

DRAFT

EXECUTIVE SUMMARY

Background

There is the need for a comprehensive assessment of the Status of the Nigerian Coastal Zone through the study of our coastal ecosystem, species of special concern, socio-economic status of the zone, environmental problems and existing national, state and local government legislations and edicts with the ultimate goal of sustainable management of the coastal and marine zone.

This report provides recommendations within the framework of national priorities as contained in the national poverty reduction strategies and national development plans. The Federal Ministry of Environment in collaboration with representatives from other government institutions, NGOs and relevant stakeholders have contributed meaningfully to this status report.

FEATURES OF THE NIGERIAN COASTAL ZONE

The Nigerian coastal zone sprawls a total of nine states, out of the thirty-six states of the federation, namely: Akwa-Ibom, Bayelsa, Cross River, Delta, Edo, Lagos, Ogun, Ondo and Rivers. The coastal states are estimated to account for 25% of the national population. The coastal areas stretch inland for a distance of about 15km in Lagos in the West to about 150km in the Niger Delta and about 25km East of the Niger Delta. The coastline stretches for about 853km comprising inshore waters, coastal lagoons, estuaries and mangrove especially in the Niger Delta.

Economic activities in the coastal zone include Oil and Gas exploration and exploitation, fishing industries, shipping, agriculture and tourism. The zone experiences a tropical climate consisting of a rainy season (April- October) and a dry season (November- March) with diurnal temperature as high as 34 to 35°C and high relative humidity rarely below 60%.

The biological activity of the coastal zone ensures stable pH, a notable feature of the marine environment, whereby conditions are remarkably constant over certain areas and marine plants and animals have correspondingly wide distributions. The marine life has therefore evolve in great diversity.

Mangrove swamps are mostly predominant and flourishing in the Niger Delta. The red mangroves- *Rhizophora racemosa* makes up about 90% of the vegetation of the mangrove ecosystem. Other species are *R. harrisonii*, *R. mangle* and the white mangrove *Avicennia nitidae*.

Wetlands are major habitats in the Niger Delta and support vegetation which is adapted to continuous water logging. The wetlands in the Niger Delta include mashes, sloughs and estuaries. The estimates total area of wetlands in the Niger Delta is about 1,794,000ha of freshwater swampland (NEST 1991). Nigeria is free of earthquakes,

the major causes of sediments within the Nigerian drainage basin are rainfall, wind and human activities.

Marine animals like Sea turtles, manatees, shoreline birds and other threatened marine species have been identified in relative population within the coastal zone in Nigeria. Manatee in particular has been of socio-economic importance in the life of coastal communities. A survey carried out by Nigerian Conservation Foundation identified presence of sizeable number of manatees in the Benue Basin (middle belt of Nigeria). Sea turtle and Shoreline birds have also been found in the Niger Delta area of Nigeria.

MAJOR PROBLEMS OF THE COASTAL ZONE

The major problems of the coastal zone derive from human and natural impacts due to high populations, industrial and agricultural activities aimed at meeting food, energy, goods and other requirements of the populace. A lot of the environmental problems of the coastal zone are caused primarily by landbased activities. The following problems have been identified viz;

- i) overexploitation of fisheries
- ii) coastal and marine pollution
- iii) oil spills
- iv) coastal erosion and flooding
- v) physical modification and destruction of habitats
- vi) climate change and sea level rise
- vii) invasive species.

CONCLUSION

This report has identified some weaknesses, commonalities and gaps associated with various issue raised. For instance, the immediate sectoral and root causes of oil spill as well as the impacts are common for Niger Delta coastal zone. Some common inadequacies in Government policies and programmes are traceable to some lapses in governmental responsibilities. For example, when legal instruments for pollution control and or the regulation of industrial activities are examined, some existing laws are inadequate.

There is poor data base in Nigeria which does not give room for meaningful decisions on appropriate interventions. There is also inadequate distribution of national regional or global wealth and opportunities thereby affecting opportunities for survival and acquisition of relevant technological and managerial capacity especially in highly skilled sectors. The lack of sufficient opportunity for survival has brought about poverty, low standard of living resulting in desperation and restiveness particularly in the Niger Delta area. This situation has lead to sabotage which is a major cause of oil spills.

A large proportion of the people is unable to appreciate the impacts of some of their activities on the environment due to lack of adequate capacity.

they are not able to make meaningful contributions to environmental protection and management measures. There is poor awareness and communications and existence of communication gaps leading to a situation of no free flow of information between governments, communities and other stakeholders.

RECOMMENDATIONS

The issues raised in this report need urgent attention in the form of concrete interventions as highlighted below:

Oil Spill

- i. Remediation of polluted areas
- ii. Provision of receptive facilities at ports in Nigeria
- iii. Capacity building for oil spill management and technical acquisition
- iv. Monitoring of oceanographic processes and health of sensitive eco-Systems.

Solid Waste

- i. Implementing sound disposal methods
- ii. Implementation of sustainable collection and disposal techniques
- iii. Formulation and implementation of waste minimisation strategies
- iv. Waste to wealth strategies (recycling)

Sewage

- i. Monitoring of health of the coastal environment from sewage and solid Waste
- ii. Low cost technology sewage treatment and management facilities

Modification of Ecosystems

- i. Public enlightenment programme
- ii. NEPA palm project
- iii. Mangrove restoration
- iv. Monitoring of coastal and marine processes for integrated management Of degraded ecosystems
- v. Mitigating coastal erosion using environmentally friendly options

Climate Change

- I Development of national climate change plan of action
- ii Inventory of Greenhouse gases
- iii Coastal protection from flooding and erosion resulting from sea level rise.

Exploitation of Fishery Resources

- i. Strengthening legal instruments for effective management of fishery Resources
- ii Fish stock assessment
- iii Public enlightenment programme for sustainable exploitation of Fishery resources
- iv Development of coastal aquaculture

CHAPTER ONE

THE STATUS OF THE NIGERIAN COASTAL ZONES

Background to the Report

Nigeria, the largest country in Africa with a total area of 923,769sq km (land 910,768 and water 13,000sq km) is located between 4 and 14 latitude north and 2.30 and 14.30 degrees longitude east. The Nigerian coastal environment consists of rich and diverse ecosystems, natural resources, and large human populations. The Nigerian coastal and marine area is a narrow strip of land bordered by the Gulf of Guinea of the Central Eastern Atlantic in the South. The zone lies within the Atlantic Ocean with its continental shelf, the Exclusive Economic Zone and the coastal fresh water and brackish wet lands ramified by an atomising network of rivers and creeks. These water bodies are characterised by periodic tidal variations and ranges along water channels and the differences depend on the hydrological properties and slopes of the various channels (CEDA 1997)

The Nigerian coastal zone sprawls a total of nine coastal states (out of the thirty-six state of the Federation) namely; Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Lagos, Ogun, Ondo and Rivers. The coastal states are estimated to account for 25% of the national population. The coastal areas stretch inland for a distance of about 15km in Lagos in the West to about 150km in the Niger Delta and about 25km East of the Niger Delta. The coastline stretches for about 853km comprising inshore waters, coastal lagoons, estuaries and mangrove especially in the Niger Delta.

Oil and gas (mainly from Niger Delta) form the main backbone of the Nigerian Economy as it provides 95% of foreign exchange earnings and about 65% of budgetary revenues. Fishing is a major activity especially in the coastal areas where we obtain important resources such as fish, shellfish, such as shrimps, lobsters, crabs and molluscs.

The offshore area bordering the Nigerian coast consists of a narrow shelf between 15km offshore Lagos to about 75km off the shore of the Niger Delta and about 85km off Calabar along the strand coast. The Nigerian continental shelf is grooved by three major canyons namely: Avon canyon just east of Lagos, Mahin canyon off the mahin mud coast and Calabar canyon off Calabar (Awosika et al 2001). These canyons have been reported to serve as conducts for channelling of sand into offshore sub-marine fans on the slope. The overall nature of the Nigerian continental shelf is mainly depositional as compared to adjacent parts of the continental shelf along the Gulf of Guinea where Basement complex rocks appear close to the coast (CEDA 1997)

The Nigerian coastal environment is divided into four main physiographic zones, viz.

- i. The Barrier Lagoon Coast which lies between Badagry and Ajumo east of Lekki town.

- ii. The mahin mud coast lying between Ajumo and Benin river estuary in the North Western flank of the Niger Delta.
- iii. The Niger delta lying between Benin River in the West and Imo River in the east and
- iv. The strand coastline lying between Imo River and the Nigerian/Cameroon border in the east with the Cross River inclusive (Awosika 2001).

The Nigerian coast and marine areas are under the influence of moderate oceanographic dynamics consisting of semi diurnal tides with tidal ranges varying from 1meter in the west to 3 meters in the east. The prevailing south-westerly waves vary from spilling to plunging waves. Long shore currents are prevalent in the near shore while the West East Guineas currents constitute the major ocean currents. The surface water off the Nigerian coast is basically warm with temperature generally greater than 24°C.

The sea surface temperature show double peaked cycles which match quantitatively the cycle of solar heights. Between October and May, sea surface temperature range from 27°C – 28°C while during the peak rainy season of June-September the range is between 24°C-25°C. This decline has been attributed to an expression of the overall cooling of the South Atlantic and the Gulf of Guinea during this period of the year. (Longhurst, 1964).

The surface water is typical oceanic water of the Gulf of Guinea with salinity generally less than 35‰. The coastal surface receives run-off water from land and from arrival precipitation. Salinity in the Niger Delta shelf range between 27 – 30‰ in January to March and 28 -30‰ in June to September. The low salinity values are due to freshwater from the numerous estuaries of the Niger Delta (CEDA 1997).

The Nigerian Coastal Zone experiences a tropical climate consisting of a rainy season (April to October) and a dry season (November to March). Diurnal temperature is high reaching 34°C to 35°C. Relative humidity is high throughout the year and rarely go below 60%. High rainfall of between 3000mm and 4000mm is experienced during the months of May to September with a short dry break in August. The dry season which lasts between October to March is characterized by the Northeast trade winds with speed of 2-7m/s. Minimum wind gusts of 2.5m/s to 4.7m/s are usually recorded during the months of November to February when mean wind direction ranges from 161 to about 190 (Awosika 2001).

The climatic conditions along the Nigerian coastal zone (heavy rainfall and high temperature) especially in the Niger Delta have made chemical weathering the dominant geomorphic process in the region. This has resulted in the formation of clay minerals and salt particles from the parent materials. Most of the soils of the Niger Delta are richer in salt-clay fraction than in sand soil types in the Nigerian coastal zone include:

- i. Fresh water alluvium and level slope with
- ii. Flood Plain Soils
- iii. Mangrove Swamp Soils
- iv. Saline Sands and
- v. Beach Ridge Sands (CEDA 1997)

Hydrologically, the Nigerian Coastal Area can be divided into three main areas (Akintola 1986). The Western littoral, the Niger Delta and the Eastern littoral which are described as follows:

Western Littoral Hydrological Area

This include the areas in the Barrier Lagoon complex, the mud coast and western delta flank. Some of the major rivers are Yewa, Ogun, Osun, Shasha, Oluwa, Siluko, Benin, Escraros and Forcados. Many of these rivers are long and originate with the Basement Complex except those in the western delta flank.

The Niger Delta Hydrological Area

This hydrological area comprises the rivers of the arcuate Niger Delta. The zone consists of a diverse network of rivers and creeks. The major rivers include Ramos, Dodo, Pennington, Sengana, Nun, Brass, Santa Barbara and Sombrero. Most of these rivers short coastal rivers and are distributaries to the Niger river. They originate within the coastal plain sands of the Benin Formation. The waters are transparent and acidic. The Ase and Orashi rivers are located within this hydrological area and both run parallel to the Niger river.

Eastern Littoral Hydrological Area

This zone includes the rivers on the eastern Delta flank and the strand coast. These are: Bonny, Andoni, Imo, Kwa Iboe and Cross Rivers. The Imo and Cross Rivers are large river systems that originate from the Basement Complex.

The various rivers in the Nigerian Coastal Area have varying lengths and widths and are subjected to tidal activities which may extend several tens of kilometre (50-80km) inland. The general hydrological cycle in the Nigerian Coastal Area has a dry season period of about 4 months, December to March. In April the stage gradually rises in the rivers reaching a peak around September to October (CEDA 1997).

The environmental problems which have been identified to be degrading the Nigerian coastal areas include Coastal erosion, flooding, pollution from oil spills, solid wastes and sewage, over-exploitation of fishery resources and adverse effect of global climate change and sea level rise (UNEP 2006). It is estimated that 50% of all coastal ecosystems around the world are at risk of degradation. Marine life is damaged by pollution. Oil and other toxins are poisoning marine animals. Animals' eggs are especially vulnerable to pollutants leading to birth defects or destruction of the eggs altogether. It has been discovered that chemical run-off into the oceans also causes alga blooms that block the sun's rays killing organisms beneath the

oceans surface that cannot survive without light. The burning of fossil fuels causes pollution and global warming both of which put biodiversity at risk.

Habitat destruction result from degradation of land and water ecosystems. It includes large-scale clearing, over-harvesting and the burning of forests for agriculture, mining and development. Wetlands filter water, protect land from flooding and provide a home to many animal species. Worldwide, wetlands have been reduced by 50% (Environment Magazine 2006). The introduction of invasive species (organism that successfully establish themselves in nature ecosystems and then take over) to new areas by humans kill off plants or animals that are nature to the area. This process together with habitat destruction has being a major cause of extinction of nature species throughout the world over the past few hundred years.

PURPOSE OF THE REPORT

From the foregoing, there is the need for a comprehensive assessment of the status of the Nigerian Coastal Zone through the study of our coastal ecosystems, species of special concern, socio-economic status of the zones environmental problems and existing national state and local government legislations and edicts with the ultimate goal of sustainable management of the coastal and marine areas. Questionnaires were sent to all the coastal states in Nigeria to provide adequate information on the status of the Nigerian Coastal Zones with a view of getting a comprehensive project document.

CHAPTER TWO

The coastal states are estimated to be composed of about 25% of the national population. Oil and gas is the main back bone of the Nigerian Economy as it provides 95% of foreign exchange earnings and about 65% of budgetary revenues.

Fishing is a major activity especially in the coastal areas. Industries include crude oil, coal, tin, columbite, palm oil, peanuts, cotton, rubber, wool, hides and skins, textiles, cement and other construction materials, food products, footwear, chemicals, fertilizer, printing, ceramics, steel, petrochemical, breweries, automobile and other small scale industries. Subsistence agriculture produces maize, yam, and other domestic food crops, cash crops include cocoa, rubber and cotton.

Ports include the Lagos port, Calabar, Port-Harcourt, Warri, Sapele, Koko and Onne ports. The coastal area is dotted by large metropolitan centres including Lagos (the former capital of Nigeria) with a population estimated at about 15 million. Other big mega cities include Port Harcourt, Calabar, Warri, Benin City and Uyo. Rural population is sprawled over the entire coastal area.

Socio-economic infrastructures in the city include those of Education, Health, Water, Electricity, Communications, Tourism and recreation as well as many industries. It is estimated that about 70 percent of the industries in Nigeria are located within this municipality. The mega city houses the headquarters of most merchant, commercial and development bank as well as insurance and re-insurance companies. The largest concentration of industrial and commercial establishment in Nigeria. A large and flowing population of skilled and semi-skilled persons that provide basics and market for a wide range of higher order goods and services, a range of buildings and allied infrastructure for local, state and federal government, regional and international organisations.

The resources in the Nigeria coastal and marine environment have high implications for Nigeria's economy. Oil and gas predominantly form the coastal zone is the main backbone of Nigeria economy. Some of the renewable resources in the Nigerian coastal and marine environment include plants, mangroves, fish and shellfish, marine mammals and reptiles. The non-renewable resources include oil and gas, solid and heavy minerals, salts, sand and gravel and clay.

Economic activities include oil and gas exploration and exploitation, fishing industries, shipping, agriculture and tourism.

SOCIO –ECONOMIC STATISTICS OF NIGERIA

Total Area	923,768km ²
Land Area	910,768km ²
Water Area	13,000km ²
Population	129,034,911 (2002 Estimate)
Population Growth	2.54% (2002 Est)
Populaton below poverty line	45% (2002 Est)
Oil and Gas	90% of GDP, 95% of Foreign Exchange about 65% of budgetary revenue.
GDP growth rate	3.5% (2002 Est)
GDP Composition of Sector (2002 est)	Agriculture 39%, Industry 23%, Services 28%.
Highways	193,200km (total) paved; 59,892km (including 1,194km of expressway). Impaved; 133,308.
Waterways	8,75km Niger Benue and smaller rivers and creeks.
Ports and Harbours	Apapa and Tin Can (Lagos), Onne, Port Harcourt, Warri, Sapele and Calabar.
Airports	Lagos, Abuja, Port-Harcourt, Calabar, Jos, Kaduna, Yola, Maiduguri, Enugu, Owerri, Benin City, Warri, Ilorin and Sokoto.

Nigeria is Africa's leading oil producer and ranks in the top ten of oil producer in the world. Oil and gas operations concentrate traditionally on land, swamp (wet land), and shallow offshore in the Niger Delta area. Oil and gas generate over 90% of Nigerian's foreign exchange and operations are carried out on land and offshore. After the first discovering in the Eastern Niger Delta in 1997, the Nigerian production reached a historic record of 2.3 million barrels per day. Nigeria produces about 70% of OPEC's quota. Current development programme is aimed at increasing production to 2.5million barrels of oil per day by the Year 2000.

The Inshore fish resources of Nigerian waters includes demersal, pelagic and shellfish resources. The potential yield from inshore waters is estimated at 201,000 metric tonnes per annum. Small scale fisheries contribute between 50 and 70% of total domestic production. Tobor, (1965 – 1968) recorded about 157 species of fish belonging to 71 families in the Nigerian inshore waters.

The pelagic fish resources are mainly the Chipeid family and the most exploited are: *Ethmaloza fimbriata*, *Sardinella maderensis*, *Sardinella aurita* and *Illisha Africana*. Others such as anchory and the soombrids are not the major targets of the small-scale fishery. Shellfish harvested by the artisans include white shrimps (*Nematoplaeonon, hartatus, Palaemon, hastatus*), brackish prawn (*Macrobrachium macrobrachion*), river prawn. (*Macrobrachium vollenhovenii*), and juvenile pink shrimps *Penaend notialis* and *Penaens duorarum*.

The industrial shellfish fishery targets the adult pink shrimp *Panaeus notialis* and *Panaeus duroarum* taking considerable quantities of the guinea shrimp *Parapenaeopsis atlantica* in the process (Adetayo and Ajayi 1996). Shrimp resources are abundant around river mouths and lagoon entrances. Important species occurring in Nigerian waters are the pink shrimp *Panaeus notialis*, dominant in 10 to 50 metres of water, the tiger shrimp *Penaeus kerathurus* and the near shore shallow coastal shrimp *Parapenaeopsis atlantica*.

Sand is one of the most important non-fuel resources in the Nigerian coastal zone. Sand is mined along major estuaries, lagoons, near shore and along the beach. Much of the sand mined from lagoons, near shore areas are used for nourishment of eroding beaches like the Bar Beach in Lagos, sand filling swamps for development like in the Lekki area of Lagos construction of buildings and roads. Over 13.22m² of sand was dredged from the Lagos lagoon between 1984 and 1989 to sand fill 552 hectares of the Lekki phase 1 residential area (Awosika et al 1994). Local people usually mine beach sand for construction. Such activities are very prevalent among the rural dwellers in the Niger Delta.

Forest Resources also contributes to the quota of socio economic activities of the coastal and marine environment. Within the mangroves and wetlands are both epifauna and infauna. The epifauna are those that occur on the stilt root and branches of *Rhizophora spp.* Lying submerged on the stilt roots are the barnacles mainly *Chthamalus estuarii* and inter mingled with these communities are the *Polychaetes marciaria enigratica*; *Balanus pallicus* and *Hydriodos uncinata*; bivalves, which consist mainly of Oysters e.g. *O.tulipa* and the less saline species *Crythea gazar*. The infauna are those that line in or on the sediments of the mangrove swamp.

At high tides, they are usually submerged and exposed at low tide. Dominant member of the infauna are *Pachymelina quadriserata*, *Tympanotomus fuscatus*, *var radula* that are of commercial value. Other important crustaceans of commercial value are *Cardiosoma armatum*, *callinectes*, *latimanus*, *Penaeus notialis* (Juvenile) *Nematopaelaemon hastatus* and *Sersema spp.*

Wetlands in the Niger Delta offer multiple benefits many of which are still only potential in the area. The detritus and nutrients from these wetlands form the food base of many marine and freshwater organisms of economic importance. For example, the estuaries wetlands form important spawning grounds for fish while both the estuaries and freshwater wetlands are important for wildlife and wood resources.

BIOLOGICAL FEATURES OF THE MARINE ENVIRONMENT

Seawater is evidently an excellent medium for an abundance and variety of the life. We know from geographical findings that the seas have been well populated since the earliest time for which we have fossil records. It is widely thought that life originated in the sea, most likely in pools on the seashore where many different solutions of varying composition and concentration could accumulate in various conditions of temperature and illumination. Alternatively, some scientists are now postulating that life could have begun around deep sea hydrothermal vents. The seas

have now been populated for so long that it has been possible for marine life to evolve in great diversity.

Probably all natural elements are presents in solutions in the sea, and all the constituents needed for the formation of protoplasm are present in forms and concentrations suitable for direct utilisation by plants. The transparency of the water and its high content of bicarbonates and other forms of carbon dioxide provide an environment in the upper layers of the sea in which plants can form organic materials by photosynthesis and in this way great quantities of food become available for the annual population. However, light penetrates only a short distance into the water.

Marine plants must therefore be able to float close to the surface or if attached to the bottom, are limited to shallow depths. Because water is relatively opaque to ultra-violet light. This oxygenated water to the bottom and thereby makes animal life possible at all depths,

Despite biological activity, the buffers properties of the water are sufficient to keep the pH stable. It is therefore a notable feature of the marine environment that conditions are remarkably constant over great areas and many marine plants and animals have correspondingly wide distributions. Such changes as do occur take place slowly, giving time for some organisms to actualize. However, stable conditions permit the evolution of a diversity of forms whose environmental requirements are very precise and whose range is limited by quite slight changes in their surroundings

It must therefore be evident that this combination of properties offers propitious conditions for a great variety of marine organisms of many types and sizes.

ROCKY SHORE/HARD BOTTOM HABITATS

Many bottom dwelling creatures are able to live and grow to large size with relatively little expenditure of energy in hunting and collecting food because they can obtain adequate nourishment simply by gathering the particles that fall within their reach or are carried to them by the currents. Others simply digest the organic matter and associated bacteria contained within the sediments. Most of the sea bottom is covered with soft deposits which give concealment and protection to burrowing creature where the substance is hard, it provides a secure surface for the attachment of sessile forms and affords protection for creatures which hide in crevices or burrow in rock. Compared with the pelagic division of the marine environment the sea bottom provides a far wider variety of habitat because the nature of the bottom differs greatly from place to place.

MANGROVE FORESTS AND COASTAL WETLANDS

The mangroves and wetlands along the major estuaries between Benue River in the West and Cross river in the East have a total brackish area of 2520.79km² (Ndaguba 1983). The mangrove swamps are mostly predominant and flourishing in the Niger Delta. The red mangroves – *Rhizophora racemosa* makeup about 90% of

the vegetation of the mangrove ecosystem. Other species are *R. harrisonii*, *R. mangle* and the white mangrove *Avaicennia nitidae*.

The high mangroves are found along the creeks but are less in the back swamps. West of the Niger Delta and along the barrier-lagoon complex, while mangroves and swamps are very sparse. However, such species are: *Ipomea aquatica*, *Vigina marina*, and *Maranthus* maritime are found around Lekki about 80km east of Lagos.

The distribution of mangrove ecosystem in Nigeria is presented in the table below:

COASTAL STATES	AREA OF MANGROVE(sq.km2)	Mangrove RESERVE (sq.km ²)	Forest
Edo	3,470.32	143.75	
Cross River & Akwa Ibom	721.86	57.19	
Lagos	42.20	3.13	
Ogun	12.18	-	
Ondo	40.62	-	
Rivers	5,435.96	90.62	
TOTAL	9,723.14	304.69	

The distribution of mangrove vegetation in Nigeria in land Use Area Data of Nig. (FAO, 1981) Coastal wetlands in Nigeria exist in isolated patches along the entire coast. However, they are mostly predominant along the Mahin mud coast in the north western flank of the Niger Delta. Along this area, coastal vegetation consisting of some mangroves and shrubs which are permanently under water for most parts of the year. This is due to the low-lying topography, which make the area susceptible to flooding especially during high tides.

Wetlands are major habitats in the Niger Delta. Wetlands support vegetation which is adapted more or less to continuous water logging . Thus, wetlands in the Niger Delta includes marshes, sloughs and estuaries. The estimated total area of wetlands in the Niger Delta is about 1,794,000 ha consisting of 617,000ha of saline and 1,177,000ha of Freshwater Swampland (NEST, 1991).

Within the mangroves and wetlands are both epifauna and infauna. The epifauna are those that occur on the stilt root and branches of *Rhisophora sp.* Lying submerged on the stilt roots are the barnacles mainly *Chthamalus estuarii* and intermingled with these communities are the *Polychaetes, marcierelia, enignation, Balanus, pallidus, and Hydriodes uncinata* bivalves, which consist mainly of Oysters e.g. *O. tulipa* and the less saline species *Cryhea gazar*. The infauna is those that live in or on the sediments of the mangrove swamps. At high tides, they are usually submerged and exposed at low tide.

Dominant members of the infauna are *Pachymelina, quadriserata, Tympanotonus, Fascatus, var, radula, that* are of commercial value. Other important crustaceans of commercial value are *Cardiosoma, armatun, Callunectes latimanus, Penaceus*

notialis (juvenila). *Nematopaelaemun hostatus* and *Sersema sp.* The mangroves are especially important in the sense that they serve as protect. The low lying coastal areas from the upsurge of the waves. Wetlands in the Niger Delta offer multiple benefits, many of which are still only potential in the area. The detritus and nutrients from these wetlands form the food base of many marine and freshwater organisms of economic importance for example, the estuaries wetland form important spawning grounds for fish while both the estuaries and freshwater wet-lands are important for wildlife and wood resources.

Development of agriculture within the mangroves and swamps however is handicapped by poor drainage and salinity of the soils, which are both difficult and expensive to control. Indeed, draining the wetlands tends to increase soil acidity with adverse effect on plant growth (NEST 1991). This is because the mangrove soils, usually characterized by large quantities of iron sulphides are stable for as long as they remain submerged.

Acidity increases progressively with oxidation of sulphides promoting the release of aluminium salts and other chemicals toxic to plant and animals. Draining of wetland create new ecological conditions with the associated management issues of species tolerance, adaptation and performance.

SEDIMENT/SOFTBOTTOM HABITATS

Bodies of water, be it river, brook, lake harbour, city canal, or an estuary drain water from the continents to the ocean carrying along products of weathering as sediment in suspension or in contact with the riverbed sediment. Therefore, it is the burden (load) which flowing water bears. Sediments carried by the flow of a river are divided into three categories. (i) Suspended load (ii) bed load and (iii) Wash load.

When the load is in suspension due to turbulence in the water body, it is called suspended load. Wash load is river sediment carried in suspension. It consists of very fine sand, with average diameter smaller than 0.50mm.

The upper carries suspended load and middle flow layers (above 400mm above the bottom) is called bed load. The summation of the three categories of sediments is the total load of a river.

SOURCES AND CAUSES OF SEDIMENTS

Sediments in rivers have two sources namely:

Land surfaces (i.e. drainage basin on catchments area) and water channels. Under the action of the force of gravity, the land surface is sculptured or eroded by water, wind ice. This sculpturing produces silts, which are drained into rivers. In addition, whenever water flows in a channel (natural or artificial), it tries to scour its surface (bed and banks), detaching silts, sand, and even boulders. In turn, the eroded materials act as cutting tools in the body of water. When a river traverses through poorly consolidated sedimentary rocks affected by folds. Faults and thrusts, there is

great erosion and removal of silt. Particular sediments contains particles of several different grades.

The grades or sizes of particles present in a sample of sediment are expressed by Atterberg scale, as shown on the Table below:

Atterberg Scale

GRADE	SIZE(mm)
Gravel	>2
Sand Coarse Medium	2- 0.6 0.6 – 0.2 0.2 -0.06
Silt Coarse	0.06 – 0.02 0.02 – 0.006
Fine	

The determination of the grades or sizes of particles present in a sample of sediments known as mechanical analysis can be studied in standard textbooks on soil mechanics. Irrespective of the resources, sediments arriving into water bodies can be associated with one or a combination of the following natural forces and human activities:

- i. Rainfall
- ii. Earthquake
- iii. Volcanic Eruptions
- iv. Wind (e.g. Colorado River in U.S.A.) } Natural Causes
- v. Ice
- vi. Desertification or drought
- Vii Farming
- Viii Construction works } Human Causes
- Ix Deforestation

Nigeria can be said to be free of earthquakes. Thus, rainfall, wind and human activities are the causes of sediments within the Nigerian drainage basin.

Farming is a major occupation throughout Nigeria. In the process, soil is broken to loose state and easily eroded by rainfall. Steep river banks, when eroded result in steeper banks beyond the angle of repose. On the occurrence of a rainfall, the banks become saturated leading to reduction of shear resistance, and thus, landslides, rainfall also causes deposition of sediments at the confluence of a tributary to a main river. Such is the case at Lokoja, where river Benue empties into the River Niger. The material (sediments) fans out and obstructs the main river yearly.

SEDIMENTS PROBLEMS

Sediments hinder man's activities on the river in one form or the other. The problems include:

- i. Reduction of clear depth required for navigation
- ii. Scouring of riverbanks, and thus increasing of flow resistance
- iii. Reduction of reservoir capacity and thus use and life
- iv. Damage of fertile plains
- v. degradation of riverbed (by clear water) Down stream of dam
- vi. Flooding due to large discharge and obstruction of river flow

The run off pattern of a river is influenced by the shape of its catchment area or drainage basin which in turn, is dependent on the [physical characteristics of the area vegetation nature of rocks and their erodability.

The erosive force in a river is dependent upon its flow parameters (gradient, velocity, etc) due to large catchment areas and discharges, high gradient and velocity, rivers such as rivers Niger and Benue are highly erosive. In 1998, river Benue over-topped its banks at Ibi (Taraba State Nigeria) to the end of submerging NIWA Area office (Sennuga 1998).

SOLUTION TO SEDIMENT PROBLEMS

Proven methods for the removal of sediment problem in water bodies include:

- i. Dredging
- ii. Water diversion
- iii. Improvement of river gradient

The methods are effective but each attracts colossal cost. It is worthy to mention here that the cost of dredging is increasingly becoming unaffordable globally. It is imperative therefore, that control measures be embraced now. It is important to note that the Federal government of Nigeria has in the past adopted dredging as a means of removing sediments along the River Niger and infact the oil companies have used that approach to reach their prosperity locations within the Niger Delta. In the planned dredging of the River Niger, dredging and water diversion to be adopted for the removal of the sediment from the river course.

SEDIMENT CONTROL

In the control of sediment and prevention of sediment problems, the basin or catchment area of a river is largely worked upon. Identified control measures are

- i. Afforestation of plains
- ii. Afforestation of high and steep slopes and thus protection against slide and hill erosion
- iii. Control of ravines by check dams
- iv. Contour budding and terracing
- v. Control of bank erosion and meandering
- vi. Rivers training by the provision of guide banks, embankments, groynes etc
- Vii Bank Protection
- Viii Sediment trapping by vegetation, etc

CHAPTER THREE

Manatee Status Distribution

Habitats and distribution of the manatee:

Along the River Niger and River Benue in Nigeria, manatees are seen regularly particularly during the early rainy season (i.e. April – October). Many believe to see manatee during the great flood around August – September when water becomes cold in the upstream of the tributary of the Forcados River while others agreed seeing manatee every month of the year especially in the Niger Delta region which experiences rainy season almost throughout the year.

On the Benue, questionnaires were administered at Wuro – Bokki (9.40N; 12.79E), Fufore (9.28N; 12.60E), Yola (9.36N; 12.50E), Numan (9.50N; 12.03E) Jen (9.37N; 11.47E), Lan (9.27N; 11.36E), Ilri (8.15N; 9.27E), Makurdi (7.72N; 8.58E) and Lokoja (7.83N; 6.72E). Manatee are seen regularly at all these sites. The presence of manatee was indicated along the River Niger in the following locations. Niger Delta (5.51N, 5.76E, 5.91N 5.68E, 5.92N, 5.77E), Edo State (6.41, 5.50E, 6.68N, 6.28E, 7.08N, 6.68E), Kogi State (7.82N, 4.82E, 7.08N, 6.75E); Kebbi State (12.02N, 4.75E), Kwara State (9.18N, 4.82E) and Niger State (9.85N, 5.13E).

On the whole, 97% of respondent along the Niger Lake have seen or heard of manatees in the Niger and Benue tributaries, 85% believes that the populations are not declining. However, 85% of respondents believe that the species is threatened while 89.7% know manatee hunters in their community.

Manatee Status

Manatees still exists in the Benue and its tributaries. They vary in population depending on levels of activities like large-scale fishing and agriculture (irrigation). Fishermen and Manatee hunters believe that Manatees are still abundant and will not go extinct because manatee hunting requires specialized skills.

There is general consensus that the manatee is hunted primarily for its medicinal value. Every part of the animal is useful in medicinal preparation. However, the treatment of rheumatism and its use as aphrodisiac and in warding of evil spirits are the commonest uses. Every respondent know that there are laws against the killing of Manatees but because of the high demand of its products people are willing to take the risk. Other aquatic fauna like the Crocodile, Hippo and Turtle still exist, but in very low numbers.

The manatee population in the survey area may be between 2000 to 3000 conservatively. A detail study is required to confirm this.

All respondents in this survey (mainly fishermen and farmer) have seen or heard that Manatee lives in the river Benue and its tributaries.

Manatees are seen all along the Benue river and it numerous tributaries like rivers Gongola, Taraba, Donga and many lesser known tributaries and ponds/lakes.

Almost all respondents have seen manatees in the last five years from the survey in 2002. They all believe that it is difficult to ascertain numbers but do observe them in pairs. Since they are “prohibited species” (protected by law), most people do not take much interest in their numbers. The manatee is more frequently seen noticed during the early rainy season (April to August).

Threat

85% of respondent believed that manatee is threatened. Generally, it is threatened because of

- i. Unregulated hunting
- ii. Seasonal hunting by visitors who came from far away to hunt during the dry season.
- iii. Reduction in volume of water available in the Niger
- iv. Destructing of habitat
- v. Pressure of speed boat
- vi. Traditional festival attached to the animal

People from urban areas like Lokoja, Ibi, Numan, Yola, Makurdi, Lau, Fufore and Wuro Bokki, think that there is a decline in the number of the Manatee in these area where there are large scale commercial fishing and agriculture and other forms of river use.

The decline is also believed to be caused by hunting (illegal), human activities like excessive fishing, noise and farming. The damming of Benue, some believed is a cause, because many breeding grounds have all dried up due to reduced river flow. Others are of the opinion that prolonged years low rainfall is the contributing factor and also siltation.

Shoreline Birds

There are numbers of coastal birds that utilize the Niger Delta coastlines for residence or as migratory routes. Six families belonging to Laridae (20 species) Stercorariidae (4 species), Scolopacidae (2 species), Haemtopodidae(1Species), Procellariidae (1 species) and Hydrobatidae (1 species) are marine migrants which are separated into all intra African migrants and the Paleoarctic migrants. The Niger delta is also known to host one of Nigeria’s two endemic birds- the Anambra Waxbill *Estrida polioptera* which has been recorded in Forcados (NDES 1997) which is west of the Brass River mouth and within the Arcuate Delta zone.

Marine Turtles

Sea turtles travel long distances across oceans while growing up but return to the same locality where they were born to lay their eggs at maturity. They lay eggs when they are about 30 to 50 years old and can lay up to 120 eggs at a time. They are widely caught for food, ornaments, and leather, or as traditional medicine in some societies for different ailments.

Five species of sea turtles have been identified in the Gulf of Guinea (Marquez, 1990). These are the Green Turtle (*Chelonia mydas*), Loggerhead (*Caretta caretta*), Hawksbill (*Eretmochelys imbricata*), Leatherback (*Dermochelys coriacea*) and the Olive Ridley (*Lepidochelys olivacea*). Habitats important for survival of sea turtles include nesting beaches, marine foraging grounds, and migratory corridors. Foraging grounds consist mainly of sea grass beds, coral reefs, and hard bottom habitats.

Fishermen at Brass presented ample evidence that these species of marine turtles visit the shores of Brass and its adjoining islands. Marine turtles are said to occur in large numbers in deep waters off the coast of Brass in an area lying between BOP and Agbara platforms. Fishermen reported that the sea bed in that area is rocky and has an abundant growth of sea grass (they actually produced a piece of coral from the area). Another location said to support a large number of marine turtles is an area south of the Brass Airstrip between Ewoama and Okpoama at depths ranging between 5 and 8 fathoms.

Fishermen gave the names of various species of marine turtles they known as “*siin*” (Green Turtle), “*obor*” (thought to be either Loggerhead or Olive Ridley), “*obongoro*” (Leatherback) and “*mind okoko*” (Hawksbill Turtle). The fishermen were able to tell these species by their carapace, colour and even the breeding seasons. Some fishermen at Okpoama seaside and Oiyankia also reported the existence of two other species “*Angheri*” (soft-shelled, yellowish and flatish), and “*Ibalua*” (not given proper description). These probably refer to soft-shelled river turtles (*Trionyx spp.*). Regarding relative abundance, “*siin*” (*Green Turtle*) is said to occur in higher numbers than the rest, followed by “*obor*” (Loggerhead or Olive Ridley) and then “*obongoro*” (Leatherback) “*Mindi okoko*” (Hawksbill is said to occur rarely).

Nesting Sites

The Marine Environmental Study Report (Brass LNG, 2004), listed the beaches between the Brass River, St. Nicholas, Sangana, Fishtown and Nun River estuaries as nesting sites for all five species of marine turtles. The report went further to state that the coastal area northwest of the site of the proposed marine facilities of the Brass LNG (possibly referring to Liama Ama-ogbo and Egwema Ama-ogbo) also serve occasionally as a nesting site for marine turtles.

Three potential nesting sites were mentioned by fishermen, i.e. the beach of Cape Formosa (west of Brass Island), the beach west and east of the Brass Airstrip between Ewoama and Okpoama, and the beach between Ilajekiri and Diema waterside.

Seasonal breeding patterns of turtles in the area

The FAO Species Identification Sheets (FAO, 1981) gave the following periods as breeding seasons for the different turtles in the Gulf of Guinea:

Leatherback – September to February

Olive Ridley- August to December

Green turtle - July to November

Hawksbill - September to February

Loggerhead - April to September

The peak breeding period in Ghana is from October to March, while local Brass fishermen said that turtles breed between November and February in the Brass area. Obongoro (Leatherback) is specifically said to nest around November while siin (Green turtle) nests around February. These statements would appear to agree with the observations of Armah et al. (op cit) in Ghana, and would also suggest that egg laying reaches a peak during late rains/early dry season (Nov-Feb). The young would then emerge after about 60-75 days (Armah et al. op cit) i.e. late dry season/early rains, which would perhaps explain the apparent prolonged breeding season of some species.

Threats to Marine Turtles

Fish Trawlers & Nest Raiders

The main threats to marine turtles in the Niger Delta area are fish trawlers. Some 20-30 trawlers are reported to be seen daily fishing within the shallow continental shelf of Brass in violation of the 200-mile EEZ limit imposed by International Maritime laws. Some fishermen reported that a lot of marine turtles were regularly found dead or entangled in trawl nets.

Apart from trawl nets, turtles are also caught in fishing nets and long-lines belonging to local fishermen. The inhabitants of the area are known to capture nesting turtles and to collect their eggs for consumption. When caught they are sold for meat, while

the shell, oil, fat and skin are used for different purposes depending on the species and the people concerned. Some fishermen reported that the fat and oil of leatherbacks are used in traditional medicine for treating chronic cough and stammering, while the oil is used in preparing several local dishes.

Oils Spills, Solid Waste and Artificial Lights, etc

Other threats include incessant oil spills, chemical waste, oil exploration activities, (platforms, drilling, laying of pipes, gas flares, night-lights, noise, etc) and persistent plastic debris, as well as the degradation of important nesting sites and feeding grounds. Marine turtles staying close to the ocean surface to bask, mate or breathe are most likely to collide with boats or be hit by propellers of trawlers and other marine vessels, and their shells are not always able to withstand the impact.

With regard to artificial lighting, evidence abounds that artificial lighting has a severe impact upon sea turtles. There are two primary effects. Nesting beaches that are otherwise attractive to turtles but which are exposed to artificial lighting receive a few nests because the lighting repels female. The site is therefore degraded in quality. Furthermore, hatchlings that emerge from the few clutches that laid on brightly illuminated beaches may be unable to orient towards the ocean. Many crawl in circuitous paths while others, especially if exposed to a single light source, may crawl towards the light itself (away from the ocean) where they eventually die from exposure or taken by predators. Thus artificial lighting leads to the decline of sea turtles hatcheries in two important ways: i.e by inducing many females to nest elsewhere, and over long periods by selecting against the offspring of females that nest on light-exposed beaches.

It is also well-known that sea turtles are prone to mistaking polythene bags for jellyfish, which they therefore ingest and die of intestinal blockage.

CHAPTER FOUR

COASTAL COMMUNITIES

Coastal Communities comprises states which abound within or influenced by the atlantic climate. Coastal communities which are richly blessed with varieties of both living and non-living resources. It also houses Nigeria's main source of foreign exchange- namely Oil and Gas. The states namely, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Lagos, Ondo, Ogun and Rivers states.

1. AKWA IBOM STATE

The state is located in south eastern Nigeria in the Niger Delta. The capital city is Uyo. The state has thirty-one (31) local governments. The state has land area of 8,421km². The land is used for oil industry, manufacturing, farming, fishing, trading and housing. The state is enriched with different cultural groups.

Population Dynamics

There have been dramatic growths in the population of the state. The population grew from 2,479,472 to 3,300,017 between 1992 and 2002. Projected figures for 2012 and 2022 are 4,392,077 and 5,845,526 people respectively. The average population density is 280 persons per square km. There are several more rural than urban communities with a rural/urban population ratio 70/30.

Access to Social Services

Accessibility of the people to social services such as health care, education, social security, water and sanitation, communication and political influence is generally poor.

Economic Status and Resource Use:

Farming, fishing and trading stand among the major sources of the state economic. In more recent times oil industry and manufacturing sector came into existence. Dominant industries include:

- i) Oil and Gas
- ii) Agro allied
- iii) Wood works and furniture
- iv) Soap, detergent and cosmetics
- v) Metal works
- vi) Hides and skin
- vii) Lumbering and
- viii) Arts and Craft

2. BAYELSA STATE

The coastal and marine environment of Bayelsa State is very fragile, due to the fact that water- both brackish and fresh water rivers is the medium for transportation of pollutants.

The climate of the area is humid equatorial climate, with a mean rainfall ranges from 2,000 to 4,000mm which spreads over eight (8) to ten (10) months. Temperature is fairly constant throughout the year with a mean of about 30°C.

There are three major ecosystems- brackish water swamp forest, the coastal swamp forests and Riparian forest ecosystems which all have abundant fauna and flora which interact, and are inter connected in various ways.

The coastal barriers/mangrove ecosystem is an homogenous unit comprising mostly of the red mangrove species. *Rhizophora*. The socio-economic importance of this ecosystem is overwhelming as there is a high level of biodiversity. The direct economic benefits of biodiversity concern the use of biological species for direct economic benefit which include foods, medicine etc.

The Coastal Swamp Forest Ecosystem:

This ecosystem has floating plant species, grasses and sedges and other plant species. This ecosystem is richly supplied with streams and which are home to reptiles, fishes and water plants (hydrophytes) of particular economic importance is the screw pine which is used for weaving of different local items including fishing gear, local hats. This is the most complex in terms of species diversity, number and structure with a mass of vegetation and probably uncountable wild animals. This ecosystem is home to some rare and endangered animal and plant species.

Coastal Communities:

Most of the coastal communities in Bayelsa State are small in size, and are scattered along the entire 185km coastline of Bayelsa State.

The coastal communities in Bayelsa State are predominantly rural communities with abundant natural resources. Agriculture constitutes the main stay and future source of growth of the communities, as oil companies have very little impact on them in terms of socio-economic growth.

The residents of the coastal communities of Bayelsa State belong to very few cultural groups with many similarities, because they are all part of the larger Ijaw ethnic Nationality except for minor differences in the dialects. For instance, there are the Ijaw speaking groups along the coast and also the Nembe dialect speaking groups such as the Akassa, Okpoma etc.

Population Dynamics:

The existing pattern of population distribution in the coastal communities of Bayelsa State is the outcome of the interplay of many factors, such as physical, socio economic, cultural, historical and even political.

The size of Bayelsa State population is put at 1,121,693 by the 1991 census figures. This is made up of 52.1% males and 47.1% females which is distributed among the coastal communities of the State. It is pertinent to mention here that the coastal areas are sparsely populated due to the very difficult terrain of the area, this can be noticed in both the population & age structures, sex ratio etc.

The coastal communities of Bayelsa State are by all standard typically rural communities of Black Africa, as they lack all basic social amenities, ranging from healthcare to education, hospitals are too few away from their reach and even health centers are not in existence in the communities. In addition, social security, water and sanitation, and communication is virtually absent in almost all of the coastal communities. Adequate river transportation is very minimal in the coastal communities and the coastal region is the only area in the country where roads are not in existence at all, the excuse has always been that area has a difficult terrain.

In Bayelsa State generally and, the Coastal communities in particular, poverty is wide spread, as per capita income in these communities which are predominantly rural in character is very low compared to the state average.

In addition as a predominantly rural areas, with coastal background, with rich natural resources endowment, agriculture constitutes the mainstay and future source of growth and development of the economy of these communities. The area has enormous potentials in the production of fish, lumber, medical herbs, game, spices and other agricultural products which can sustain cottage and other medium and large scale industries.

Basically, however, the primary economic activity in these coastal communities is fishing along the coastline and in the rivers, creeks.

ECONOMIC ACTIVITIES

Coastal Tourism: This is rare socio-economic activity in the state entirely, however, its importance in attracting foreign earnings cannot be overemphasized, as people are attracted to the coastal communities such as Koluama, Twon-Brass and Akassa – where sea turtle conservation programme is going on and other attractive sites are located. The State Ministry of Environment and that of Culture & Tourism are the regulatory bodies.

Agriculture: Agriculture is a very important activity both in foreign earner and as a source of domestic income and source of food for the coastal communities. All the communities of the state engage in agricultural activities, although on a very subsistence level due to poverty level and terrain problems. The State Ministry of Agriculture is the main regulatory body in the state.

Aquaculture: Aquaculture has been practiced for many years in the coastal areas of the state. Aquaculture provides for families by way of income during fish harvest. Aquaculture is also importance as it can be also developed for tourism in the coastal parts of Bayelsa State. Aquaculture is carried out throughout the entire coastal communities.

Forestry: The coastal communities of Bayelsa State also very rich in forest resources such as Carapa procera, Musauga cecropoides and even the economically important raffia palms. The sap of these plants species produces palm wine which on processing produces gin. There are also other economic trees, which include African Mango that produces ogbono and many other economic trees.

3. CROSS RIVER STATE

Cross River is located in South Eastern most corner of Nigeria in the Niger Delta. The capital city is Calabar. The state has 18 local governments and a land area of 23, 074, 425km². The land is used for oil industry, manufacturing industries, fishing, farming, trading and accommodation. The state is rich with different cultures. Population dynamics gradual changes in the population of the state. There has been changes between 1992 and 2002, the population grew from 2,022, 701 to 2,692, 063 people, projected figures for 2012 and 2022 are 3,582, 937 and 4,768, 622 respectively. The urban areas are more populous than rural areas with a rural/urban population ratio of 25/75%.

Access to social services

Accessibility of the people to social services such as health facilities, potable water and sanitation is generally poor in the Niger Delta. Communication is also poor in this state, this is because roads exist only in the inland areas, in the most coastal areas, the comparatively slow and expensive water transportation is dominant. The literate level is medium average.

Economic Status and Resource Use:

Fishing, farming and trading had been the mainstay of the state. In more recent times, oil industry and manufacturing sector came into existence and uplift economic status of the state.

Among the dominant industries include:(i) Petrochemical, (ii) Wood processing,(iii) Agriculture/fishing, (iv) Quarrying and cement, (v) Rubber latex, (vi)Crape and Crumps, and (vii) Metal processing.

4. DELTA STATE

Delta State is located in southern Nigeria in the Niger Delta. The State has twenty five, (25) local government area and a land area of 17,011km². The capital city is Asaba. The land is majorly used for farming, fishing and trading activities. Also, part of the land is used for oil industry and manufacturing industries, houses are also built on this land for accommodation of the inhabitant. The state is comprises of different cultural groups.

Population dynamics

There has been rising in the population of the state. Between 1992 and 2002, the population of the state grew from 2, 644, 716 to 3,519, 921 million people. The projected figures for 2012 and 2022 are 4,684, 754 and 6,235,060 respectively. The population density is 71.7 per km². The rural/urban population density is 71.7 per km². The rural/urban population respectively. The population density is 71.7 per km². The rural/urban population ratio is estimated at 30/70%, this is because there have been rural migration to urban centers.

Access to Social Services

Accessibility of the people to social services such as health facilities, there has been gradual improvement in the provision of health facilities compared to old survey people in the urban areas have more access to health facilities.

Communication: In the Niger Delta in general, roads exist only in the inland areas, communication is slow and expensive in the coastal areas of the state.

Access to potable water is generally poor in the Niger Delta where it is estimated that less than 20-24% of rural communities and 45.50% of urban dwellers have access to potable water.

Access to educational facilities: The state is educationally advantaged when compared with some other coastal communities. The literacy level is 65%

Economic Status and Resource Use:

Farming, fishing and trading had been the main economic source of the state. In more recent times, oil industry and manufacturing sector came into existence and uplift the economic status of the state.

Among the dominant industries include: (i) Oil and Gas, (ii) Petrochemical, (iii) Wood processing, (iv) Rubber Latex, (v) Crape and crumps, (vi) Metals and Alloys, (vii) Agriculture, (viii) Foam Manufacturing and (ix) Textiles.

5. EDO STATE

Edo state is located in South Western Nigeria with Benin City as her capital city. The state has eighteen (18) local governments and a land area of 15,650km². The land is majorly used for farming, fishing, building of both light and heavy industry, mining and housing for accommodations. The state has various cultural groups.

Population Dynamics

There has been increasing in the population growth of this state. The state's population of 2, 234, 995 million in 1992 is projected to be 2,974, 461, 3,958, 983 and 5,269, 111 million in the years 2002, 2012, and 2022 respectively. The rural/urban population ratio is estimated at 30/70, since most of the rural dwellers are moving from rural areas to urban centers for better social activities.

Access to social services:

Accessibility of the people to social services such as health care facilities is generally poor, since only few have access to healthcare facilities. On education there are various education institutions ranging from primary to tertiary. The literacy level in the state is better, compared to some other coastal communities.

Access to potable water is generally poor in the Niger Delta where it is estimated that less than 20- 24% of rural communities and 45-50% of urban dwellers have access to potable water. Communication facilities is better than some stated within the coastal communities, this is because there are more intra-state linkages of land roads, though transportation on water also occurs in the riverine areas.

Economic status and Resource Use:

Fishing, farming ecotourism woodworks, art craft and trading main economic source of the state. In more recent times, oil; industry and manufacturing sector came into existence and uplift the economic status of the state.

Among the dominant industries include:

(i) Agriculture/fishing, (ii) Petro chemical, (iii) Brewing and Plastic manufacturing, (iv) Lumbering and Sawmilling (v) Rubber processing (vi) Quarrying, (vii) Mining and Wood.

6. LAGOS STATE

Lagos State is located in the South Western corner of Nigeria. The capital is Ikeja. The state has twenty (20) local governments. The state is situated on a system of barrier/lagoon complex. Parts of the land area are used for fishing and partially for farming. Also, parts of the land are occupied by industrial manufacturing outfit (both light and heavy). Parts of the land are also inhabited by the settlers. The state is rich with various cultures and traditions.

Population Dynamics

The state has been experiencing tremendous population rising i.e between 1992 and 2002, the state experienced a doubling of population from 6, 125, 874 to 12, 050, 512 people. The projected figures for 2012 and 2022 are 23,705, 616 and 43, 127, 289 people respectively. The rural/urban ratio is estimated at 10/90 with most of the population staying in the urban area. The population growth of the state is phenomenally largely because of the daily influx of people from other states of the country into metropolitan Lagos.

Access to social services

Accessibility to social services these include health facilities, potable water and sewage treatment light, means of communications education etc.

There are many ways in which the dwellers enjoy health facilities this may be through orthodox treatment as well as western health institutions provided both by the state, private and federal government, though, these may not be readily available in the rural areas.

Potable water is been provided by the government. However, these do not function optimally due to poor maintenance and the taps are usually dry. Also, there are many bore holes in many parts of the state.

Access to educational facilities is quite appreciable compare to other states of the country. This is as a result of several educational institutions owned either by government of private individuals.

Economic Status and Resource Use:

Lagos is a major commercial center of international trade especially in the West African sub-region, fishing and farming to a less extent. Most industrial manufacturing outfits in the country are also located within metropolitan Lagos. The dominant industries are (i) Textiles (ii) Food processing (iii) Foams and Asbestos (iv) Drug and Pharmaceutical (v) metals and Alloys (vi) Cosmetics and detergents, (vii) Resins, Plasticizers glues and adhesives, (viii) Lumbering and Wood-processing and (ix) Shipping.

7. OGUN STATE

Ogun State is located in the southwestern Nigeria. The capital is Abeokuta. The state has 20 local Governments and a land area of 16.72 sq. kilometre. The Southern part extends from the Bight of Benin by the coast to approximately 8⁰N Latitude. The land is suitable for farming fishing while some parts are used for manufacturing sector and housing. The state is rich with various cultures and traditions.

Net annual population growth rate of 2.75% is assumed for 1991 – 2010 and 2.25% is assumed for 2010 – 2030. The population density in 1991 was 139.5 person per sq. km. and rural/urban ratio of 66 to 34. In year 1991 population was 2.34m, in year 2000, population was 2.99m, in year 2010 population would be 3.92m, in year 2015 population would be 4.38m, while in year 2020, population would be 4.89m.

Access to Social Services:

There are various social services provided by government and private individuals this includes potable water, health facilities, communication, education, and electricity etc. Apart from education facilities which averagely the inhabitants have access to compare to some other states. Most of the other social facilities are not adequately available and many people have no access to them.

Economic Status and Resource Use:

Farming, fishing and trading are the main base of the economic of the state. Manufacturing industries were also established in the state from which the economic of the state been improved. Among the dominant industries are: (i) Textiles, (ii) Breweries, (iii) Lumbering and sawmilling, (iv) Foam, Plastic and Rubber and (v) Quarrying.

8. ONDO STATE

Ondo state is located in South Western Nigeria with her coastline lying in the Mahin mud coast geomorphic segment of the Nigerian coastline. The state has eighteen (18) local government areas and a land area of 14,769km². The capital city is Akure. Part of the land is used for farming and fishing, while some parts are used for mining activities as well as housing for the indigenes. The state is rich with various cultures and tradition.

Population Dynamics

Between 1992 and 2002, the population grew from 2,312,535 to 2, 983, 433 people. The projected figures for 2012 and 2022 are 3,856, 469 and 4,984, 900 people respectively. Most of the population lives in the rural areas with a rural/urban population ratio of 61/39. However, people from rural area are migrating to urban area for white collar jobs and better social amenities.

Access to Social Services

There are various social services provided by government and privates individuals these include potable water, health facilities, communication, education and electricity etc. Apart from education facilities which averagely the inhabitants have access to compare to some other states. Most of the other social facilities are not adequately available and many people have no access to them.

Economic Status and Resource Use:

Farming and fishing make the main base of the economic of the state, while some trading activities also take place. Manufacturing industries were also established in the state in which economic of the state is being improved.

Among the dominant industries are:

(i) Agriculture/farming, (ii) Lumbering, sawmilling and woodworks, (iii) Oil and gas (Bitumen-due to take off), (iv) Quarrying and (v) Sand mining (River channels).

CHAPTER 5

ECONOMIC ACTIVITIES

(i) Coastal tourism

Nigeria consists of 36 states with the Federal Capital Territory in Abuja. The Nigerian coastal zone sprawls a total of nine states namely; Lagos, Ogun, Ondo, Delta, Edo, Rivers, and Akwa Ibom Nigeria has a population of about 129,934,911 people with an estimated annual growth of 2.54%. the coastal States are estimated to be composed of about 25% of the National Population.

Socio – Economic Statistics of Nigeria

Total area	923,763m ²
Land Area	910,768km ²
Water area	13,000km ²
Population	129,034,911 (2002 estimate)
Population growth	2.54% (2002 est.)
Population below poverty live	45% (2002 est.)
Oil and gas	90% of GDP, 95% of foreign exchange, about 65% of budgetary revenue
GDP growth rate	3.5% (2002 est.)
GDP composition of sector (2002 est.)	Agriculture 39%, industry 23% services 28%.
Highways	193,200km (total) paved 59,892km (including 1,194km of expressway) unpaved, 133,308.
Water ways	8.75km (Niger Benue and smaller rivers and creeks).
Ports and harbours	Apapa and Tin Can (Lagos),. On Port-Harcourt, Warri, Sapele and Calabar.
Airports	Lagos, Abuja, port-Harcourt, Calabar, Jos, Kaduna, Yola, Maiduguri, Enugu, Owerri, Benin City, Warri, Ilorin, Sokoto, Kano.

Agriculture: Development of Agriculture within the mangroves and swamps however is handicapped by poor drainage and high salinity of the soils, which are both difficult and expensive to control.

Indeed, draining the wetlands tends to increase soil acidity with adverse effects on plant growth (NEST, 1991). This is because, the mangrove soils, usually characterized by large quantities of iron sulphides, are stable for as long as they remain submerged. Acidity increases progressively with oxidation of sulphides promoting the release of aluminum salts and other chemicals which are toxic to plant and animals

Shipping Ports

Ports include the Lagos Port, Calabar Port-Harcourt Warri, Sapele, Koko and Onne ports. The coastal area is dotted by large metropolitan centers including Lagos (the former capital of Nigeria) with a population estimated at about 15 million. Other big mega cities include Port Harcourt, Calabar, Warri, Benin city, and Uyo.

Rural population; is sprawled over the entire coastal area, socio economic infrastructures in the city include those of education, health, water, electricity, communications tourism and recreation as well as many industries. It is estimated that about 70 per cent of the industries in Nigeria are located within this municipality.

The mega city houses the headquarters of most merchant, commercial and development banks as well as insurance and re-insurance companies, the largest concentration of industrial and commercial establishment in Nigeria. A large and growing population of skilled and semi-skilled persons that provide bases and market for a wide range of higher order goods and services, a range of building and allied infrastructure for local, state and federal government, regional and international organizations.

Fisheries

The mudshore fish resources of the Nigerian waters (0-50 metres) includes demersal, petagical shellfish resources. The potential yield from inshore waters is estimated at 201,000 metric tones per annum. Small scale fisheries contributes between 50 and 70% of total domestic production Tobor, (1965 and 1968) recorded about 157 species of fish belonging to 71 families in the Nigerian inshore waters. Demersal species are grouped according to their area of occurrence either above or below the thermocline (30-40m depth).

The pelagic fish resources are mainly the clupeid family and the most exploited are:

Ethmalosa fimbriata, *Sardinella maderensis*, *Sardinella aurita* and *Illisha africana*. Others such as anchory and the scombrids are not the major targets of the small-scale fishery. Shellfish harvested by the artisans include white shrimps (*Macrobrachim macrobrachinum*), river prawn (*Macrobrachium vollenhovenii*), and juvenile pink shrimp *Penaous notialis* and *penaeus duorarum*. The industrial shellfish fishery targets the adult pink shrimp *Perous notiales* and *Penaeus duorarum*. Taking considerable

quantities of the guinea shrimp *Parapenaeopsis atlantica* in the process (Adetayo and Ajayi 1996).

Shrimp resources are abundant around river mouths and Lagos entrances, important species occurring in Nigerian waters are the pink shrimp *Penaeus notialis*, dominant in 10 to 50 m water, the tiger shrimp *Penaeus kerathrus* and the near shore shallow coastal shrimp *Parapenaeopsis atlantica*.

Forestry

Within the mangroves and wetlands and both epifauna and infauna. The epifauna are those that occur on the stilt roots and branches of *Phizophora* sp.

Lying submerged on the stilt roots are the barnacles mainly *Chthamalus estuarii* and intermingled with these communities are the *Polychaetes marciarella enigmatica*; *Balanus pallidus* and *Hydriodes uncinata*; bivalves which consists mainly of Oysters e.g. *O. tulipa* and the less saline species *Crylea gazar*. The infauna are those that live in or on the sediments of the mangroves swamp. At high tides, they are usually submerged and exposed at low tide. Dominant members of the infauna are *Pachymehnia guadriserata*, *Tympanotonus fuscantus variadula* that are of commercial value.

Wetlands in the Niger Delta offer multiple benefits, many of which are still only potential in the area. The detritus and nutrients from these wetlands form the food base of many marine and freshwater organisms of economic importance.

For example, the estuarine wetlands form important spawning grounds for fish. While both the estuarine and freshwater wetlands are important for wildlife and wood resources.

Industries

Industries include crude oil, coal, tin, columbite, palm oil, peanuts, cotton, rubber, wood, hides and skins, textiles, cement and other construction materials, food products, footwear, chemicals, fertilizer, printing, ceramics, steel petrochemical, breweries, textile, automobile and other small scale industries.

Subsistence agriculture produces maize, yam and other crops, cash crops include cocoa, rubber and cotton.

CHAPTER SIX

MAJOR HUMAN AND NATURAL IMPACTS ON COASTAL ECOSYSTEMS

The Nigerian coastal environment is subject to various human and natural impacts caused by high populations, industries and agricultural activities aimed at meeting the food, energy, goods and other requirements of the populace. A lot of the environmental problems of the coastal zones are caused primarily by land-based activities. The following common problems have been identified (Awosika et al 2001) at the national level, viz.

i. Over exploitation of fisheries

In Nigeria, the potential yield of the fish resources from all sectors (wastal, brackish water, rivers and lakes aquaculture and off shore fisheries) is estimated at 1, 180, 12J metric tonnes, the breakdown of which is as follows

Inshore fisheries (brackish/coastal)	201, 300 metric tonnes
Offshore fisheries	33, 900 metric tonnes
Inland fisheries	288,200 metric tonnes
Fish farming	1,180, 215 metric tonnes

Source: Federal Department of Fisheries 2006

Tobor (1992) estimated the maximum suitable yield for Nigerian fisheries at 240,000 metric tonnes. The official catch figure here exceeded the MSY greatly (Moffat and Linden 1995). In Rivers state of Nigeria for example, between 86,000 to 107,000 tonnes decreased to values ranging between 16,000 and 19,000 tonnes in the 1986 to 1987 period (Moffat and Linden 1995). The use of undersized mesh results in the catching of juvenile leading to decline in fishing resources. Over exploitation activities of the fish resources is carried out by both the small (artisanal) fisherman and the commercial transfers.

Degradation of coastal environment resulting from oil spill and sand filling led to the reduction and destruction of breeding and nursery grounds in creeks, swamps, mud flats, river channels estuaries and near shore zone. The conversion of the mangrove ecosystem to office uses (plantations, housing estates, highways etc) has led to reduction of large area where fish namely breed; pooling is a contributing factor to over-exploitation of fishery resources in Nigeria.

(2) Coastal and Marine Pollution

As a result of high level of population in Nigeria, there has been increased application of technology in the exploration and exploitation of natural resources aimed at producing more food, goods and services. The rise in industrialization and agricultural activities have led to release of different categories of wastes into the environment. These wastes sometime reach and exceed toxication level and are thus classified as pollutants.

In Nigerian the developments of the petroleum industry release pollutants such as petroleum hydrocarbon into the coastal environment. Solid wastes from domestic homes, sewage and effluents from industries also pollute the marine environment and have adverse effect on the marine lives.

(3) Oil Spills

This is a major impact on the coastal environment particularly in the Niger Delta area where oil prospecting is extensive. In 1970 one oil spill of about 150 barrels oil as recorded with number increasing to 14 in 1971 involving 15, 110 barrels of crude oil. Between 1974 and 1980 the cases of oil spill had increased from 105 and 1982 there were 1,581 oil spills involving two million barrels of oil.

Potential impacts of oil spills include among others

- (i) High mortality of aquatic animals
- (ii) Contaminations of human lathered
- (iii) Impairment of human health
- (iv) Loss of biodiversity in breeding grounds
- (v) Vegetation destruction and other ecological hazards
- (vi) Loss of portable and industrial water resources
- (vii) Reduction in fishing activation
- (viii) Poverty, rural underdevelopment and bitterness nothing the coastal communities.

(4) Coastal Erosion and Flooding

The coastline has been subjected to erosion over the years in Nigeria, scientist from the Nigerian Institute for Oceanography and Marine Research (NIOMR) have reported widespread erosion and flooding of the Barrier Islands and the Niger Delta (Ibe et al 1984, Awosika 1993) created erosion resulting from deficit of sand due to natural and anthropogenic activities varies in intensifies from area to area along the coastline. Notable among the natural causes of coastal erosion are vulnerable soil characteristically topography and occurrence of off shore canyons. Anthropogenic cause includes destruction of coastline dredging and dams of rivers.

The Victoria beach is the fastest eroding beach in Nigeria with arrange erosion rates of 20-30m yearly. Erosion rates range between 18-24m annually at Ugborodo/Escravos, Forcados 20-22m, 16-19m at Brass, Karamo 15-20m, Bonny 20-24m and Opobo 10-14m as reported by Ibe in 1989 coastal erosion with serious flooding is carry widespread damage in many areas along the coastal zone. The beaches along the Nigerian coastline are very susceptible to flooding due to their very low topography. Flooding of the Victoria Island in Lagos state and other lowlying areas of the state are common during the rainy season (June-August). High rainfall in the Niger Delta coupled with poor drainage allows storm waters to collect in the hollows and eventually flood large areas within the Delta.

(5) Physical modification and Destruction of Habitats

In Nigeria, the coastal zones have undergone wide modifications in the last thirty years. Due to high pressures on coastal resources conflicting exploitation techniques and increasing population leading to loss of biodiversity, ecosystem and reduced value of coastline. The destruction of mangrove ecosystems has been on the

increase since exploitation of oil and gas started in the Niger Delta resulting in replacement of mangrove vegetation by new vegetation like grasses and clumber.

The kwale games reserve in the 1950's was rich in biodiversity but due to oil exploration, gas production and poaching elephants and many flora and fauna here disapproved in the Reserve several animal species of conservation interest including Scalter's Guenon, Delta Red Colobus, the crested Genet, the Pygmy Hippo Chimpazee and African Leopard have almost disappeared in the Niger Delta, many plants of medicinal, economic and cultural values such as *Thaumatococcus daniel* (sweetener), *Fegara* sp (for sickle cell anemia) and *Rauvolfia vomitoria* (for treatment of high blood pressure and now rare in the Niger Delta).

The major socio-economic problems result from poverty ecosystem modification in the coastal zones include unemployment because the people depend on their tradition means of livelihood.

(6) Climate change and Sea level Rise

The consequence of global temperature increase on coastal zone is the accelerated rise in sea level due to thermal expansion of oceanic waters. Results from ramous models on the magnitude of global warming predict an acceleration of the eustatic rise in sea level from 12-15mm/yr over the last 100 years to anything between 0.56m and 3.68m by the end of the 21st century. Latest projections of sea level rise predict a sea level rise between 65-85cm by the end of the 21st century (Second World Climate Conference Genera 1990). The UWEP/ICSU/IMO International conference in villach, 9-25 October 1985 accepted an increased temperature of 15-45⁰c and sea level rise of 20-140cm before the end of 21st century.

The rate of sea-level rise along the Nigerian coastline in the past have not been quantified due to paucity of data. The average mean sea level obtained from tide gauge records (Lagos) between 1960 and 1870 was 0.462m above the zero of the tide gauge. The Nigerian coastline is no exception to the adverse effect of sea level rise as shown in the past assessment of impacts of sea level rise on the Nigeria coastal zone (Ibe 1990, Awosika et al 1990, 1992 and 19993).

Two major case studies have since been carried out by NIOMR. These are (a) impacts of sea level rise on the coastline of Nigeria using Ariel videotape assisted vulnerability Analysis (AW) (Nicholas et al 1993) technique coupled with ground truth data (Awosika et al 1992 and (b) implications of climate changes and sea level rise on the Niger Delta using historical and recent records and information (Awosika et al 1993). Results from these studies reveal that several areas of Nigerian coastal zone are highly vulnerable to climate change and sea level rise.

The Niger Delta could lose well over 15,000 sq km of land by the year 2100 with a one-meter sea level rise (Awosika et al (1993). The Victoria Island and Lekki in Lagos could lose well 584 and 602 sq km of land from erosion while inundation could completely submerge the entire Lekki barrier.

The other adverse effect of sea level rise in the Nigerian coastal zone as earlier assessed by Ibe (1990) Awosika et al (1991-1992 and 1993) indicate increased salinization of both ground and surface water leading to death of plants and animals that cannot tolerate high salinity which will adversely affect coastal agriculture water supply as well as coastal industries.

(7) Invasive Species

The cutting down of mangrove vegetation by local people for building and firewood together with effect of oil and gas on mangrove vegetation, resulting in destruction of mangrove species, thereby encouraging the spread of NYPAL palm (an exotic species) which is fast displacing mangroves in many disturbed areas. The emergence of grasses and climbers in areas where mangrove species have been destroyed is a major impact in coastal zone in Nigeria.

CHAPTER SEVEN

COASTAL GOVERNANCE

Three tiers of Government exist in Nigeria under the 1979 constitution amended in 1984. These are Federal, State and Local Governments. The Nigerian Constitution allows States to make legislation, laws and edicts on the environment.

In Nigeria, many Ministries, Extra-ministerial departments, Agencies of the Federal Government, State and Local councils, Research Institutes, Universities, Private organizations and NGOs have been actively involved in different activities aimed at the sustainable development of the coastal zone. In recognition of a need for co-ordination, there is also a joint Ministerial committee set up by the Federal Government to hold regular consultations on matters of mutual interest for the protection and development of the coastal and marine environment.

In recognition of the need to address issues associated with various environmental problems in the country, several bodies and institutions have been established. In addition, Nigeria has many existing national, state and local government legislations and edicts that are designed to ensure the sustainable management of the coastal and marine areas. All national legislation have national jurisdiction. In other to remove duplication and conflicts, states or any other local legislation are meant to reinforce the national legislation. At the national level, the Federal Ministry of Environment has a national jurisdiction for all environmental issues.

Nigeria has a national policy on the protection, management and development of the marine and coastal environment. The major thrust of which is encapsulated in the overall objective of the National Policy on Environment, which are stated as follows:

- (i) securing for all Nigerians a quality of environment adequate for their healthy and well being
- (ii) conserving and using the natural resources for the benefit of the present and future generations:
- (iii) restoring, maintaining and enhancing the ecosystems and ecological processes essential for the preservation of biological diversity,
- (iv) raising public awareness and promoting understanding of the essential linkages between environment and development;
- (v) cooperation with other countries and International organisations and agencies to achieve (i)-(iv) above and prevent trans boundary environmental pollution.

Legislation affecting the conservation and management of Nigeria Coastal Zone-are embedded in legislations classified under: Forestry, Wildlife, Fisheries, Crude Oil exploration and exploitation and Exclusive Economic Zone and Natural resources conservation. In all, there are about 20(nos.) legislations already for this purpose.

There are also, various institutions that deal with protection, management and development of the marine environment in Nigeria. These include but not limited to the following:

- (a) Federal Ministry of Environment, Housing and Urban Development (Lead Institution)
 - (b) Federal Ministry of Aviation (Dept. of Meteorology)
 - (c) Federal Ministry of Defence (Navy)
 - (d) Federal Ministry of Transport (National Maritime Authority)
 - (e) Federal Ministry of Foreign Affairs (International Negotiations and Agreements)
 - (f) Federal Ministry of Solid Minerals (Regulations Mining in the Coastal Zone)
 - (g) Federal Ministry of Petroleum Resources (Dept. of Petroleum Resources)
 - (h) Federal Ministry of Justice (Adjudication and Drafting of Ecological laws and policies)
 - (i) Federal Ministry of Water Resources
 - (j) Federal Ministry of Lands
-
- All the thirty six states and all the Local Governments in the country
 - Nigerian Institute for Oceanography and marine Research (NIOMR)
 - Some Nigerian Universities,
 - Petroleum Training Institute

 - NGOs- Many NGOs including the Nigerian Environmental Society (NES), Nigerian Environmental Watch (NEW), Nigerian Study Action Team (NEST) etc.

CHAPTER 8

CONCLUSION AND RECOMMENDATIONS

8.1 CONCLUSION

This report has identified some weaknesses, commonalities and gaps associated with various issue raised. For instance, the immediate sectoral and root causes of oil spill as well as the impacts are common for Niger Delta coastal zone. Some common inadequacies in Government policies and programmes are traceable to some lapses in governmental responsibilities. For example, when legal instruments for pollution control and or the regulation of industrial activities are examined, some existing laws are inadequate.

There is poor data base in Nigeria which does not give room for meaningful decisions on appropriate interventions. There is also inadequate distribution of national regional or global wealth and opportunities thereby affecting opportunities for survival and acquisition of relevant technological and managerial capacity especially in highly skilled sectors. The lack of sufficient opportunity for survival has brought about poverty, low standard of living resulting in desperation and restiveness particularly in the Niger Delta area. This situation has lead to sabotage which is a major cause of oil spills.

A large proportion of the people are unable to appreciate the impacts of some of the activities on the environment due to lack of adequate capacity. They are not able to make meaningful contributions to environmental protection and management measures. There is poor awareness and communications and existence of communication gaps leading to a situation of no free flow of information between governments, communities and other stakeholders.

8.2 RECOMMENDATION

The issues raised in this report need urgent attention in the form of concrete interventions as highlighted below:

8.2.1 Oil Spill

- v. Remediation of polluted areas
- vi. Provision of receptive facilities at ports in Nigeria
- vii. Capacity building for oil spill management and technical acquisition
- viii. Monitoring of oceanographic processes and health of sensitive eco-systems.

8.2.2 Solid Waste

- v. Implementing sound disposal methods
- vi. Implementation of sustainable collection and disposal techniques
- vii. Formulation and implementation of waste minimization strategies
- viii. Waste to wealth strategies (recycling)

8.2.3 Sewage

- iii. Monitoring of health of the coastal environment from sewage and solid Waste
- iv. Low cost technology sewage treatment and management facilities

8.2.4 Modification of Ecosystems

- v. Public enlightenment programme
- vi. NEPA palm project
- vii. Mangrove restoration
- viii. Monitoring of coastal and marine processes for integrated management of degraded ecosystems
- v. Mitigating coastal erosion using environmentally friendly options

8.2.5 Climate Change

- I Development of national climate change plan of action
- ii Inventory of Greenhouse gases
- iii Coastal protection from flooding and erosion resulting from sea level rise.

8.2.6 Exploitation of Fishery Resources

- ii. Strengthening legal instruments for effective management of fishery Resources
- ii Fish stock assessment
- iii Public enlightenment programme for sustainable exploitation of Fishery resources
- iv Development of coastal aquaculture

REFERENCES

- Awosika, L.F. (1991). Offshore avon Canyon west of the Niger delta: Sedimentary Processes and possible implications for Hydrocarbon Entrapment: In Proceeding Nigerian Association of Petroleum Explorationists 9th Annual Conference, Nov. 20 - 22, 1991.
- Awosika, L.F., Ojo, O, Ajayi T.O. et,al (1993): Geomorphic features of the Gulf of Guinea Shelf and Littoral drift dynamics. In Proc. International Symposium on the results of the first IOCEA Cruise in the Gulf of Guinea, 17-20 May 1994.
- Awosika, L.F., Osuntogun, N.C., Oyewo, E.O. and Awobamise, A, (2001): Development and Protection of the Coastal and Marine Environment in Sub sahara Africa: Report of the Nigeria Integrated Problem Analysis.
- Awosika. L. et al (2001): Report of the Nigerian Integrated Problem Analysis on Development and Protection of The Coastal and Marine Environment in Sub-Saharan Africa 15, 16 pp.
- Ibe, A.C., (1987). Coastal Erosion in Nigeria. Ibadan University Press Ibadan. Nigeria.
- FAO, (1981): Land Use Area Data of Nigeria.
- FAO (1998): Integrated Coastal Area Management and agriculture, forestry and fisheries. FAO, Rome.
- NEST (1991): Nigerians Threatened Environment. A National Profile. Nigerian Environmental Study Action Team Ibadan 288pp.
- Nicollas, R. J., Awosika, L. F., Niang-Diop, I, Dennis, K. C. and French, G. T. (1993). Vulnerability of West /Africa to accelerated Sea Level Rise "In L. F. Awosika, A. C. Ibe and P. Schroadereds, Coastlines of Western Africa, New York American Society of Civil Engineers.
- Nwachukwu, C. O. (2000) "Environment , Food and Agriculture Dynamics: Development Policy Implications for Natural Resources Exploitation and Exploitation in the Niger Delta Wetlands Wildlife and Biodiversity region of Nigeria" In A. Osuntokun (ed) op. cit.
- Semaga, A.A.,; Sediment and Sediment Problems Within the National Inland Waterways Authority (NIWA) Operational Areas.
- Sorensen, J.C. and Mc Creary, S.T. (1990): Institutional arrangements for managing coastal resources and environments. Second edition (revised). Renewable Resources Information series coastal management publications No. 1.

UNEP, (1995): Guidelines for Integrated Management of Coastal and Marine areas, with special reference to the Mediterranean basins. UNEP Regional Seas Report and Studies. Nairobi No. 161.

Tobor, J. G. (1992): Fin and Shellfish of Conservation interest in Nigeria. Paper read at the 1st National conference on Conservation of Aquatic Resources in Calabar 11th – 14th May, 1992.