, around the islands of Lamu, Manda, Pate and kiweyu. Much of the landings come from snorkel divers operating to depths of about 7 m around coral reefs, and to a lesser extent from the use of trammel nets.

3.6 Fisheries Development Objective

Fishery development has multiple factors to be achieved by any country coming up with fishery programmes. These include inte-alia:

1) Contribution to the quality of life in rural and low income fishing communities. It also includes the achievement of a major goal for any government for attaining national self sufficiency in food by locally produced fish or in supporting activities which will lead to improved standards of health, education and general prosperity in fishing communities.

2) Contribution to the National Economy.

Kenya can highly benefit from the fishery resources in the EEZ by developing fisheries which would not only
replace some of the imported food but will also save foreign exchange. At the same time processing fish for export will not only earn the country some foreign exchange but will also stimulate national investment in fisheries.

3) Maintaining the Fisheries on a Permanent Basis

It is necessary that the fishery resource is managed well to ensure sustained fish harvests at an optimum level, and at the same time conserving fish stocks against over-exploitation and protecting water resources against degradation from other competitive use.

3.6 Development Constraints

The major constraint in fisheries development in Kenya is economical. It is an established fact that to develop any resources, a country needs trained staff, efficient supporting organizations and appropriate policies to deal with social and industrial aspects of the fishing industry.

First and foremost, Kenya is mostly hit in the sense that it does not have technical experts to do some research on the existing fishery resource. The Kenya marine institute which is supposed to carry out this role has a skeleton staff who even though willing, will not perform any meaningful research because of lack of equipment. Need has been found to establish oceanographic institute but has been delayed by lack of funds. This has led policy makers to formulate policies which become difficult to implement since there is no base on which
they are found. Any meaningful policy has to be backed by proper data and information system collected and analysed over time to establish the various needs that should be employed for effective management.

Communication to market centers is a major handicap to the fishermen. Connecting roads to the only fishing port of Malindi are lacking and the fishermen are left with no alternative but to sell their product at minimum prices to the middle men who converts the hard earned stock into high commercial earnings there-by rendering the poor fishermen more and more poor. The government, is however planning to complete a fishing port and connect it with all weather roads so that fish can be transported safely and faster.

Realising the importance of artisanal fishery as a source of food and employment, there has been urgent need to improve their fishing crafts, provide them with preservation facilities but this has not been attainable due to lack of funds.

3.7 Are There Any Options Out of the Economic Hurdle

The current economic climate in Kenya does not allow for setting up of new organizations and it is therefore necessary that the existing organizations are optimally used to provide some managerial skills.
The government should however endeavour to:

1) organize adequate transportation to regional and urban markets.

2) Provide adequate physical preservation facilities for the proper handling and sanitation of fish for health purposes.

3) Assist the artisanal fisheries through the already existing co-operation for the acquisition of loans to improve their fishing gears and also to market their products. Minimum prices should be set so as to ensure that the fisherman is not exploited by the middle man.

4) They should develop the existing markets and seek new ones through aggressive promotion. The current trend of fish eating communities insisting on eating the same type of fish should be discouraged. Diversification in fish eating habits should be encouraged to make use of the less used species.

5) The government should make use of the existing institutions of high learning ie laboratories and the university personnel for some scientific research. Fishery programmes should be incorporated in the university curricula.

6) Extension officers should be recruited and be stationed at landing sites and the fishermen should be made to register all the days catch in terms of weight, size, and species. This will ease in the collection of data and will form the basis for management rules.
Above all, the government should take time to plan before coming up with any programme for implementation and the fishermen should be given a chance to express their opinion before any programme is made into policy. There is also need to strengthen the existing institutions that deal with fisheries.

3.9 Need for Fishery Management in Kenya

As stated earlier, there is need for proper management of fishery resource in Kenya. This need arises due to the already stated fact that the artisanal fishery goes on without much control with the assumption that the fish stock is unlimited and yet as earlier indicated in table 2, the artisanal fishery is occupied by only a few species of fish and those that have not been traditionally fetched remain undisturbed.

There is therefore the need to ensure that the current fishing methods and gears do not deplete these particular species. The challenge of developing good management practices is to recognize the changing demands of society, the differing social characteristics of different communities living at the coast, and the long-term dependence on practices that will ensure sustainable development. One major hurdle to overcome is the traditional concept associated with fish stock ie that the fish is an endless resource. Education at all levels of the society is important for long term successful strategy. Among the most important need for fish management is to;
1) have a stock assessment to ensure that the managers know what to manage and what they intend to control. When proper data on existing stock behaviour is available, it is easy to set targets and limits but without the proper data, no management measures will be employed effectively.

2) There is need to have frequent inspection of the type of fishing gears the fishermen are employing to ensure that juveniles are not caught. Without proper control, the fishermen will use any means to increase their catch without really caring for the depleting stock.

3) The right number and kind of fishing gear combinations should be licensed so that only the allowable catch will be caught without frustrating some fishermen who may not catch anything due to overlicensing. This on the other hand will ensure the correct level of catch so that a lot of energy is not wasted and later the fish fails to fetch a good price due to oversupply.

4) The fishermen should be encouraged to go further inshore and the government should encourage the fishing of other species which are not currently common by purchasing whatever the fishermen bring on shore and process it into other useful products like fishmeal.

5) The existing institutions should be used to train fishery officers of all kinds to help in the regulation and control of fishery resources.
3.10 Regulatory Measures to be Applied

Various forms of regulatory measures can be applied but most of them will be difficult to apply either due to cost or the technicalities involved. Only those methods that are thought to be easy to apply and are cost effective will be looked into:

1) Control by mesh regulations;

This method has been applied effectively for a long time. It implies that a large mesh net permits young fish to escape and hence to grow to normal size and contribute to the biomass of the fish stock in subsequent years, and on the other hand, if a small mesh is used small fish will be caught and will later be discarded as waste.

2) Closed seasons

This method is applied when particular periods of the year are banned for fishing. In such situations, it is possible to protect particular life history stages of a stock, for example, juveniles or small fish. This method will require progressive monitoring to establish the declining in the catch rate as the season goes on. Together with this, geographical closure of some fishing ground would be the other method which can be applied to achieve the same results.

These methods if applied will help in conserving the fish stock which would otherwise be exploited to the detriment of the fisherman himself. These methods may be
easy and cheap to apply but the political and social implications should not be ignored. Closed areas and seasons means a decline to the fisherman’s income and correspondingly it may lead to over capitalization since the fisherman will be tempted by high fish catch rates at the start of a season to invest heavily in capital equipment to increase their share of the ultimate yield. It is therefore, necessary that a balance is maintained when any of the management programmes are applied.

3.10 Regional Cooperation

Due to the high migratory nature of some species it is necessary to enter into regional agreement with the neighbouring countries for the proper management of the stock. Any one national conservation measure may have little over all impact.

Notes

- Summary of Fisheries and Resources information for Kenya by T de sousa. Kenya Marine Research institute, Mombasa

- Achieng,0, 1978.- An assessment of Kenya’s coastal tourism

- Institute of Development studies, Kenya Marine Fisheries An outline of policy and activities, Occasional paper no 30
CHAPTER FOUR

Social and Environmental Implications of Sea-use

4.1 Pollution is not really a use of the Ocean but is often as a result of multiple use. It must therefore be discussed within the opportunities and uses of the sea. The Ocean has been recognised as a facet consisting of multiple resources and competitive use of space by various actors in search for commercial undertakings. This increasing level and scale of Ocean uses combines with growth in population and industrial and agricultural activities. Marine scientific research and indiscriminate application of technology also poses hazard to the marine environment.

Most of these economic activities take place within National jurisdiction especially within limits of three kilometers off the coast. These coastal waters forms the lifeline for the coastal community in terms of settlement and as a food source. It is therefore necessary that a lot of care is taken when undertaking projects to ensure that the coastal ecosystem is not impaired. Epting reminds us that 'the impacts resulting from all facets of use activity might be dispersed through the marine environment and restrict the level of other desirable uses by adversely affecting the Ocean resources upon which they depend' (1). This statement simply qualifies what has been internationally accepted definition of what marine pollution is.
Marine pollution is the 'introduction by man, directly or indirectly, of substances or energy into the marine environment which results or is likely to result in such deleterious effects as harm to living resources and marine ecosystems, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities'. (LOS con 1982 para 1 (4)(2).

There is a widespread acceptance of the fact that environmental pollution is an inescapable by-product of industrial development. Experience also shows that some societies become preoccupied with long range ecological consequences only after large-scale industrization and after reaching a high level of economic affluences.'The life support system based on air, land, and water is delicate, interconnected and very intricate. It is becoming clearly evident that we are damaging, perhaps fatally, the thin envelope of life sustaining atmosphere -biosphere by persistent character of large scale pollution;'(3).

Life can only be sustained through a delicate equilibrium between man and nature. The equilibrium is now being disturbed by the pressure of increasing population and strain of pollution generated by the developing technologies. Man unlike in the past has resorted to man made chemical fertilizer in agriculture, towns have grown into cities and the improvement of sewage facilities have not increased at the same pace.
The principal cause of environmental pollution is industrialization, and indiscriminate application of science and technology to economic development. The vast use of energy and new materials, industrial effluents, urbanization and consumptive ideals are leading man on a course which can alter negatively the natural systems on which man's biological survival depends on.

It is, however, generally realized now that the problem of environmental pollution is a global one which concerns all states irrespective of their size, stage of development or ideology. 'There is no escape from the underlying interconnection of the ocean world. The seas and the oceans, like the winds above mingle with each other, cleanse or poison each other' (4). Hence there is no chance for one country to sit back and ignore the issue of marine pollution in their zones because it will affect other waters. A global net work of fighting pollution is the main tool to ensure that all the shared waters of the oceans remain clean. Thanks to IMO for coming up with international conventions for easing and erasing the pollutions of the oceans. But what remains to be resolved is the pollution from land based activities which are highly localised. Individual countries have to take initiative to ease this problem.

It must be appreciated by now that coastal tourism together with fisheries forms the backbone of the economy of the coastal people in Kenya and contributes highly to the gross domestic product. This comes in the form of food nutrients and as a source of labour in the tourist hotels at the coast. It should therefore be borne in mind that
multiple use of the space they share with other resources should be treated with utmost care before any destructive conflicts affect them. The negative impacts can be direct pollution or indirect interference with their existence. The direct sources and effects of marine pollution on the ecosystem is clearly analysed in this chapter.

4.2 Sources of Marine Pollution

It would be difficult to discuss all the known sources of marine pollution but a few of them that are rampant on Kenya’s coast are going to be looked into.

4.2.1 Sedimentation

Soil erosion, transport and deposition of sediment are natural processes which can vary according to many physical, biological and climatic degrees. The case of sedimentation in Kenya is well demonstrated by siting the example of river Athi. This river drains the country’s capital city and largest industrial center, and represents the country’s primary recipient of urban and industrial waste. It drains into the Indian ocean and passes through Malindi (a town located at the base of the river). A visit to this area was a confession of how sedimentation has dangerously changed the ecosystem and the marine resources in the area. The whole area is persistently exposed to all pollutants of all forms transported by the river, including inter-alia, municipal wastes and erosion from the agricultural activities going on in the mainland. All these wastes have different types of chemical composition
like chlorine, pesticides, and other forms of hydrocarbons. When these pollutants reach the coastal habitats, a lot of damage is noticeable. This was well stated in a research paper done on Athi catchment area where the author (Martin 1979) describes the beaches and the waters off the coast and near Malindi as colored by ‘millions of tons of up country topsoil disgorged by the river and covering the area with a wide stretch of chocolate red silt to such a degree that bathing is out of question’(5). Other forms of destruction are in form of killing the coastal habitat like seagrass beds, algae and mangroves.

The principal causes of sedimentation cited by many sources include the natural phenomena, devegetation and non sustainable agricultural and livestock land use pressure.

4.2.2 Run-off from Agricultural land

As stated earlier, 90% of the population living at the coast are highly engaged in agriculture, which invariably contribute significantly to the gross domestic income. Subsistence as well as export crops are grown along the Kenya’s coast. This is in line with the government policy of self sufficiency in food production and also great need to grow cash crops which can earn the country some foreign exchange. For improvement purposes, traditional and less efficient methods of agriculture are being overtaken by the modern agricultural methods involving the use of agricultural chemicals such as pesticides and fertilizers.
The need for continuous land use has put pressure on the same land causing devegetation and the soil becomes easily carried away by rain water into the rivers which transport it to the coastal estuaries and bays. This sedimentation is accompanied by different forms of chemical products which have been used on land in form of fertilizer or pesticide and which have had an adverse effect on the marine ecosystem.

4.2.3 Municipal and Industrial Wastes

Municipal and industrial wastes include a wide component matters of pollution. These include wastes and chemical compounds from factories. Few studies have been done in Kenya to assess the degree of industrial pollution but the major sources have been identified as the effluents from coffee and sugar factories. As a whole, the coastal industries are varied and are oriented towards food processing and the manufacture of import substituting products. However, according to the ministry of local government, dept. of public health, discharge of the untreated low volumes from these factories has not produced any significant pollution problems.

On the other had the coastal province is not well equipped with sewage system. Only Mombasa in this area has a sewage system and the rest of the towns use septic tanks which are emptied into the sea when need be. Only 80% of this sewage receive mechanical treatment before disposal, causing great hazards not only to the marine environment but also to public health.
4.2.4 Dumping and Dredging

Dumping as a source of marine pollution is the most uncontrollable activity in Kenya. Solid waste comprising of broken glass materials, metal containers, paper, used lubricating oils in containers, expired medicines from hospitals, old toxic chemicals and animal cadavers are at present dumped in a land fill at Makupa causeway. Open air burning is done here but no precautionary measures are taken to prevent land fill leakages from the adjoining creek water nor any measures to prevent a run-off during the rainy season. These contribute highly to toxic organic chemicals of all sorts which have a damaging effect to the floral and fauna at the coast. (source: Mombasa sewage master plan 1988).

Dredging for purposes of deepening the harbors or building new harbors has also got some effect on the coastal area. The dredging causes some suspension of sediments in coastal waters which interferes with light penetration into coastal waters thereby reducing the penetration of chemical and biological oxygen to the needy fisheries and corals. The dredging of Mombasa port in 1988-89 did not take into consideration all the environmental factors. They are currently faced with the problem of where to place the silt which is already obstructing other coastal activities and raises fear that it will be carried back into the dredged area by erosion.

4.2.4 Ship Generated Pollution

While technology is trying to improve in ships to
reduce oil pollution (intended) it has not come up with fool proof technology which can stop oil from spilling incase of an accident. Catastrophic accident may occur anywhere along the major routes or within a port. The position of Kenya in the Eastern part of Africa is next to the heaviest tanker traffic route in the world. Millions of gallons of oil is transported through the East African region to Europe and America each year. The tanker traffic route lies well on Kenya's EEZ and is known as the tanker bay. Fortunately Kenya has not fallen victim of a major tanker disaster on this route, and none of the neighboring countries ie Mozambique or somalia.

However minor oil accidents occurring during the loading and unloading of oil and bunkering at the port are frequent incidents. Kenya has had three incidents in which a recognizable oil spill found its way to the waters. These includes the British cavalier in 1975 which grounded on the reefs as she approached Mombasa harbour and an estimated 100 tons of crude oil leaked through. In 1983 the 50m long oil barge Alpha general sank next to the harbour and some oil spilled into the harbour. This does not leave Kenya free from ratifying the necessary conventions and the ratification of Solas in Kenya would be a step towards minimizing some of such accidents.

Localized oil spills are also recorded along the Kenya's coast. This type of oil pollution is within the Mombasa harbour. It is caused by either pipe leakages or bursting fuel hoses during handling of petroleum products. However immediate action is taken when such incidents happen.
Oil pollution takes the form of the intended and the accidental one. The implementation of Marpol has gone far into reducing the intended oil pollution. The intended pollution occurs in the course of the operation of the vessel and also at the bunkering stage. This pollution involves all kinds of ships whether passenger, bulk carrier or a tanker. Any ship is made to carry a certain weight for it to ascertain stability at sea. It is not always that ships will have the full cargo required to achieve its stability. At such times, the ship will use sea water in its empty tanks to compensate for its difference in weight. This water referred to as ballast is pumped into empty tanks as they become empty in the course of a voyage. In time of refueling, the water/oily mixture is pumped back to sea. The bilges water from the machinery spaces also used to find their way into the sea. Things have however changed with many countries adopting to marpol. The convention prohibits discharges into the sea of any oil or oily mixture unless various conditions are fulfilled. That is, no tanker can discharge oil or oily mixture unless:

a) The tanker is not within a special area
   Thus Mediterranean, Black and Baltic sea, Red sea, and the gulf area)

b) The tanker is more than 50 nautical miles from the nearest land

c) The tanker is proceeding on route
d) The discharge rate of the oily content does not exceed 60 liters per nautical mile

e) Total quantity discharged does not exceed 1/15,000 parts per million

f) The tanker has in operation an oil discharge monitoring and control system and a slop tank arrangement.

These requirements are aimed at controlling discharge of oil from cargo tanks areas. The convention further states that oil or oily mixtures can only be discharged from machinery space if the following conditions are fulfilled:

a) The ship is not within a special area

b) The ship is more than 12 nautical miles from the nearest land

c) The ship is proceeding on route

d) The oil content of the effluent is less than 100 parts per million and

c) The ship has in operation an oil discharge monitoring and control system, and an oil water separating equipment and oil filtering system.

Apart of being a party to Marpol convention, Kenya has enacted rules in its constitution for the protection and prevention of pollution at sea. It authorizes the port
authority to bring to court any person who may be found polluting the waters under her jurisdiction.

Unfortunately, little effort has been shown in the control of land based pollution in the country which so far may be contributing dangerously to the degradation of the marine environment. The government may shy away from initiating a programme of action in fear of costs. But it should not cost more to establish a systematic procedures to evaluate coastal and marine implications of a proposed development. The existing institutions should be reorganised under the proposed or existing department of marine affairs. This department should implement a monitoring programme including continuous observations of key inputs influencing the Zone. Periodic visits to vulnerable areas should be scheduled, this will help in collection of data for trend analysis. A data bank would be built on these analysis which will help the government to know which harmful inputs they need to control. This will also help the government in identifying critical coastal and marine resources that should be protected.

The ministry of Agriculture should also educate farmers in the catchment areas of the country to improve their current methods so as to reduce soil erosion.

4:2 International Obligations

Internationally, the law of the Sea provides for an internationally agreed regime for management of the Oceans. While the convention gives sovereign rights to the coastal state over all the resources under National
Waters, it leaves the jurisdiction over the protection and preservation of the marine environment to the coastal state.

The Convention calls for regional co-operation in formulating and implementing conservation strategies for living marine resources, including co-operation in the exchange of scientific information, conservation and development of stocks.

This co-operative effort was furnished by the adoption of the action plan for the Human environment at the 1972 United Nations Conference on Human Environment at Stockholm. There was a subsequent formation of United Nations Environmental Programme to coordinate efforts to protect and preserve the environment from stresses due to human activities.

4:3 Action Plan for East Africa Region

In 1981, UNEP and seven international organizations sent a mission to east african states. This mission came up with a draft plan for Action containing issues on environmental assessment. This was to encourage promotion and training, collaborative efforts among scientists of the region.

An inventory of sources of pollution, from land based or oil were regionally assessed and their impacts on social economic activities on marine environment studied. Its main objective was to focus on guidelines for the control of domestic and industrial wastees; management of wildlife, genetic resources, natural habitat and a programme for action incase of oil pollution emergencies
and improvement of exploitation of fisheries and tourism.

This programme has however not been adopted and therefore little success could be expected from any individual Government. As long as the regional cooperation is not enhanced, the marine regions in this area will remain as 'commons' since marine pollution respects no boundaries.

4:4 Effects of Marine Pollution on the Ecosystem

Very little research has been done to access the effects of hydrocarbons and the heavy metals on the marine ecosystem. However the vulnerability of grassbeds to pollutants appears to be noticed at the coast near Athi river mouth. Studies done by Taylor 1973 on Malindi seagrass deduced that the density of the sea-grass reduced with the increase of various pollutants including domestic and effluent discharges.

The decrease of reef fish populations have been associated with insecticides, pesticides and high chlorine levels. It was, however, noted that the effects these pollutants have had on fish were mostly visible along the Mombasa mainland coast rather than the area near Malindi. This is because of the high density of corals along the Mombasa mainland coast which have been adversely polluted with all forms of chemicals. However, it is worthy noting that it is difficult to give a proper analysis on the Malindi fisheries because marine regulations prohibit fisheries in the protected area. This makes it difficult to give a proper analysis of any decrease of stock at any one given time.
Apart from causing the marine degradation, the toxic chemicals and organics react further with the marine resources like fish and can sometimes be harmful to the same fish the coastal people live on. The fish may retain these persistent chemicals in their tissues thereby posing a potential health hazard to the community who may consume toxicated fish. Reduction of recreational amenities is another factor that marine pollution has posed. The situation of Malindi beaches is highly connected to the reduction of tourists in the last two years. According to the Hotel Association quarterly manual, one factor attributed to the decrease of tourists is the deteriorating dirty beaches where balls of tar can be observed during Nov-Dec in current with the Monsoon winds. The pollution of coastal waters can also result to the bathers contracting skin ailments but this incident has not so far been reported in Mombasa, but other neighbouring countries like the Seychelles have reported such cases of fish toxication.

4.4 Measures Taken

Kenya has a clear policy of keeping the whole environment clean. There is a National Secretariat dealing with the protection of the environment in general. It is, however, not easy to assess how much this policy has succeeded in achieving the protection and preservation of the marine environment. What is clear is that a lot of campaign for de-vegetation and afforestation has been rampant but the author has no data to substantiate the success of the campaign.
Noting the problems the domestic and municipal wastes have on the environment, the government, under the Ministry of Local Government has plans to construct sewage schemes for the coastal towns like Malindi and Lamu which do not have such facilities. Government is also in the process of rehabilitating and expanding the existing ones in Mombasa. The Government has already set up an authority to look into the problem of sedimentation from Sabaki River. Its main aim is to advise the government on all matters concerning river sedimentation and the solutions. The authority has further gone into educating the agricultural community of better methods of farming to preserve the top soil which is eroded easily and carried into the river with all the agricultural chemicals used in farming.

To control oil pollution the government has formed a committee on oil pollution control and is chaired by the Ports Authority and consists of representatives from each oil company. To combat oil pollution, a Kenya coastal oil spill contingency plan is applied.

The main operational plan of the oil spill consist of the assessment of spill risk, movement and persistence of oil, priorities for protection and selection of techniques to be used in case of a spill.

The plan, as it is documented, is sound policy but what it lacks is the law to back the operations in case of oil spill. The lack of funds to purchase equipment for a clean-up is also another major handicap.
4.5 Social and Economic Implications

Marine pollution not only affects the marine ecosystem but also poses a heavy burden on the Government. Socially, when the fish stock has been reduced due to marine pollution, the fishermen will be forced to look for an alternative means of livelihood. Kenya, at present, is not in a position to absorb all its labour force in the service sector and therefore, it becomes difficult for the government to maintain the status-quo if this was to happen. Together with the loss of livelihood and economic income the social impact of marine intoxicated fish cannot be over simplified.

The pleasurable aspect of the marine environment includes the sandy beaches, pleasure-craft, tourist hotels and the coastal bathing waters. Whenever these amenities are polluted the users will tend to back away. This will in turn be a loss to the government as a whole because its expected income from this source will diminish. The decline of the tourist industry would have an adverse impact on Kenya's economy since tourism is the second largest foreign exchange earner for the country.

It is worth noting that the cost of cleaning up any marine pollution digs deep into the government's savings. This goes in terms of buying equipment and paying for cleanup personnel, not to mention the unquantified losses the government will under go economically to rehabilitate the environment and local community depending on the damaged resources.
Conclusions

Sustainable development for Ocean use can only be achieved by proper maintenance of the ecosystem. Exploitation of resources should be accompanied by a thorough knowledge of what impacts the environment is able to bear in the development of any of Ocean related project. This should be assessed in terms of physical disruption or chemical contamination.

It would be asking for too much from the government in terms of setting up another institution to monitor marine pollution. The existing National Environment secretariat should take a leading role to ensure that no project is approved before an assessment of any expected social or environmental disruption is submitted and what measures the developer envisages to take incase of the negative happening.

The existing institutions of higher learning should direct their knowledge into the chemical assessment of all the effluents that enter the Ocean from the land and also from factories. There is need for the local scientists to continuously assess any changes that may appear within the coastal habitat.

Finally, the government should ensure the integration of environment and developmental considerations emphasizing prevention and conservation.
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CHAPTER FIVE
MULTIPLE USE OF RESOURCES
AND THEIR CONFLICTS.

5.1 General

It is difficult to deal with coastal zone resource use in isolation from the broader context of Ocean management. Many countries have a tendency of designing projects independently for coastal areas or for the EEZ. Ocean management cannot run independently from coast area management. Both are closely interconnected through biophysical, functional and social economic linkages. The coastal area operates as a door way to the EEZ by providing supporting services, which sometimes include permanent infrastructures, support installations and social economic linkages based on the dependence of Ocean uses upon the coastal area and vice versa.

Increased and more diverse use of marine areas increases the potential for conflict. Multiple use conflicts increase with increases in separately managed uses. Present and foreseen trends in the use of coastal and marine space indicates a clear increase and intensification in the variety, degree and complexity of conflicts. Several factors seem to be contributing to the rise of conflicts. Among others, a growth of population density in the coastal area, increasing competition among users of the coastal space and between alternate, and sometimes equally necessary users, such as urbanization, transport networks, recreational space, industrialization
Offshore, the development of modern technology to explore and exploit marine resources and new sources of energy has led to an increased and diversified marine activity. The traditional uses such as navigation and fisheries, have seen the advance in scientific research, marine mining, oil and gas, and the establishment of permanent structures at sea.

The resources found within Kenya's ocean space are well covered in chapter 2. The research further reveals how the use of one resource may have an impact on another use and how coastal development may have an impact on ocean resources. These conflicts that arise due to multiple ocean and coastal resource use is what this chapter is going to look into. These include:

5.2 Urbanization, Industrialization with Coastal Habitat

In recent times, the population of the coastal area has experienced a marked increase. This increase in population has been due to an increase in the development of industries, mainly in the tourist sector, sugar processing plants, cement and fertilizer which are among the existing industrial complexes. The rapid industrialization was due to government policy of encouraging industrialists to use locally available materials and by a remission in taxes on all industries operating outside the capital.
Rapid development in industries calls for an increase in housing and public facilities. Mombasa and Malindi have experienced a high increase in migration of people from less developed centers who come to work in the tourist related industries. This has forced the city developers to put up housing projects even in areas that were previously meant for beach reserves, and this has caused problems of shore entrances.

The other effect of this unplanned development has been the unmatched development of sewage facilities at the coast. This has resulted in many people living in poor sanitary conditions and half of others flushing untreated sewage into the sea. The effect has been the uncontrolled marine pollution which is covered in chapter four.

5.3 Pollution with Living Resources

Pollution implies that unwanted side effects produced by one user are passed to other uses especially at sea. The effects of pollution is felt in the change of climatic conditions and affects the metabolism or reproduction of specific organisms. Unfortunately, very little is known about effects of pollution in the Indian Ocean (East African Zone) as a whole because no specific project has ever been undertaken to analyse the physical chronic effects of pollution.

However, pollution on marine life and the consequences of other activities of man has been known to destroy habitat, and poisoning of fish. Beaches have
experienced tar balls during monsoon winds which can result to skin tainting or discolouration of the flesh by organic or metallic substances to the tourist enjoying their holiday.

5.3.1 Ocean Dumping

Deliberate disposal of a variety of waste materials ranging from industrial residue to explosives have been disposed on Kenya’s water or nearby high seas. The disposal of dredge spoils clearing shipping lanes, harbors, and other areas also represent a significant quantity of material dumped in the ocean, and some of this material contains high chemical concentrates. The effect of this dumping is the decrease in nutrients and highly affect the distribution of marine organisms.

5.3.2 Litter

Litter in form of plastic bottles, glass, rubber, nylon nets, and other materials is becoming a problem for fishing interests whose nets are increasingly fouled by such foreign matter floating in the Indian ocean. In addition, the large quantities of these materials that wash up on beaches are a threat to those who sunbathe on the beaches and also to amenity values. It also becomes a nuisance to the pelagic species who may be caught up by a dumped net or plastic litter causing suffocation.
5.4 Tourism and the Social Structure

Kenya's tourism is well developed and is earning the country a substantial amount of foreign exchange. Benefits from tourism are often offset by unpleasant economic, ecological, social and cultural side effects. Tourism can cause inflated land values and this has been mostly felt in the south coast of Mombasa where land near the beaches has been utilized for the hotel industry at great expenses. The hotel developers have not given thought to any other user and has gone on buying off land from poor fish communities which have left them displaced, and the other ill effect is that the habitat is destroyed in the name of cleaning the beaches. The industry has lured labourers out of menial but essential jobs in rural areas, causing more pressure on coastal land for housing development and services. The tourism is highly applauded by the government that a deaf ear has been given to the increasing destruction of coral reefs by tourists as souvenirs and also the effect it has had on the coastal community in eroding their local values and customs essential to the social structure of the indigenous population.

5.5 Agriculture and Environment

The most serious problems related to soil utilization in Kenya is erosion. The scarcity of arable land and high population densities have created intense pressure on the arable land. Most of the fertile regions of upland Kenya have been put under coffee and tea. This has forced many small holding farmers to migrate progressively upslope and
into drier regions to put new land into domestic food production. The result has been the clearing of marginal land which has shown a major impact on soil erosion.

In the fertile areas, of the country, traditional methods of farming have been replaced by the modern methods of intensive cultivation and use of artificial fertilizers and pesticide. These are in course carried down stream into main rivers and enters the ocean through marine habitat areas, many times causing some coral die-off from all types of chemicals. The effects of agricultural chemicals, industrial and urban effluents have not been studied but evidence is there that a negative effect to the coastal waters and their environments is being felt.

5.6 Ocean Mining with Other users

Offshore production of solid minerals from the continental shelf is a relatively minor activity in Kenya. Mining and quarrying goes on around Mombasa. Lime is quarried for use in the cement industry and also collected from coralline sources. Small scale production of barium oxides North of Kilifi and lead silver ores at Kinangani North of Mombasa are mined. A lot of pollution occurs when water has to be used and reused in the processing of these minerals. This, coupled with the dredging that has to be done may not take note of the fishing beds along these areas and may lead to destruction.
5.7 Offshore Oil with Fisheries

Although there has been speculation about potential for offshore oil, not much development has been made on this line. Exploration began offshore the coast of Malindi in 1950's but no oil has been discovered. Rigging is still going on along the same area with trials on new technology.

Offshore oil drilling can cause a lot of damage to the marine fish and acquaculture farming. This case has not been an issue in Kenya but it is important to remember the effects of oil on fisheries especially where exploration is taking place at present. Oil exploration should not be allowed to take advantage of the artisanal fishing which is limited to the reef and artisanal community have little knowledge of the effects such giant like oil exploration would have on the industry.

5.8 Fishing with Marine Transport

Noting that the fishery industry is not well developed in Kenya, no prior examination has been made on the existence of fisheries before dredging a harbour and channelisation for navigation. The artisanal fisherman have learnt to look for greener pastures any time their fishing beds are destroyed. Conflict occurs but no fisherman has raised it since knowledge and sufficient support from the system is lacking.
5.9 Habitat Conservation and Human Activities

The pressure for land in Kenya has already been emphasized. However, there is need to realise the importance of coastal habitat and marine animals to allow them space to grow uninterrupted. A community can only appreciate some of the management measures if their needs are well catered for. The protection of mangrove forests raised an outcry since the coastal community had not known any other source of fuel or building material. When the government decided to protect their traditional source of fuel and material for shelter, an alternative was not given. So the community was left with no alternative than to start using kerosine and mud for their immediate needs. This did not augur well for the government which was seen as threat to a social order which had existed for ages without control.

5.10 How can these conflicts be resolved

Resolving of these conflicts do not need extra financies but prior assessment of all activities should be assessed before take off stage. This will give room to managers to bear in mind what conflicts are likely to arise if any one project is developed. Economic, social and environmental implications must be borne in mind. At times it would be neccessary to look for alternative area or depending on what factors are more pressing than others, compensation methods should be considered. The overall objective of this planning is to ensure that any project undertaken will bear optimal benefits without sacrificing any actor in the development. However, the
government must be ready to forego some benefits as opportunity costs incase of need.

It is not the aim of this paper to exemplify all means existing to resolve these conflicts but a few examples will be cited, believing that most resolutions exist and are not expensive. A decision making framework fully aware of potential conflicts can always come up with solutions. Three examples showing different kinds of conflicts are cited here.

An existing conflict among different fleets for the same stock ie fisheries, should not take extra capital to resolve. The easiest solution is to allocate different sectors of the resource to each method depending on the control measures that the government is employing. More so, the coastal strip exploitation should be left to the artisanal fishery.

For conflicts between users of different resources, ie the fear of oil spill incident on the coastal ecosystem, the government should enforce the existing National and International laws and introduce heavy fines on any oil spill within this zone. It should be borne in mind that pollution at the coast would not only be damaging the fishery breeding grounds but would also affect the tourism which the country relies on for foreign exchange. Compensation schemes should be introduced to ensure that the fisherman is not displaced by impacts of oil spill. The need for contingency plan becomes important for this purpose.
Resolving conflicts concerning the use of space especially within sea routes would be reduced by creating safety zones, and ship routing schemes. This will go hand in hand with the improvement of navigational aids, pilotage and safety regulations.

These are some examples to illustrate some ways that could be used to resolve conflicts. All solutions are not easily achievable but a framework for decision making can be used to look at these issues as they arise.

5.11 Management problems of Marine and Coastal Resources

It is now evident that conflicts arise wherever economic interests prevail over other considerations. Coastal and Ocean resource management being a new venture, no data is available to assess the expected detriment any project development may have on the coastal ecosystems or other marine resource. Economics of cost benefit analysis have overridden all reason to have a prior investigation into interacting activities of marine and ocean space, leading to an emphasis on economically viable projects and giving little attention to those with little economic gains.

The question of conflicting use of coastal and ocean resource in Kenya is quite new. New in the sense that only the economical viable projects are being undertaken and so quite few in number. On the coastal zone, the local authority concerned allocates land either for industry or for human settlement with little regard to what effects such developments may have on other marine factors. The
various existing agencies dealing with coastal and marine resource development performs their role without consulting other users leading to fragmented single use management.

Though, there exists legislation for all the agencies dealing with enforcement of regulations, these rules and regulations are segmented and separate in nature. Land conservation and afforestation comes under the ministry of lands, fishery under agriculture, coastal land use under the relevant local authority, and marine parks under the ministry of tourism, etc. The laws fail to identify the needs of each other and hence their development procedures further enhance the user conflict. All these agencies have failed to recognise the marine sector as one factor encompassing various components.

Resource constraints have forced the government to take conservation measures without offering the public an alternative means. This has rendered most of those development projects unpopular with the public and hence offers little support.

5.11 Observation

In a situation of limited resources, the government may not have the capability of doing some feasibility studies to identify and weigh the benefits and losses in environmental or economical terms. Social-economic terms of benefit always seem to override all others to the detriment of some of the resources. Hence, in a situation like this the multiple use conflict may be considered moderate in Kenya. However, this is no factor for complacency.
because failure to provide such a foresight can lead to costly and possible damages and may cost more in rehabilitation than in planning and accommodation of marine multiple use conflicts on a continuous basis.

For Kenya to achieve full and sustainable use of coastal and marine resources, it will be necessary to invest in experimentation, training and education and to forge for cooperation with countries that are already in the process of re-programming plans for their coastal and marine resource development. A deserving attention is taken from the case of Sri lanka who went through a coastal zone reprogramming plan. This should not be taken to mean that Kenya’s marine development are the same as those of Sri lanka but it must be appreciated that programmes are made out of the realisation that mistakes have been made and the need to amend. However, there is no widely accepted programme that can be easily adapted and applied. Each country has to study its own situation and limitations and then tailor in bits and pieces to form a coastal and marine area programme which will meet the requirements of its society.

5.12 A Case of Sri lanka Coastal Zone Plan

Sri lanka is an Island country lying off the southern tip of India. It has a coastline of 1,562 km which consists of a wide range of geomorphological features such as headlands, bays, lagoons, and a variety of tropical habitats including wetlands, mangroves, salt marshes and sea-grassbeds, coral reef etc.
The primary coastal uses are fishing, agriculture, tourism, housing and public facilities. Fish is the main activity in the coastal zone. The primary agency designated as responsible for coordinating these disparate regulatory, developmental and planning activities is the Central Environmental Authority. Its mandate is to conduct studies, prepare environmental standards, conduct educational and training programmes and increase environmental awareness.

Sri Lanka enacted a coastal zone conservation Act in 1981 and the law went into force in 1983 requiring the coastal conservation department to develop a coastal zone management plan. It has the most comprehensive management authority affecting development plans. Among the problems which led to the preparation of a management plan are:

1) The problem of unco-ordinated activities of various agencies,

2) Lack of data as a basis for decision making

3) Public awareness of the need to protect and conserve natural resources.

4) Insufficient legal authority as an impedement to management

Realising the issues the Coastal Conservation Department had to grapple with in the development of a coastal plan, they had to decide on what the new plan had
To include. The problem was to decide on whether to build on the already existing plan or to replace the management agencies. Care had to be taken to ensure that the new plan avoids anomalies and also ensure that it does not stiffle the ongoing activities. They therefore, set their terms of reference to encompass the wider spectrum of all marine and coastal activities.

To achieve this, the department officials started a search for planning models. With the UNDP funding, officials visited United States coastal states and European countries engaged in coastal management. They attended international workshops on coastal management. However, this did not provide an answer for Sri Lanka but the officials could then identify what was not likely to be appropriate or successful, and on this basis they were able to come up with a '124-page' document for parliament approval in 1987. The plan was divided into six sections of four chapters which includes:

1) A brief narrative on the nature, scope and severity of each problem

2) Identification of specific problem causes

3) Identification of objectives and policies for the management of each problem and

4) The identification of specific management techniques to be employed

It is not the aim of this paper to try to assess the
success of this programme, but it must be appreciated that at least they realised their problem and a solution is likely to be found in the new programme.

5.13 Comment

Having read the preceding chapters, one cannot fail to see the similarity in problems in Kenya and those of Sri Lanka. Both have the common problem of fragmented policy, lack of good data on which to base their management decisions, poor enforcement of laws regulating coastal and marine management and lack of environmental impact assessment among others.

Kenya like Sri Lanka has many agencies dealing with coastal and marine use. With the realization of the existing problems, the easiest way to go about it is to learn from those who have already experienced the problem and taken measures. The case of Sri Lanka is a good example. The major problem areas have to be realised in Kenya;

1) coastal erosion caused by natural processes, sand, and coral mining, improperly sited coastal works, loss of coastal vegetation. Together with this, improperly sited coastal developments and related causes have to be looked into.

2) Degradation or depletion of natural habitats and resources caused by dredging, land reclamation practices, domestic and industrial pollution, over-exploitation of resources etc.
3) Loss and degradation of historic, cultural and archaeological sites and monuments of significance due to the construction of hotels and other development activities.

4) Loss of physical and visual access to the ocean caused by siting of hotels and other facilities in ways that impede access.

5) Realisation of all other marine use and their conflicts

Having claimed her EEZ and demarcated her boundaries according to the Law of the Sea convention, the next point of focus would be in drawing of a potential expectation of goals to be realised. These should include;

1) A projected and potential resource demands of individual Ocean and coastal use categories.

2) Assess the impacts likely to result from all facets of use activity, as well as the causes of these impacts

3) Assess the potential against expenditures and the social economic benefits of undertaking either activity

The three measures should be used as the basis for Plan formulation and policy guidelines on how a plan of action is to be taken. Thus, any activity foreseen to bring higher returns with little negative effects on other facets should be developed as a priority project. With the expected goals at hand, and with a management programme focussing on each activity, a philosophy should
be established to reflect the highest national aspirations in respect to the role of the coastal and Ocean development strategy which should be translated into specific objectives.

5.14 Administration of the Programme

The existing marine related institutions should be identified and assessment of whether the existing authorities with responsibilities for management of individual marine resource are competent. Among them, the body should be identified to work mechanisms for balancing competing demands on the limited space. It should be the co-ordinating body which should provide a linkage of channels of communication among all the other agencies.

Care should be taken in establishing new institutions. This may call for more spending on resources which are already lacking. At present, the national Environment Secretariat should take the co-ordinating role but a smaller department within it should be created to deal and monitor the specific programme for coastal development.

Finally, a legislative framework should be formed, outlining the basic rights, responsibilities and conditions for use of Ocean space to meet the desired needs.
6.1 The survey on Kenya's coastal and Ocean space serves to highlight the fact that Kenya is going through a difficult economic growth. The reliance on imports of oil and gas, which increases in price due to world market conditions, places a severe strain on the National economy. There has been a tendency to depend on one or two major crops for export purposes, ie coffee and tea. In addition, agriculture which is the mainstay of the economy has failed to provide a basis for industrial development through agro-industries. Thus, the country has continued to rely on imports of manufactured goods, chemical and fuels which have been higher in value than exports and this has led to serious imbalance of trade. This poor performance in trade, coupled with high population growth, has resulted in high unemployment rates in the country and social unrest. These factors should act as main catalyst to encourage the government to direct more resources, financial and human, to the development of the resources within the country’s economic zone.

Considering this economic climate, it is a difficult decision that the government will undertake to commit money into projects whose returns are not easily assessable for the nearest future gains. So far, it has been difficult to define quantitatively the Ocean contribution to the national economy. Despite this absence of a good methodology to estimate the Ocean contribution to the GNP, an indication is already perceived of the important role marine resources have played to the
country's economy. Generation of employment, increase of exports and increase in government revenue are some of the aspects that this survey has appreciated when assessing the benefits that have accrued from Ocean resources.

Kenya, having claimed her maritime zones, is aware of the opportunities and responsibilities embodied by the Law of the sea convention. She is aware of the potential existing on the Ocean under National jurisdiction as a resource base which includes renewable and non-renewable resources. Inspite of this, the government has continued to rely on land for agriculture which having been a traditional activity, does not require any additional capital input. But, agriculture does not seem to meet the requirement of a growing population, and the aspiration of the government to offer higher standards of living to a demanding population. The government therefore needs to search for 'greener pastures'. Upto now, this search has been directed on land by employing higher technology appliances and irrigation on the semi-arid areas. This paper has advocated for a focus towards the Ocean under National jurisdiction. A determined effort should be employed in this area for greater benefits.

The preceeding paragraph should not be taken to imply that no development on the ocean resources has been undertaken. A highlight has been given on the current developments on fisheries, coastal tourism and transportation among others. A glance of issues as reflected in the paper are that;
1) The region is believed to have a high potential, both in living and non living resources, despite the low level of exploitation. The low level of exploitation is reflected in the management of fisheries which inspite of it being recognised as a continuous contributor to food self-sufficiency, very little research and management effort has been employed to improve the sector. The artisanal fisherman goes on with little regulation or improvement of his gear or the market conditions. The sector lacks in biological research, standing fish assessment, training and any further development in artisanal fisheries. Marine transportation and tourism are the other two sectors with basic data to claim any viability. Apart from those three, the rest of the resources found here do not possess any basic data to analyse their economic potential.

2) Vulnerability of the marine environment especially at the coastal zone has not been of much concern. Concern has been shown in the area of pollution by oil by enacting laws against such incidents and also by ratifying to the Marpol Convention. Apart from that, land based sources of pollution go unabated. Unfortunately, it seems that pollution of the Ocean has not reached a magnitude to cause government concern. Sad, because this disposition has not been assumed due to some analysis. Some chemical analysis may prove different. Research done on the coastal habitat has revealed the degrading effect of pollution on the living resources. Pollution from river run-offs, industrial, domestic and municipal wastes are the recognised sources of pollution. The presence of oil refineries at the coast, bunkering of vessels, and oil
generated from moving ships constitute another problem of pollution.

However, the absence of adequate data base interferes with any effort to determine the full range, nature and severity of marine pollution on the ecosystem.

3) Insufficient understanding and knowledge of coastal and marine resources, especially the relationships and interactions of various natural factors, and lack of comprehensive geographical studies in advance of projects involving coastal and marine resource use. This has led to the exploitation of one resource without considering an integrated development and management of all sectors to make effective use of all the natural resources existing within that zone. This has failed to maintain the stability in the ecosystem and to protect the coastal environment. At times it has resulted to unresolved conflicts of interests which have denied some users their commercial undertaking. A case in point was the displacement of artisanal fisherman when the government decided to construct an extra terminal at Kipevu. The area was enclosed for a government project and no prior explanation was given to the displaced fishermen who for a long time relied on the area.

4) Lack of special laws, and regulations concerning coastal and marine space utilization, development and management, as well as the lack of single authorized professional body with the power to manage this area and coordinate all development undertaking.
These, are among the problems that have been quoted as impediments to development of marine resources. Three major sectors impress as having been well developed. These include tourism, marine transportation, and fisheries to a less extent. It should not be forgotten that the natural element in climate has been the major inviting gesture for tourism, the location of the country as an entry point to various landlocked countries and the existing need for international trade are all ingredients in the good port and shipping performance. Their performance indicator shows tremendous improvement. Tourism alone having grown from ksh 250 million in 1986, to ksh 1.7 billion in 1989 (1). Port throughput capacity increased from 3,760,207 to 4,986,549 in imports and 1,783,084 to 1,978,012 in exports in the year 1988-89 (2).

However, improvement in the tourist industry should be considered on an overall development policy which will be directed into the;

- control and siting of sewage discharge and industrial projects. A health threat can be the highest contributor of tourists moving away.

- monitoring and restricting sand dredging in beaches. Cleaning of beaches to remove the tar and litter that collects after July monsoon.

- improvement of tourist related infrastructure like roads, hotels, airports in coastal area. The case of Malindi which is poorly served by air and road should lead the way.
development of ecologically focussed educational programme for both tourists and nationals alike.

On marine transportation, improvement on vessel traffic management systems and aids to navigation will go along way into preventing major oil spill disaster. Improved training to upgrade the seamen currently engaged in the industry and pollution control and contingency planning at national and regional levels are all measures which would improve the trade as well as keeping the Ocean clean.

Fisheries still play a central activity at the coast. The sector is marked by lack of data on the existing stock making it difficult to draw any management guidelines. Improvement on this area should be directed towards an inventory of fisheries resource potential, both inshore and offshore, improved techniques to increase fisherman's capabilities, including training and equipment designed for artisanal operations and above all the improvement of market infrastructure.

The project has appreciated the effort that has been employed in this sector inspite of all the problems quoted. Initiatives have been shown, but financial capabilities have been a drawback. However, opportunities for development still exist, and development challenges are still going to exert pressure on the undeveloped economy. The government must therefore come up with a plan of action for Ocean development and management, a plan that will lay down the priorities on demanding areas. Emphasis should be directed towards;
1) Scientific Information Base

All activities in the Ocean, both developmental and managerial, are dependent upon knowledge of the natural phenomena which govern the environment. This has been the repeated slog in this survey. Scientific research is required to establish the data bases and managerial models to allow for rational control of fishing quotas, protected species, pollution contingency plans, maricultural development, and the location of each and every available resource in the marine space.

2) Infrastructure Development

The survey realised the importance of onshore development as closely related to those offshore. Development or lack of development of the adjacent coastal area will highly affect the development of the Ocean industries.

Landing sites, storage and processing facilities, transportation routes to major market, all determine the well being of Ocean resources. This has been reflected in the fishing industry where these facilities are lacking in one way or another and therefore, the fishing domestic industry has remained undeveloped. Port facilities and land transportation networks are an integral part of a healthy shipping industry, while tourism requires hotel accommodation, airline links and road networks.
3) Manpower Training

One thing that Kenya has achieved is a well trained cadre of public officers skilled in a number of areas. Ocean management being a new field, was not incorporated in the earlier curricula. So, there is need to train technical and managerial expertise necessary for the effective exploitation and regulation of the Ocean. Broad-based managers, with sufficient skills to regulate and manage, with an awareness of the multisectoral nature, of Ocean development, interconnected and often conflicting requirements of different resource use should be trained. Technical staff specialists, for private and public departments should be trained to enhance the role of exploitation.

A regional approach to this problem would suffice through investment in regional research facilities and increased training of Ocean scientist.

4) Local Investment

It must be appreciated that the country has little money available to invest in marine planning and management. There is therefore need to search for innovative approaches involving all interested parties who may be willing to give an input. Private, public or foreign investment will be essential to the improvement of domestic capacity in such industries as fisheries, offshore oil exploration, aquaculture farming and direct energy production. The government should endeavour to put a little more capital on fisheries considering that the expertise for harvesting is there but what lacks is
scientific approach in allocating the resource data, hence
distribution methods.

Other areas of Ocean resource like offshore hydrocarbon development, the government should make a
critical decision to go into joint venture with a multinational corporation to exploit a resource that is
believed to be marginal, but which hopefully may prove sufficient for domestic import substitution.

6.2 Regional Approach

Effective national policies can be achieved with a
degree of regional harmonization of policy. This can work well for marine resources which have been seen to respect
no boundaries. The harnessing of tuna fish and matters of marine pollution should be done on regional basis. The
intermingling currents and winds affect all boundaries sharing the same waters. States like Tanzania, Somalia, Mozambique should implement a programme of action especially in joint pollution emergency planning, surveillance on fisheries and other activities which would be less expensive on a negotiated coordinated access agreement with neighbouring coastal states.

6.3 Policy and Institutional framework

A concentration of the requirements to be considered for marine development has been outlined. It is however, necessary to consider the institutional and policy development which will contribute to the effective longterm development and management of Ocean resources. The fact that Kenya does not have a marine policy is clear
from the preceding chapters. What exists is a number of institutions each having her own policy. Ports and harbours are the only two marine sectors administered from the same Ministry. Other resources like minerals come under the Ministry of natural resources, tourism under the Ministry of Tourism and wildlife, environment under the Ministry of environment, and fisheries under the Ministry of agriculture. Apart from the Ministries, a group of committees exist in each ministry dealing with various matters at departmental level.

The foregoing reflects a policy highly compartmentalized and is expected to suffer from dynamics of each issue and occasional force from external considerations mostly of high politics. It means that decisions are highly fragmented and suffers from a large number of internal, competing jurisdictions with no clear sense of national priorities. Such a decentralisation will have no official perception of the need to calculate net benefits accrued from a wide range of resources and activities in the areas of the ocean under the national control (3). Conflicting and interacting activities will only be noticed after a project has been undertaken, thereby reversing a decision after a high cost in terms of material and human energy.

These sectoral policies should not however be eliminated all together. They should be seen to reflect their line of development, thus the ministry of science and technology should have a policy on technology to be applied in the exploitation of the resources based on the research done by the same organization. The ministry
of fisheries should on the other hand have a policy on the fisheries conservation and management, others like ministry of environment will have a policy on environmental protection. But these sectorial policies must be integrated into one development policy which should encompass all areas and should reflect the country's goals in the long run. The declaration of the 200 mile economic zone, should be accompanied by a comprehensive marine policy which will help the country in achieving maximum benefits and at the same time sustain the resources. The current interlocking components of resources, the fragmented state of current legislative and administrative responses, and the number of committees dealing with marine resources will only enhance conflict. The existing acts tend to be single purpose, the administrative responsibilities compartmentalized, and the committees without linkages which would allow them to address the marine resources in a comprehensive manner. What is needed is a decision-making framework with systematic capabilities matching the range and intensity of issues now involved in marine resource use. There is need to address future issues and seize opportunities regarding marine resources and strengthen the base for conservation. The future policy should take various requirements into consideration for maximum benefits and at the same time sustaining the resources. It should be borne in mind that, 'what we do on, in, or under the sea should be done by design, in accordance with a positive and cohesive approach, rather than dictated solely by the accident of immediate pressures. Further, our decisions about the use of the sea should be based on consideration of all the relevant ample account of future
developments—in relations with other countries, we should be guided by a balanced appreciation of our various interests at sea’ (4). The National policy should include:

An inventory of what resources exist on the coastal and the EEZ should be the first step. This should be followed by an attempt to define the objectives the policy is intended to achieve. A projected means of resources to be used should be borne in mind, this may be in terms of budget or human resources. The goals should be stipulated and ranked according to priority, and an emphasis on the specific course to be taken in their achievement. The policy should be easily stated for all those involved to understand. This will increase efficiency, reduce conflict and any duplication will easily be noticed thereby reducing waste.

The government, having the upper hand in all development should bear in mind the difficulties or consequences of any policy alternative she may choose to take. The integration effort will imply opportunity costs. The government must be ready to forego one thing or another either in terms of popularity or income but be aware of the fact that in the long run, such policy will bear optimal returns.

The policy should enumerate the cadre of staff to be recruited in this area. It should be linked directly to job opportunities. This will call for Training of specialists and generalists who would be important and should reflect on new realities away from land. A full understanding of the natural environment of the Ocean
should be understood and a greater awareness created among
the managers of what living and non living resources
exist and how they inter relate. A fisheries manager
should be able to understand the effect of oil or any
other activity on his fisheries development and vice
versa.

The new policy should not dismantle the existing
institutions and their policies. The existing departments
can still go on. This will avoid power conflicts and
resource waste. It is recommended that a department be
formed under the office of the president to be headed by
the chief Secretary and Head of the civil service. The
department will play the coordinating role and analyse
projects before they are passed for approval. This will go
along way into reducing conflicts which may have been
ignored at ministerial level. This office will together
with the ministry of planning give a preferential budget
allocation to the most viable project. This will be viable
in terms of the net benefit returns expected in the short
and long terms.

The policy should not forget the marine environment
on which development is to take place. The recognised
number of actors on the same space are going to put
pressure on the environment. There is therefore need to
incorporate a marine policy in the overall development of
the resources. Any project proposal should be accompanied
by an expected impact and the remedies intended to be
taken in case of a danger. The aim of developing the
resources is to benefit from the same and at the same time
sustaining them.
Hence, a marine environmental ethic should be developed as a social value. Currently, cutting of mangrove trees in any area is prohibited without a proper permit from authorities. This has not met a lot of support because alternative means for obtaining fuel was not provided. While the rule is obeyed, a lot of strain is felt among the wood users. If sustained use of resources is to succeed in the marine sector, the community must be educated first about the need to protect and conserve marine areas. The long term effect in continued uncontrolled use must be expounded to the user. Only then will the need to conserve resources be understood. Those displaced or denied their traditional facility should be provided either free or at subsidised prices alternative means. Those living within the maritime zones should be allowed to enjoy the facilities like beaches and marine parks at very nominal charges.

Secondly, planning should be made towards an integration of environmental and development objectives. Adequate understanding of the consequences of industrial projects on the marine environment and the long term effects must be understood. Since the marine ecosystem cannot be compartmentalized, neither should the decision making framework. Appropriate planning is necessary to ensure a full integration of environmental and development considerations.

Third, an increased understanding of marine ecosystem is necessary. This involves inventories of marine populations, characteristics and processes of ecosystem including the interaction between man and the environment.
However, this may call for expensive institutions equipped with high technology equipment to carry out the research. This may require government considerations of partnerships or cooperative ventures between regions or government and industry.

Considering the importance of tourism in the country, protection for ecology, both the natural and the cultural heritage should be preserved. This can be done by setting aside a network of ecological reserves, representing terrestrial and aquatic ecosystem to serve as unique sites. This may serve to assist the public in understanding, appreciation and enjoyment of a marine heritage in ways which will leave it unimpaired for future generations.

Fourth, involve the public and the industry in the decision making process. This will earn the government some credibility in that the policy will be seen as a decision coming from the users of the resources themselves.

6:4 The Legal Frame Work

It is expected that the haphazard approach of marine development is reflected in marine legislation. A legislation should reflect the aims and objectives a policy is intended to achieve. The National legislation should state the Nation’s marine boundaries. Together with this, the legislation should reflect on only those areas with viable activity. It should take into account the possible multiple use conflicts, and how such conflicts
are to be resolved. It should specify means for compensation in case of damage of one resource in the development of the other.

It is important that the National legislation be in line with international agreements. Having adopted the law of the sea Convention, the legislation should endeavour to meet those obligations embodied in the Convention and also those that the country is a party to ie Marpol, etc.

Finally, the law should be easy for day to day guidelines. Those enforcing it must know exactly what is to be enforced, and what benefit the law is serving the country.

6:5 Conclusions

A policy with the above components would provide a framework with a rationale for coordinated efforts by departments and agencies to maintain environmental quality in the development and use of marine areas. Industrial, municipal waste disposal, dredging, mining, recreational activities, shipping and ports, fisheries management as well as offshore oil and gas development, all these issues could be examined precisely by an integrated body of experts for a comprehensive policy guidelines for a quality achievement of both resource use and environment.

Finally, such a policy would also enable the country to make a coherent response to the positive obligations outlined by UNCLOS convention, the world Conservation strategy and other international initiatives aimed at sustained and preservation of marine resources.
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