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IMPLEMENTATION OF A PUBLIC AWARENESS AND PUBLIC
PARTICIPATION PROGRAMME IN RELATION TO MANGROVE
DEPLETION AND PROPOSED RE-FORESTATION IN COASTAL NIGERIA

Technical report: Preliminary Report on the design of a questionnaire and extent of
mangrove loss and documentation of the most impacted sites

Prepared for the United Nations Industrial Development Organization

Based on the work by
Bioresources Development and Conservation Programme (BDCP)

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EXECUTIVE SUMMARY

Overview

Nigeria, the largest country in Africa with a total area of 923,769sq km (land 910,768 and water 13,000 sq km) is located between 4° and 14° latitude north and 2.30° and 14.30° degrees longitude east (Figure 2.1). It is bordered in the west by the republic of Benin, in the east by the Republic of Cameroon, in the North by Niger Republic and Chad in the northeast and the Gulf of Guinea of the Central Eastern Atlantic in the south. The Nigerian coastal and marine area is a narrow coastal strip of land bordered by the Gulf of Guinea of the Central Eastern Atlantic. The coastal areas stretch inland for a distance of about 15km in Lagos to about 150km in the Niger Delta and about 25km east of the Niger Delta.

Mangroves are found to some extent in all the nine coastal states of Nigeria (Lagos, Ogun, Ondo, Edo, Delta, Bayelsa, Rivers, Akwa Ibom and Cross River). The major concentrations however are in the key Niger Delta states of Delta, Bayelsa and Rivers. The widest reach of mangroves is in the edges of the Niger delta and specifically Delta and Rivers states. The Lekki and Lagos lagoons have the largest component of mangroves in the western axis. The Cross River has a secondary delta associated with the branching of the river into an estuary. This reaches 7-8km in width and stretches inland into the estuary for about 26kilometre (FAO, 2005). Edo state though not on the Atlantic coast has a tiny mangrove section along the Gwato creek. A further amount is along the boundary line with delta state as the Ossiomo enters the Benin River.

Mangrove is a distinct sub-set of the Nigerian rainforest and estimated to cover about a tenth of the forest and wooded area of 31.59 million hectares (Ibianga, 1985). It is found on the coast and stretch into the rivers and its complex lagoons in several places. Spalding (1997) estimates the Nigerian mangrove to be about 10,500km².

All over the tropical world, mangroves are regularly harvested by coastal communities to meet their needs but mangrove use is not confined to subsistence, small-scale harvesting (FAO, 1985). For example, before the discovery of oil in Nigeria, about 20 000 m³ of mangrove wood was utilized annually in the coal mining industry as pit-props (Adegbehin and Nwaigbo, 1990). Even though the demand for coal has drastically declined, mangrove wood is still extensively used in Nigeria and the extraction of much

higher volumes of wood is undertaken exclusively as selection harvesting under licence agreements with the competent authorities (Isebor and Awosika, 1993).

Rationale

Mangrove forests usually consist of taxonomically diverse, salt tolerant trees and other plant species which thrive in inter-tidal zones of the sheltered tropical shores, over-wash islands, and estuaries. Mangrove trees have specially adapted aerial, salt filtering roots and salt excreting leaves that enable them to occupy the saline wetlands where other plant life cannot survive.

Mangrove forests are vital for healthy coastal ecosystem. They help protect coastline from erosion, storm damage and wave action. They act as buffer and catch alluvial materials, thus stabilizing land elevation by sediment accretion that balances sediment loss. Vital coral reefs and sea grass beds are also protected from damaging siltation. It has been postulated that the last sunamy in South- Asia could have been less devastating if mangrove depletion has been less extensive. Also, it has been predicted that Coastal Nigeria cities of Lagos, Warri and Port Harcourt will be under water in the next couple of decades if the present level of mangrove depletion is not controlled.

The mangrove forests of Nigeria is the third largest in the world and largest in Africa. Over 60% of these forests is found in the Niger Delta. The area is generally inhospitable and difficult to develop. The area is inhabited mainly by fishermen/women and small farmers. The dense vegetation of mangrove forest found in most of the coastal states have become a dependable source of fuel wood for domestic and small scale food processing as well as income generation. In Nigeria, mangroves and associated mangrove species are used for charcoal, firewood, wood distillation, poles and *Nypa* products. Species mostly used for charcoal are *Rhizophora spp.*, *Avicennia spp.* and *Laguncularia spp.* Mangrove poles are used for building and flooring of houses, foundation piling, scaffolding and fishing stakes. The leaves are also used for medicinal purposes.

Similarly, the fresh water swamp forest vegetation occurring around fresh water creeks and lakes support fishing activities, gathering of sea foods, fuel wood, gin distillation from raffia palm trees (*Raphia vinifera*), collection of African mango seeds, Ogbono, (*Irvingia gabonensis*), snails, weaving of mats and other objects/items from screw pines (*Pandus candelabrum*), rattan palm (*Pandus andelabrum*), and bulrushes etc. The population engage in subsistence farming, depending on availability of land, for their

livelihood. In addition, mangrove forests have been of great use, supporting some of Nigeria's highest level of biodiversity and as habitat for numerous endangered plants and animal species.

In recent times, however, the mangrove forest and coral reef of Nigeria's coastal states has become highly degraded and depleted with the result that the ability of the ecosystem to fulfill its numerous functions is threatened. It is for this reason that it has become necessary to call attention to the risks and problems of the mangrove ecosystem in the coastal states of Nigeria.

Terms of Reference for the preliminary stage

The tasks involved in this preliminary stage as detailed in the terms of reference include to:

- Design a questionnaire for use in gathering information about the status of mangrove alteration and the causative factors in coastal Nigeria.
- Determine, via the questionnaires and backed by site visits, the extent of mangrove loss and document the most impacted sites.

The long term purpose of the project is to protect and restore the mangrove depletion through public awareness and promotion of reforestation in the Gulf of Guinea Large Marine Ecosystem (GCLME) of which Nigeria is a part. The purpose of this specific programme is to undertake a public awareness and participation campaign aimed at sensitizing coastal communities and other important stake-holders on the risks and problems associated with the continued destruction of the mangrove forests and the consequent deterioration of the ecosystem and depletion of associated living resources.

Methodology of the Study

The study has been undertaken in the coastal states of Nigeria (Akwa-Ibom, Bayelsa, Cross River, Delta, Edo, Lagos, Ogun, Ondo, and Rivers). The specific communities visited are listed under each state report. Information for the study was obtained through a copious desk analysis of existing data on mangrove and the Niger Delta coastal states, visits, personal and group interviews with leaders and knowledgeable persons in the mangrove communities and use of questionnaires, interaction with relevant stakeholders (oil companies, NGOs and civil society organizations etc). The data obtained has been subjected to substantial interpretation and complemented with photographs to give a comprehensive and vivid understanding of the results.

Preliminary Findings

Preliminary findings indicate that there is substantial mangrove in most of the states with the red mangrove (*Rhizophora racemosa*) and the white mangrove (*Avicenneaceae*) predominating. Both species have been subjected to severe depletion due to human activity. Community leaders and rural dwellers in general as well as most stakeholders are fully aware of the problem. The study has raised the level of awareness of the study group substantially and there is evidence that they will participate in the stakeholder workshop to develop and implement an action plan to be agreed to later.

TABLE OF CONTENTS

| | |
|--|-----------|
| TITLE PAGE..... | 1 |
| EXECUTIVE SUMMARY..... | 2-5 |
| TABLE OF CONTENTS..... | 6-9 |
| Section 1.0 | |
| 1.0 INTRODUCTION | 11 |
| 1.1 <i>Background</i> | 11 |
| 1.2 <i>Level of Dependence on Mangrove as a Resource</i> | 11 |
| Table I- mean annual increments expected from mangrove stock | 12 |
| Table II: Percentage contribution of each forest type to total area and yield. Figures in brackets are the percentages of reserved estate within each forest type..... | 13 |
| Table III: Projected wood supply in the various product classes | 13 |
| 1.3 <i>Poverty reduction and mangrove resource</i> | 13 |
| 2.0 THE NIGER DELTA..... | 15 |
| 2.1 <i>Topography</i> | 16 |
| Figure 2.1a: The drainage system in the Niger Delta | 17 |
| Figure 2.1b: Drainage System in the Niger Delta..... | 17 |
| 2.2 <i>Vegetation</i> | 17 |
| Figure 2.2a: Map of the mangroves of the Niger Delta..... | 18 |
| Figure 2.2b: Changes in the Mangrove Ecosystem between 1987 and 2002 obtained from the Landsat satellite imageries | 19 |
| 2.3 <i>Climate</i> | 20 |
| 2.4 <i>Tides & Flooding</i> | 20 |
| 2.4.1: Tides..... | 20 |
| Figure 2.4.1a: Observed, predicted and residual Tides at Dodo for February 1993 (after Ezeigbo et al, 2003) | 22 |
| Figure 2.4.1b: Semi Diurnal Tides at Opobo..... | 23 |
| 2.4.2 Flooding..... | 24 |
| Figure 2.4.2a: Minimum Tidal data for 8 locations in the Niger Delta..... | 24 |
| Figure 2.4.2b: Maximum Tidal Data for 8 locations in the Niger Delta..... | 25 |
| 2.5 <i>TIDES IN RIVERS OF THE NIGER DELTA</i> | 26 |
| 2.6 <i>TIDAL PHENOMENON</i> | 27 |
| 2.6.1 Available Data..... | 28 |
| Table IV: Data from River Gauges..... | 28 |
| Fig 2.6.1 Distribution of tide gauge locations..... | 28 |
| 2.7 <i>TIDAL ANALYSIS AND PREDICTION</i> | 29 |
| 2.7.1 Tidal Analysis..... | 29 |

| | |
|---|-----------|
| 2.7.2 Tidal Prediction..... | 31 |
| 2.8 RESULTS AND ANALYSIS | 31 |
| Figure 2.8 a: Semi diurnal tides in Opobo..... | 32 |
| 2.8.1 AJAMIMOGHA RIVER..... | 32 |
| 2.8.2 BENIN RIVER..... | 32 |
| 2.8.3 BRASS RIVER..... | 32 |
| 2.8.4 DODO RIVER..... | 32 |
| 2.8.5 NEMBE RIVER..... | 33 |
| 2.8.6 OGBOINBIRI RIVER..... | 33 |
| Fig 2.8b: Maximum Tides in the Area..... | 33 |
| Fig 2.8c Minimum Tides in the Area | 33 |
| 2.8.7 OPOBO RIVER..... | 34 |
| 2.8.8 SOKU RIVER..... | 34 |
| 2.8.9 YENEGOA RIVER..... | 34 |
| 2.9 MAJOR FEATURES OF TIDES IN THE NIGER DELTA..... | 34 |
| Table V: Maximum, Minimum and Mean Tides at each location..... | 34 |
| Fig 2.9: Observed, predicted and residual Tides at Dodo for February 1993 | 35 |
| 2.10 CONCLUSIONS..... | 35 |
| 3.0 GLOBAL DISTRIBUTION OF MANGROVES..... | 36 |
| 3.1 IMPORTANCE OF THE MANGROVES..... | 36 |
| 4.0 STATUS OF MANGROVE FOREST IN NIGERIA..... | 37 |
| 4.1 Background..... | 37 |
| Table VI; Fig. 2.1 The distribution of mangrove vegetation in Nigeria (In Land Use Area Data of Nigeria (F A O, 1981)..... | 38 |
| 4.2. <i>Modification of the Mangrove Ecosystem in Nigeria</i> | 39 |
| (i) Coastal Erosion..... | 39 |
| (ii) Flooding..... | 40 |
| (iii) Pollution..... | 40 |
| (iv) Oil spills..... | 41 |
| (v) Solid wastes..... | 41 |
| (vi) Sewage..... | 42 |
| (vii) Global climate change and sea level rise..... | 42 |
| 5.0 MANGROVES IN NIGERIA..... | 42 |
| Table VII: Niger Delta Mangrove Forest Estimates..... | 43 |
| Table VIII: mangrove area in coastal states of Nigeria..... | 44 |
| Plate 1: the crab <i>Calinectes</i> , an occupier of the mangroves is an important crab species harvested in Delta state..... | 45 |
| Plate 2: prawns from the mangroves on sale in a local market..... | 45 |
| Table IX: Mangrove types in Nigeria..... | 46 |
| 6.0 EXTENT OF MANGROVE LOSS IN NIGERIA..... | 47 |
| 6.1 <i>Threats and drivers of change in mangrove vegetation</i> | 48 |
| 7.0 STATUS OF THE MANGROVE FORESTS IN NIGERIA..... | 50 |
| 7.1 <i>Destruction of mangroves</i> | 50 |
| 7.2 <i>The petroleum industry</i> | 50 |

| | |
|--|----|
| Box I: impacts of petroleum industry activities in selected sites..... | 50 |
| 7.2.1 Oil industry stresses..... | 51 |
| Box 2: Experiments on impact of oil on mangroves..... | 52 |
| Box 3: Oil spillage in Delta State | 53 |
| Table X Fuelwood demand and supply balance..... | 55 |
| Table XI: distribution patterns in the collection, processing and marketing of NTFPs in Nigerian mangrove..... | 57 |
| Table XI: Estimate of annual gross income from major NTFPs in the major zones of Nigeria | 58 |

Section 2.0

8.0 STATE REPORTS: EXTENT OF MANGROVE LOSS AND MOST IMPACTED SITES

| | |
|---------------------------------|-----|
| 8.1 DELTA STATE..... | 60 |
| 8.2 EDO STATE..... | 69 |
| 8.3 LAGOS STATE..... | 81 |
| 8.4 RIVER STATE | 119 |
| 8.5 BAYELSA STATE..... | 122 |
| 8.6 OGUN STATE | 138 |
| 8.7 ONDO STATE..... | 168 |
| 8.8 IMO STATE..... | 201 |
| 8.9,8.10 Executive Summary..... | 202 |
| 8.9. CROSS RIVER STATE..... | 206 |
| 8.10 AKWA-IBOM STATE..... | 210 |

9.0 CONCLUSION.....

10.0 OIL COMPANIES.....

| | |
|---|-----|
| 10.1. AGIP..... | 219 |
| 10.2. SHELL (S P D C)..... | 220 |
| 10.3. MOBIL (Mobil Oil Producing Company, Nigeria)..... | 223 |
| 10.4. TOTAL..... | 223 |

REFERENCES.....

Section 3.0

LIST OF ANNEXES

ANNEX 1: NIGER DELTA DRAINAGE SYSTEM.....

ANNEX 2: MANGROVE FORESTS OF NIGER DELTA.....

ANNEX 3: SAMPLE INFORMATION ASSESSMENT QUESTIONNAIRE FOR RESOURCE PERSONS, STAKEHOLDERS, NGOs AND OTHER INSTITUTIONS.....

ANNEX 4: SAMPLE QUESTIONNAIRE FOR COASTAL COMMUNITIES.....

| | |
|---|-----|
| ANNEX 5-REPORT ON FIRST STAKEHOLDERS /ICAM AND MANGROVE RESTORATION MEETING..... | 238 |
| ANNEX 6: TECHNICAL SCIENTIFIC WORKING GROUP AND PROJECT STEERING COMMITTEE MEETING..... | 258 |
| ANNEX 7: WORK PLAN (Mangrove Project)..... | 263 |
| ANNEX 8A: LIST OF OIL COMPANIES..... | 266 |
| ANNEX 8B: LIST OF NGOs AND INSTITUTIONS..... | 267 |

SECTION 1.0

1. INTRODUCTION

1.1 Background

The coastal areas of Nigeria, which house the Mangrove ecosystem have undergone wide modifications especially in the last thirty years. Most of the modification had been due to increasing pressures on coastal resources, conflicting exploitation methods, increasing population and other anthropogenic activities. These activities include oil pollution, gas flaring, industrialization, soil degradation, heat stress, acid rain, water resource degradation, introduction of alien invasive species and deforestation. Most of the modifications have resulted in loss of biodiversity, reduced ecosystem viability and value of coastal systems.

In many cases for example, mangrove ecosystems have been on the decrease since exploitation for oil and gas commenced in the Niger Delta. Most areas, which had dense mangrove vegetation, have been replaced by new vegetation like grasses and climbers. Cutting down of mangrove vegetation by local people for building and firewood also result in deforestation of the mangrove vegetation. This has also encouraged the spread of *Nypa* palm (an exotic species) which is fast displacing mangroves in many disturbed areas.

The purpose of the project is to implement a public awareness and public participation programme in relation to re-forestation of degraded mangrove forests in south-eastern Nigeria. The purpose of this preliminary stage is to design a questionnaire, determine the extent of mangrove loss and documentation of the most impacted sites.

The above objective will be achieved by the use of questionnaires backed by site visits. Networking will be established with the concerned communities and stakeholders will be identified and enlisted.

1.2 Level of Dependence on Mangrove as a Resource

A strong call for connecting mangroves and livelihoods at the policy level throughout Africa has been made (UNEP-WCMC). Dependency on fish and other resources has become heightened with high coastal populations and rapid urbanization.

Commercial exploitation of mangrove has traditionally not been high, a situation that may be reversed as other sources of timber dwindle. In Asia, mangrove is used for poles, lumber, chipwood and pulp (Synge, 1989).

The mangrove is a dependable source of income from their use as a source of Non Timber Forest Products. These NTFPs include food items such as crabs, shrimps, honey,

medicines; chemicals for industrial uses such as alkaloids, flavonoids, tannins and saponins, thatch materials and many house hold utensils derived from the mangroves. By 1994, total NTFP contribution to domestic enterprise was put at N177.627. This has been adjudged a conservative estimate since it was based on 19 products across the ecological zones. The mangrove component of this is shown in table below.

Periwinkles (*Cerithiacea potamididae*) and mangrove salt and the annual value of sustainable fishing has been put at N15 million. Mangrove utilization is limited by preference for dead wood in place of fresh mangrove (Leh, 1994). Mangrove cutting therefore seems to be a low-level sustainable activity. At the national scale, it is estimated that coastal populations extract 4m³ of mangrove products annually (ESMAP). This level of utilization does not seem to constitute a threat to the resource base or the ability of the mangrove ecosystem to sustain its ecological functions.

Of the almost 10,000km² national mangrove coverage, about 5,000km² occurs in the Niger delta. Kinako (1977) reports a forest inventory conducted by Niger Delta Development Board with a standing mangrove timber of 283,200,000 m³ or a standing stock of 546.7m³ per hectare (Anon). The annual yield has been put at 6x 10⁵ to 16x10⁵ tons. This translates to a potential harvest of about 600,000 tons in perpetuity.

Adegbehin and Nwaigbo (1990) estimate that Nigeria's mangrove has a total standing volume of 30million m³ and an exploitable volume of 10 million m³. This corresponds to a total standing volume of 16.7 million m³.

Forest policy takes cognizance of the supply potential of the mangrove forest. Table VIII below forecast of area and yield from forest estate in Nigeria. While mangroves are known to contribute to certain use types in Asia, the projection in the table does not recognize or include the possibility of using mangroves for pulpwood etc. It is instructive that the projected figures for mangrove compare favourably with those for other zones given the area of mangroves under reservation and the management regime to which it is subjected Table IX. Table IX shows the expected contribution of mangrove to the national wood consumption budget in the production of finished goods.

Table I- mean annual increments expected from mangrove stock

Source: Ojo, L.O; Update of supply and demand data, FORMECU, quoted in NFAP,

| | 1976 | 1990 | 2000 | 2010 |
|--|------------|------------|------------|------------|
| | AREA YIELD | AREA YIELD | AREA YIELD | AREA YIELD |

| | '000 HA | '000 CUM | '000 HA | '000 CUM | '000 HA | '000 CUM | '000 HA | '000 CUM |
|------------|------------|-------------|------------|-------------|------------|-------------|------------|-------------|
| Mangrove | 902 | 911 | 634 | 673 | 490 | 497 | 379 | 385 |
| Reserved | 30 | 39 | 26 | 32 | 23 | 30 | 20 | 26 |
| Unreserved | 872 | 872 | 608 | 641 | 467 | 468 | 359 | 359 |

Source: National Forest Action Plan

Table II: Percentage contribution of each forest type to total area and yield. Figures in brackets are the percentages of reserved estate within each forest type

| Vegetation type | Area | Yield |
|-----------------|----------|-----------|
| Woodland | 52 (18) | 30 (23) |
| Forest | 33 (45) | 39 (52) |
| Mangrove | 12 (0.3) | 8 (4) |
| Plantation | 3 (34)* | 23 (49) * |

*Figures refer to contributions of *Gmelina arborea*, an exotic plantation species.

Source Ojo, L.O in Nigerian Forestry Action Plan, main report, vol. II, June 1995

Table III: Projected wood supply in the various product classes

| Forest type | Veneer log | Saw-log | Poles | Fuel-wood | Pulpwood |
|-------------|------------|---------|-------|-----------|----------|
| Woodland | 0.0 | 10.0 | 25.0 | 65.0 | 0.0 |
| Forest | 5.0 | 83.0 | 5.0 | 5.0 | 0.0 |
| Mangrove | 0.0 | 0.0 | 10.0 | 90.0 | 0.0 |
| Plantation | 0.0 | 20.0 | 25.0 | 25.0 | 30.0 |

SOURCE: National Forestry Action Plan

1.3 Poverty reduction and mangrove resource

Mangroves are situated in the Niger delta, a region that has been reported with above national average of poverty. GNP is reported by the World Bank to have been below the

national average of US\$280. Unemployment is generally high. Indicators point to reduced availability of social infrastructure resulting in low enrolments in school, absence of roads and hospitals.

In meeting the development challenge, the NEEDS document was articulated to address gaps in policy articulation for mangrove dwellers.

Mangrove was given a prominent place in the 2004 Poverty Reduction Strategy Paper published by the Nigeria National Planning Commission. It lists mangroves under “Conservation of unique habitats” and details the importance of the ecosystem for livelihoods and a strategy to combat threats to it. The strategies include monitoring industries, conducting impact assessment and strengthening law enforcement.

It says *inter alia* “Conservation of unique habitats-Nigeria has two thirds of central Africa’s mangrove stands and wetlands. These are among the most important mangrove habitats in the world, but they are under threat from exploitation of timber, gas flaring, oil spill and the impacts of increasing coastal urbanization”.

It is yet to be seen how this translates into actual concrete work either for the ecosystem rehabilitation or for the human residents of the mangroves.

2.0 THE NIGER DELTA

The Niger Delta is the area where the main river channel of the River Niger reaches base level and branches into multiple distributaries, disposing of and distributing the discharge and sediment load. It is the resultant of the interaction between these river processes and the marine processes dominating the receiving basin offshore (Jelgersma et al., 1993). The shape of the Niger Delta has been described by Sexton and Murday (1994) as being similar to the Nile and the Mississippi Deltas with a profile that is curved or bowed with its convex outer margin facing the Atlantic Ocean. This curved shape has been attributed to a combination of variables, such as the drainage basin, alluvial valley, and deltaic plain, receiving basin, distributive network and fluvial/marine processes that directly impact the Delta.

The Niger Delta is composed of a chain of sandy beach ridge barrier islands about 20 in number, backed by brackish mangrove swamps. Behind the swamps is an extensive flood plain that starts from around Onitsha at a height of about 20m above sea level (Allen, 1965). The barrier islands rim the subaerial Niger Delta from the vicinity of the Benin River on the north western flank of the delta to the Opobo River in the east. Their lengths range from 5 to 37 kilometres and average 18 kilometres while their widths vary from a few hundred metres to 12 kilometres.

The Delta is underlain by deltaic deposits of the tertiary age up to 12,000m thick in some places. It is still building even though accelerated erosion and flooding are taking place in many places (Ebisemiju, 1985). Several authorities regard this delta as one of the world's deltas that are very vulnerable to sea level rise due to its low lying nature, natural and human induced subsidence and other human interventions in the environment (Jelgersma, 1993; IPCC, 1990; IPCC, 1992; Ibe, 1988).

The base of the sedimentary fill in the Niger Delta consists of unfossiliferous sand stones and gravel weathered from underlying pre-cambrian basement (Akpati, 1989). Above the coarse materials are marine shales, sandstones and limestones of Santonian age, whose deposition was ended in parts of the Nigerian basin by folding, faulting, and basic igneous intrusion during the Santonian age. The next cycle of deposition began with the transgression that lasted into the Maestrichtian. The present Niger delta was initiated during regression that began in early Eocene (Emery et al ,1974; Nigeria Coastal Erosion & Subsidence Tech. Report No. 1, 1991).

The soils underlying the Niger delta are generally characterised as soft, highly compressible, organic and inorganic silty clays overlying fine sands at great depths (Nig. Coastal Erosion and Subsidence (Tech. Report no.1, 1991). These soil characteristics make the Niger delta highly susceptible to subsidence. Although no conclusive studies or research have been carried out to determine the degree of subsidence, increased flooding and inundation of the barrier islands and swamps seem to indicate that the rate of subsidence is appreciable. A preloading survey of the liquefied natural gas site in Bonny tends to support the idea that the delta is still undergoing natural subsidence. Allen (1965) sees the Delta as an area of long continued subsidence which has attracted stream drainage over millions of years and represents an interplay between the powerful, sediment laden Niger and almost equally powerful forces of the Atlantic Ocean into which it empties. Other forces such as damming, oil, gas and water extraction have also recently come into play in the determination of the physical configuration of the Delta. For example, the construction of dams across the River Niger and its tributaries has led to a reduction in the volume of sediment getting to the coast. This reduction has invariably led to increased erosion problems along the coastline (Nwilo, 1995).

2.1 Topography

The Nigerian coastal area is generally low lying. A topographic survey of the onshore area of the mud coast revealed heights of 0.8 - 1.8 metres above sea level (Ibe, 1988). With a tidal range of about 1.5m at Lagos to 3.5m at Calabar, a large portion of the coastal areas can easily be inundated at high tides especially during spring tides. The Niger Delta which consists of about 20 barrier islands has maximum heights of between 2 - 4m above mean sea level (Allen, 1965). Figure 1.1a shows the drainage system in the Niger Delta. The rivers in blue show the major rivers in the Niger Delta such as the Nuns, the Forcados, the Cross River, the Imo river and others. The ones in light blue indicate the Minor rivers. These rivers as can be seen are certainly very numerous.

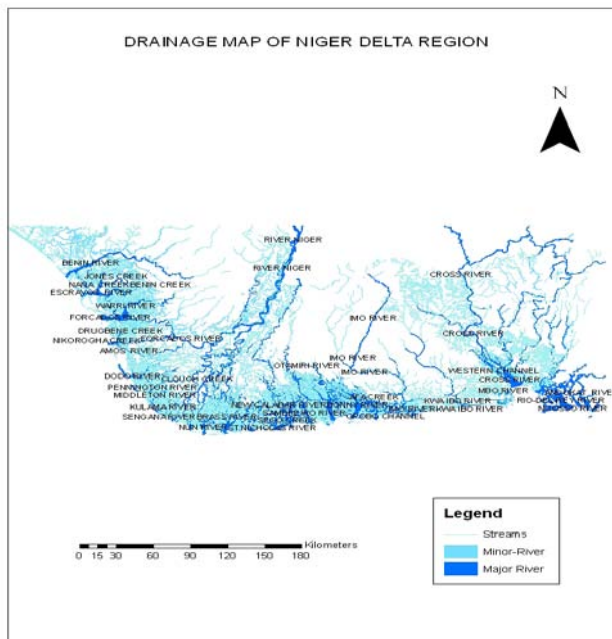


Figure 2.1a: The drainage system in the Niger Delta

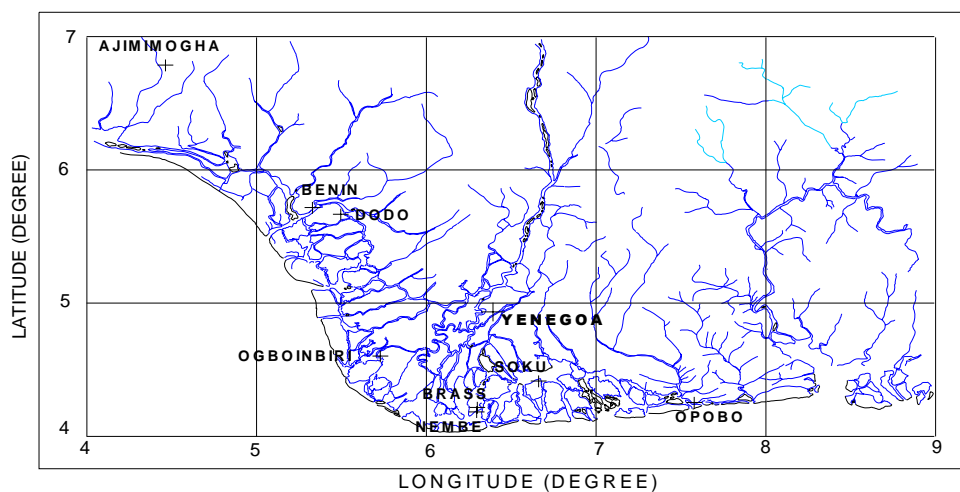


Figure 2.1b: Drainage System in the Niger Delta

2.2 Vegetation

The coastal vegetation in the barrier lagoon complex is scarce due to the predominance of erosive forces in this zone of the coastline. Mangrove and swamp plants are largely absent (Ibe, 1988, Nwilo, 1995). The coast is dominated by coconut and palm trees especially at Badagry Beach and some kilometres east of Lagos. In the mud coast, the vegetation is dominated by the mangrove trees, which normally have root mats. The halophytic red mangrove variety (***Rhizophora racemosa***) is the most common. Due to erosion and Man's actions, a substantial portion of the area has been denuded of vegetation and has been replaced by hardy grasses (***Paspalum vegetatum***) interspersed

with strands of stunted mangrove. White mangroves are found in the Awoye and Molume areas. Inland, the white mangroves form a belt of dead or dying vegetation followed by ferns. Towards the sea, the coastal forests on the fringe of the mud beach are made up of climbers, grasses and herbs. The grasses noticeable in this environment are derived savanna brought about by deforestation of the mangrove and farming activities (Ebisemiju, 1985). These grasses often serve as sources of food for animals.

The Niger Delta has a variety of trees and plants. These include mangrove trees of all kinds, grasses herbs, and climbers. The variety has been attributed to depositional nature of the shoreline.

In the strand coast (estuarine environment), the beach is heavily forested with small swamp systems. In areas of Calabar and the Cross River estuaries the mangrove forests front the sea, the red mangrove species being dominant. Also, the fern and the senegal date palm (***Phoenix rachimata***) are present.

The tropical climatic conditions favour the mangrove swamp vegetation. The water temperature and salinity in the swamps help to improve the quality of the mangrove trees. Water temperatures vary between 15 to 30°C while the salinity is known to be between 10 - 35‰. Figure 1.2a shows the spatial distribution of mangroves on the Niger Delta while figure 1.1b shows the changes that have taken place on the mangrove ecosystem of the Niger Delta.

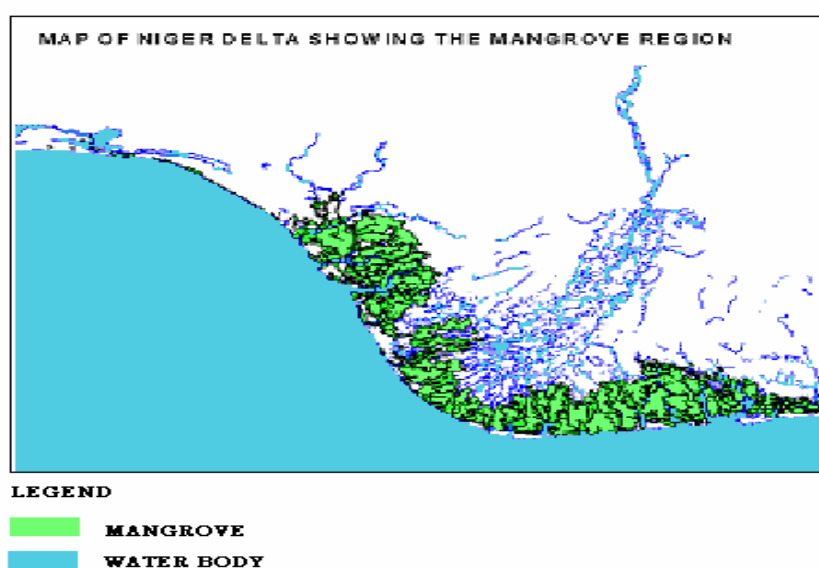


Figure 2.2a: Map of the mangroves of the Niger Delta.

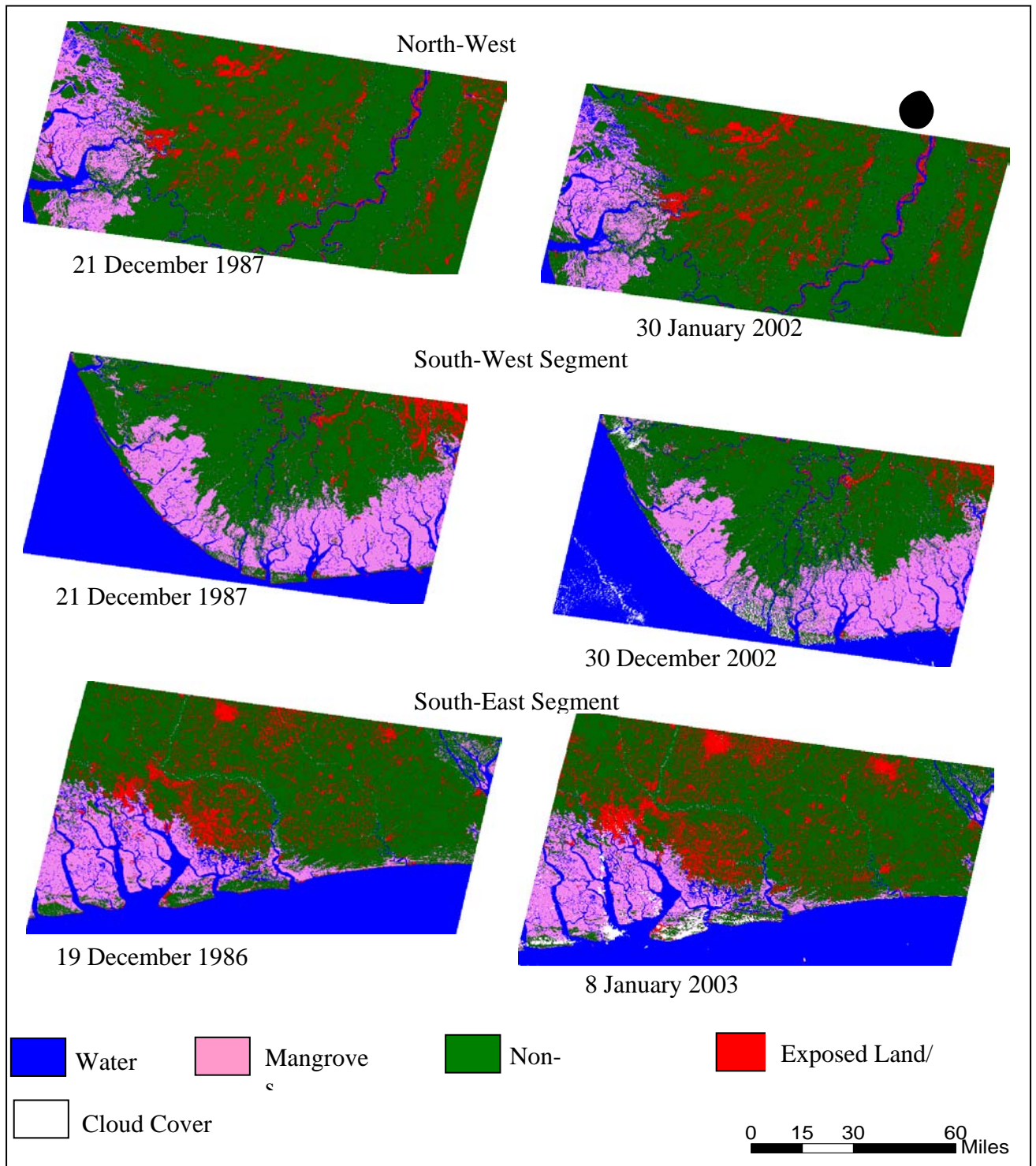


Figure 2.2b: Changes in the Mangrove Ecosystem between 1987 and 2002 obtained from the Landsat satellite imageries (James *et al*, 2007)

2.3 Climate

The Nigerian coastal area is dominated by the equatorial hot and humid climate. The annual temperature range is between 26°C and 34°C with the highest temperatures occurring during the dry season (November - March). Gas flaring in the oil producing areas has introduced local highs in temperature that were hitherto uncommon in these areas. Temperatures of the order of 35°-36°C could be experienced in the hot season while average temperatures of 32°C are not uncommon. Hot spots include Port Harcourt, Warri, Bonny, Escravos, Forcados and their surroundings. The flaring of gases, apart from increasing the local temperatures also creates serious environmental pollution (Nwilo & Onuoha, 1993, Nwilo, 1995).

The total annual rainfall averages between 350 - 600cm. More than 80 percent of the rains fall in the rainy season (April - October) when the tropical storm conditions are frequent. Rainfall is usually heavy and occasionally may last well over 24 hours. Rainfall of say 50mm per hour between July and August is common and results in floods which destabilize soil and enhance erosion.

The predominant wind is the rain bearing south west trade winds from the Atlantic Ocean. During the short dry season period, the dust laden north east trade wind from the Sahara Desert reaches the coastal area producing hazy weather conditions (Ibe **et al.**, 1985). Two rainfall periods exist in the coastal areas of Nigeria. The first is between March and July when the inter tropical zone is moving northwards, followed by the south westerly monsoon wind which brings rainfall to the areas it blows over. Then, there is a short dry period in August when the intertropical zone is at its most northerly position, after which it starts moving southwards. Again, all the areas under the influence of the monsoon winds experience rainfall between the months of September and November (Nedeco, 1959).

2.4 Tides & Flooding

2.4.1: Tides

We shall start this subsection with a clear description of the phenomenon of tides and then relate that to the Niger Delta. The results of the periodic rise and fall of the ocean and sea waters are referred to as tides. This periodic rise and fall is related to the forces generating the motion which is the gravitational force of attraction between the particles of the ocean and seas on one hand and the celestial bodies mainly the moon and the sun

(Lisitzin, 1974; Pugh, 1987). According to Newton's law of gravitation, the gravitational attraction, F , between two bodies is directly proportional to the product of their masses and inversely proportional to the distance between them. The formula is expressed thus:

$$F = Gm_1m_2/r^2 \quad (1.1)$$

where m_1 and m_2 are bodies separated by the distance r and G is the gravitational constant. The value of the gravitational force will be more accurate the greater the distance.

If the moon and the sun attracted every water particle in the ocean and seas with the same force, there will be no tides. It is the extremely small but perceptible deviation in the magnitude of the gravitational force of the two celestial bodies upon particular points on the Earth's surface that is responsible for the tidal phenomenon as observed in nature. In a similar manner, the attractive forces deviating in magnitude cause stresses upon every part of the Earth's surface. The gravitational attraction of the moon upon the Earth corresponds to a vector sum of constant force represented by the lunar attraction on the Earth's centre and a small deviation at every point on the Earth surface. It is this small deviation which is called the tide generating force.

The tide generating force at the zenith and the nadir is given approximately as Gm_2a/r^3 and $-Gm_2a/r^3$ where a is the radius of the Earth, r the distance between the centre of the Earth and that of the Moon, \ddot{u} , element of mass of the Earth at the point under consideration and m , the mass of the Moon. From the above formula for the tide generating force, it becomes obvious that the effect of the Moon as far as the tidal phenomenon is concerned is more than that of the Sun since the Sun is much further away than the Moon (Lisitzin, 1974). There are also tides generated by the periodic variations of the atmospheric pressure and onshore winds which are called meteorological tides or surges.

The observed tides in the oceans have ranges of about 1.0m but there are several variations. In some local areas of the continental shelves, ranges may exceed 10 metres. An extreme example is the Bay of Fundy, where ranges of 15 metres may sometimes occur. In most places the tides are dominated by semi-diurnal tides which imply that there are two peaks in a day but there are places where diurnal tides dominate. In others, it is mixed (IOC, 1985). The character of a tide is determined by using the ratio:

$$F = (K1 + O1)/(M2 + S2) \dots\dots\dots(1.2)$$

where K1 , O1, M2, and S2 are the amplitudes of the main tidal constituents. Where F is less than 0.25, the tide is characterised as semi-diurnal. The tide is considered mixed but predominantly semi-diurnal if the ratio lies between 0.25 - 1.5. The tide is also said to be mixed but predominantly diurnal with the ratio between 1.5 - 3.0. Finally, the tide is diurnal if the ratio exceeds the value 3.0 (Lisitzin, 1974). Along the West African Coast, the tide is semi-diurnal. For example, the data from Nigerian coast shows that F is between 0.13 and 0.22, therefore the tides are semi- diurnal. Other examples include Takoradi (semi-diurnal), Liverpool (semi-diurnal), Copenhagen (mixed but predominantly semi-diurnal), Finch, New Guinea (mixed but predominantly diurnal), and Helsinki (diurnal) (Lisitzin,1974). Semi-diurnal tides refer to tidal regimes where the tides exhibit two maximum tides and two minimum tides a day. Diurnal tides on the other hand refer to tidal regimes where one peak and minimum tide occur once a day. Figure 1.3a shows a typical example of tide along the coast of Nigeria.

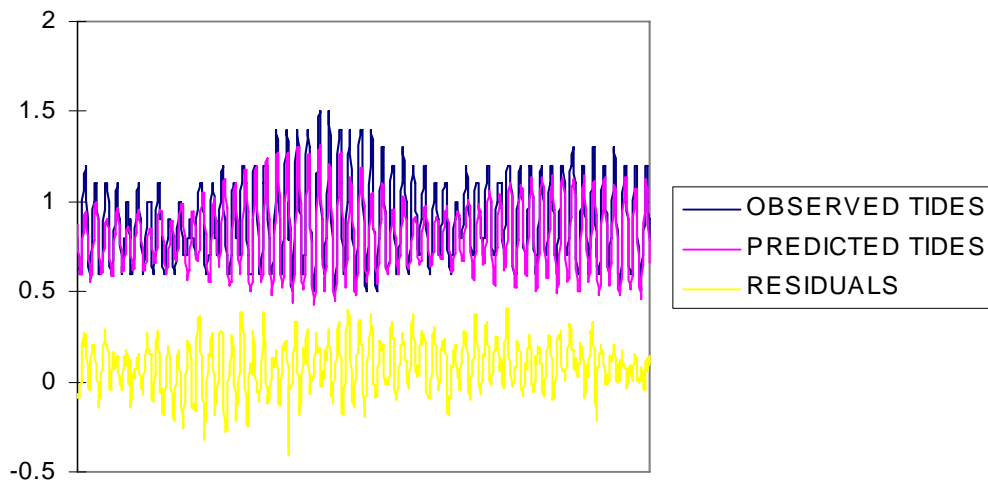


Figure 2.4.1a: Observed, predicted and residual Tides at Dodo for February 1993 (after Ezeigbo et al, 2003)

SEMI DIURNAL TIDES AT OPOBO TIDE STATION

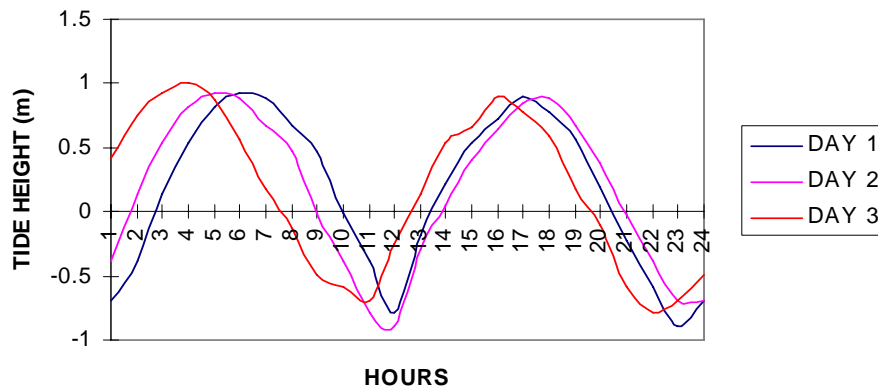


Figure 2.4.1b: Semi Diurnal Tides at Opobo (after Ezeigbo *et al*, 2003).

Tides propagate as long waves on a rotating Earth. They spread from oceans onto shallow continental shelves where their speed of propagation is much slower. Energy is lost to overcome bottom frictional resistance to the strong tidal currents. This may lead to bores in estuaries which are often spectacular and can do great damages.

The difference between the peak of a tide and the lowest value gives the range. The range obtained varies depending on whether the tide is a spring tide or neap tide. A spring tide occurs when the tidal generating forces between the moon - sun system are acting in the same direction. This normally occurs at the time of new moon and full moon. On the other hand, a neap tide occurs when the tidal generating forces due to the moon and the sun are acting in opposite directions. The range during a spring tide is normally more than during the neap tide.

One way of monitoring the rise in sea level on a global or regional scale is through the analysis of tidal data obtained over a long period of time and not less than 18.6 years. The significance of using data of not less than 18.6 years arises out of the need to take into consideration the nodal effect of the moon (Pugh, 1987). This analysis involves the determination and plotting over time of annual mean sea levels. From the graph, a trend may be noticed as to how the sea level is changing. Through regression analysis, a line of best fit may be plotted (Chatfield, 1983). A positive slope indicates that the sea level is increasing while a negative slope indicates that the sea level is falling. From the annual mean sea levels for Bonny for 19 years. Nwilo (1995) has shown that the sea level is increasing at the rate of 1mm per year in Bonny excluding subsidence.

2.4.2 Flooding:

The flooding in the Niger Delta is caused by:

- (i) The Tides
- (ii) the Rainfall
- (iii) the Storm surges and
- (iv) Subsidence

The tidal phenomenon has been described extensively above. We have stated that the tide along the coast of Nigeria is semi-diurnal which means that the coast of Nigeria experiences two high waters and two low waters daily. Tidal ranges along the coast vary from 3.5m in Calabar to 1.2m in Lagos. In Bonny, the maximum range is about 2.0m while it is 1.5m at Forcados. These results are obtained from the analysis of tidal data in these locations. Tidal influences are experienced up to Aboh in delta State, over 100 kilometres from the coastline. This is one of the peculiarities of the Niger Delta.

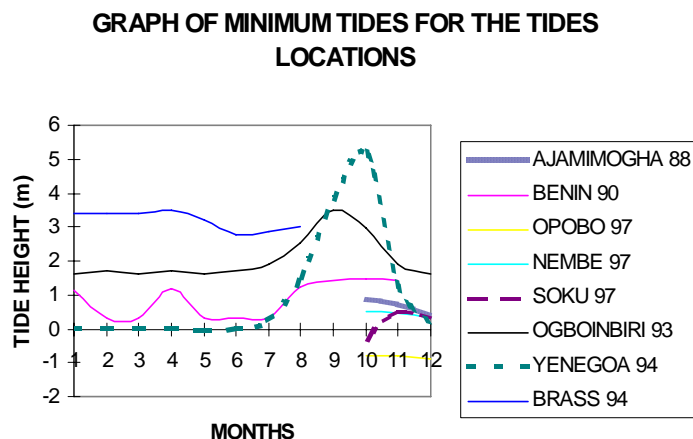


Figure 2.4.2a: Minimum Tidal data for 8 locations in the Niger Delta (after Ezeigbo et al, 2003)

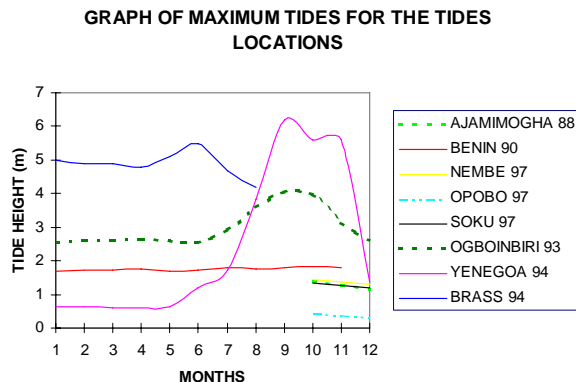


Figure 2.4.2b: Maximum Tidal Data for 8 locations in the Niger Delta (after Ezeigbo et al,2003)

The tidal ranges increase from West to East, with the minimum values experienced along the coast of Lagos and the maximum around the Strand Coast.

Along the coastline, the flooding is caused mainly by tides and meteorological effects such as storm surges but further inside, it is a mixture of flooding from rainfall and the daily rise and fall of the tides. During the rainy season, when high waters of up to 6 – 8m are experienced, the tidal influences are not discernable (see figures 1.4a and 1.4b).

It is not clear to what extent the runoff coming from the rivers affects the volume of water locally along the Nigerian coast but Nedeco (1959) has shown that the River Niger water level rises due to local rains from July to early October (normally referred to as the White flood) when the peak is reached. It then falls until December, when the fall is balanced by the second flood (the Black Flood) which has travelled from the headwaters in Senegal area after having been retarded in the swamp area south west of Timbuctu. This Black flood results in a sustained water level until March or April when there is a further fall until June. These events resemble closely the rises that Vestraete (1987, 1988a, 1988b) and Thompson (1986) have highlighted above but the fact that the rise occurs throughout the West African Coast even where major rivers do not reach the coast such as in the Lagos area, shows that the seasonal rise may not be entirely due to flood.

Along the coast of Nigeria, the major contributory factors are likely to be subsidence phenomena, meteorological events, thermal expansion and ocean circulation. The contribution from subsidence is both as a result of the natural compaction of the Niger delta and as a result of fluid withdrawal in the form of oil/gas and water. No conclusive studies have been done on the rate of subsidence along the Coast of Nigeria although evidence abounds to show that withdrawal of fluids from under the ground contributes very substantially to subsidence (Poland, 1984; Nwilo, 1995; Ibe, 1988; Ibe & Ouelennec, 1989; Carbogen, Gatto, and Marabini, 1984; Shimizu, 1991). The recent increased flooding of and inundation of the Nigerian Coastal lowlands seem to suggest that subsidence is a contributory factor.

One of the most common examples of land subsidence due to fluid withdrawal is the San Joaquin Valley, Los Banos-Kettleman city area, USA where between 1930 - 1975 a land subsidence of 9.0 m has occurred. Other cases include Mexico city (9.0m), Far West Rand, South Africa (9.0m), Sacramento Valley, California, USA (4.1m) (Poland, 1984). These are very high rates of subsidence. These examples are particularly relevant in an

area like the coast of Nigeria where several millions of barrels of oil, gas and water are being extracted on a daily basis.

The relevance of the subsidence phenomena is that it could make the rate of relative rise in sea level for a location much higher than the global average. The explanation for this is that while the increase in global sea level is moving up, the effect of subsidence is a downward movement, giving a higher relative rise in sea level. An analysis of world wide tide gauge data show that eustatic sea level has risen approximately 12 to 20cm over the last century (Woodworth, 1991; Woodworth , 1993; Peck, & Williams, 1991; and Parker, 1991). These values were obtained from the tidal data collected from various parts of the world with a concentration of the data coming from the countries in the Northern hemisphere. The global value of the sea level rise when compared with the relative rise obtained from some deltaic coasts such as Louisiana's has shown relative rise at almost 10 times the present global average (Peck, & Williams, 1992). The significance of the relative sea level rise on the coastal environment, particularly the deltas, cannot be overemphasised. The impacts of the global rise in sea level will be much more devastating on these low lying coastal environments, including the Niger Delta.

Apart from all above factors that are known to affect the sea level generally, Thompson (1986) and Vestraete (1987, 1988a, 1988b) have shown that the sea level along the Gulf of Guinea has a seasonal cycle with an amplitude of up to 10cm. They observed that along the coast line there is a minimum height between the months of June and August which corresponds to the African Monsoon in the Gulf of Guinea. During this period there is an upwelling signal which is shown in the form of a sea level drop, bringing nutrients closer to the surface. Maximum sea level occurs between the months of September and November. The other maximum occurs between the months of February and April, while yet another minimum height occurs between the months of June and August. A similar situation has been observed on the South Carolina Coast and Noble & Gelfenbaum (1992) have attributed these to changes in the transport of the Gulf Stream.

One other interesting observation that is noticeable about the seasonal variations of the sea levels on the Coast of West Africa, is that the maxima occur very close to the equinoxes (March and September) while the minima occur very close to the solstices (June and December). This is further supported by Ajayi (1992) who pointed out that twice a year or so around the equinoxes, breaking seas gather strength very suddenly into storms that rage and abate just as quickly, leaving devastation in their wake. Nwilo

(1995) had also observed while analysing tidal data from Bonny, Forcados and Lagos that the same phenomenon is observed on all these coasts. The maximum amplitude observed in Bonny was 18cm. It will be observed that in the past salt water used to get into Iju water works in Lagos in February and March. This could be attributable to this seasonal variation on the level of the Ocean (Nwilo, 1995).

2.5 TIDES IN RIVERS OF THE NIGER DELTA

Waves produced by the tide-generating forces are regular in shape in the open ocean and have an amplitude of about one or two feet (0.3 – 0.6m) (Bomford, 1971). When a tidal wave proceeds upstream, its range (difference between maximum and minimum tides) increases. High waters become higher and low waters fall lower (Bok, 1982). This leads to the flooding of the riverbanks by the overflowing waters at the crest of tidal water. These tidal phenomena are largely responsible for the sedimentation and pollution that occur in Delta regions. This paper outlines therefore, the importance of the knowledge of tidal characteristics of rivers in solving these problems.

The harmonic analysis of tides will in general produce tidal constants. Using these constants, predicting correct to 15 – 30 minutes in time, and correct to 5–10% of the range in height is easily achieved (Bomford, 1971). Therefore, by computing the discrepancies between the observed and predicted tides at a number of points in a river, one can determine the limit to which the tidal influence is experienced upstream. Knowledge of tidal characteristics of rivers and estuaries are needed in the planning and execution of coastal projects.

2.6 TIDAL PHENOMENON

Each body of water has a natural period of oscillation, depending on its size and depth, which have a great influence on its response to tide-raising forces (Bok, 1982). The tide-raising forces act over the whole earth, and yet certain bodies of water have natural periods of oscillation, which make them relatively unresponsive to either the diurnal or semi-diurnal forces. However, for tidal waters, the tides are higher in a given body of water if the period of the tide is the same as the natural period of oscillation of the body of water, since the two reinforce one another.

As the wave moves into shallow waters, it becomes irregular. The wave crests build up and the tidal range increases. The crests are accelerated while the troughs are retarded. Consequently, the riverbanks are flooded by the overflowing waters at the crest of tidal water. This results in the destruction of developments, vegetation, recreational facilities and fish breeding grounds. It causes saline intrusion into aquifers and fresh water streams, erosion of the shorelines and surrounding environment and the dispersion of contaminants, etc (Dronkers, 1972).

2.6.1 Available Data

Ezeigbo et al, (2003) have studied tidal characteristics of rivers in the Niger Delta based on the tidal data obtained from the Geomatics Division of Shell Petroleum Development Company (Nigeria). These data are tide gauge readings at various locations indicated in table 1.1. Figure 1.1 shows the distribution of the tide gauge locations in the area. All the data sets, without exception, have gaps of varying degrees and contain tidal readings of different lengths in months and years. All the tidal heights are referred to the Lagos Datum, except the data for Dodo River which are referred to project (local) datum. This is due to the fact that the relationship between Dodo and Lagos datum is not known.

Table IV: Data from River Gauges.

| S/No. | NAME OF RIVERS | AVAILABLE DATA SET | MAXIMUM DATA SIZE FOR THE STUDY | YEAR |
|-------|----------------|-----------------------------|---------------------------------|------|
| 1 | AJIMIMOGHA | 1988 | 91 | 1988 |
| 2 | BENIN | 1987 – 1988, 1990 – 1992 | 334 | 1990 |
| 3 | BRASS | 1992, 1993, 1994 | 214 | 1994 |
| 4 | DODO | 1990 – 1994 | 369 | 1993 |
| 5 | NEMBE | 1997 – 1998 | 92 | 1997 |
| 6 | OGBOINBIRI | 1990 – 1994 | 365 | 1993 |
| 7 | OPOBO | 1997 -1998 | 92 | 1997 |
| 8 | SOKU | 1997 & 1998 | 92 | 1997 |
| 9 | YENEGOA | 1992, 1993, 1994 | 214 | 1992 |

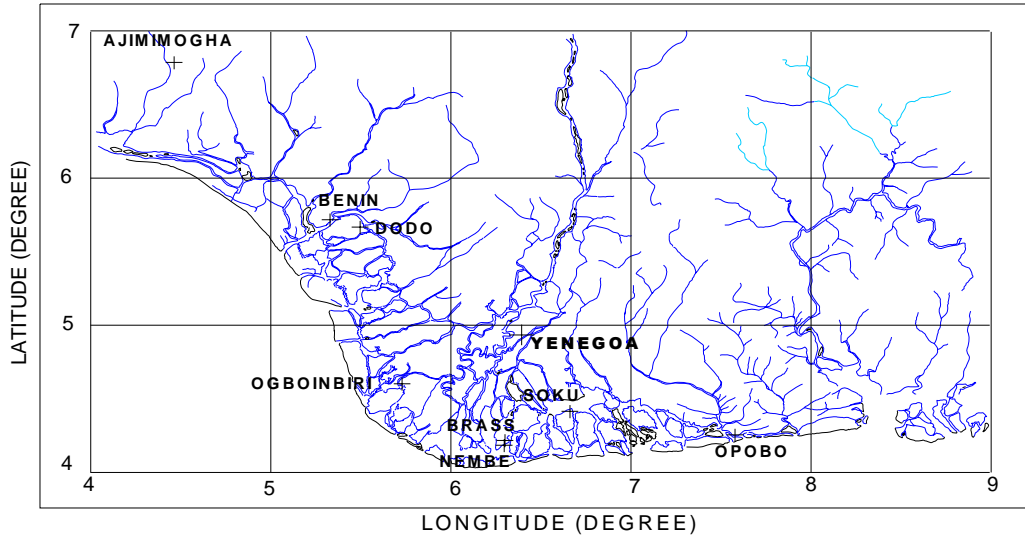


Fig 2.6.1 Distribution of tide gauge locations

2.7 TIDAL ANALYSIS AND PREDICTION

The characteristics of tides at any location are known, if the tidal constants (amplitudes and phases), maximum and minimum tides, and their times of occurrence are known. These quantities, however, change when there is change in the physical characteristics of the river.

To determine these quantities, tidal analysis is carried out. A most comprehensive and accurate method of tidal analysis is the so-called Harmonic Analysis of tide by the least squares method. The method, which adopts the so-called central time origin approach in deriving the normal equations, was used for this analysis. The detailed description of this can be found in Dronkers (1972).

2.7.1 Tidal Analysis

A basic assumption in tidal analysis is that the angular frequencies (ω) of astronomical tide-generating forces are known, and that the vertical tide $Y(t)$ at any time in a given tide gauge station is given by:

$$Y(t) = H_0 + \sum_{i=1}^n f_i H_i \cos(\omega_i t + V u_i - g_i) \quad (1.1)$$

Where,

H_0 is the mean sea – level.

H_i is the amplitude of the i^{th} tidal constituent.

f_i is the astronomical correction factor for H_i .

ω_i is the angular speed of the i^{th} constituent.

g_i is the phase lag of the i^{th} constituent behind the phase of the corresponding equilibrium constituent at Greenwich.

Vu_i is the astronomical correction factor for the phase.

n is the total number of the constituents used in the analysis.

f_i, ω_i, Vu_i are completely determined by astronomical influences. H_i and g_i

which are determined by tidal analysis, depend on the particular site where the tide is to be evaluated. Once determined, they will remain valid, except when there are changes in the physical conditions at the location, caused by variations in the natural conditions of the river (say, dredging or sedimentation) (Dronkers, 1972). To use equation (4.1) in the analysis by the least squares, it is modified as follows (Ibid):

$$Y(t) = H_0 + \sum_{i=1}^n (A_i \cos \omega_i t + B_i \sin \omega_i t) \quad (1.2)$$

Where,

$$A_i = f_i H_i \cos(Vu_i - g_i) \quad (1.3)$$

$$B_i = -f_i H_i \sin(Vu_i - g_i) \quad (1.4)$$

From equations (4.3) and (4.4) we obtain:

$$H_i = \frac{1}{f_i} \sqrt{A_i^2 + B_i^2} \quad (1.5)$$

$$g_i = Vu_i - \tan^{-1} \left(-\frac{B_i}{A_i} \right) \quad (1.6)$$

H_0, A_i and B_i are obtained from equation (1.2) using least squares estimation technique.

2.7.2 Tidal Prediction

From tidal analysis (equation 1.1), the tidal constants H_i and g_i in equations (1.5) and (1.6) are determined. These constants form part of the input data in the tidal prediction model. As long as the physical characteristics of the river remain unchanged, the tidal heights predicted using these constants in equation (1.1) will give accurate results (Dronkers, 1972).

Often times, it is the maximum and minimum tides and their times of occurrence that are needed. This can be achieved by differentiating equation (1.1) with respect to time (t). This gives:

$$\frac{dY(t)}{dt} = -\sum_{i=1}^n f_i H_i \omega_i \sin(\omega_i t + Vu_i - g_i) \quad (1.7)$$

Equation (1.7) vanishes at the maximum and minimum points of the curve. To differentiate between the maximum and minimum points, equation (1.1) is differentiated twice. This gives:

$$\frac{d^2Y(t)}{dt^2} = -\sum_{i=1}^n f_i H_i \omega_i^2 \cos(\omega_i t + Vu_i - g_i) \quad (1.8)$$

Equation (1.8) is positive or negative according as the turning point is minimum or maximum, respectively. An analytical solution of equation (1.7) and (1.8) is hard to come by. Hence, numerical differentiation approach, which is equally accurate, is adopted here. It is also possible to determine these turning points by visual inspection of the tidal curve. However, the visual inspection method, devoid of the rigours of mathematics, associated with the former, is a more tenuous exercise.

2.8 RESULTS AND ANALYSIS

The tides in the study area are largely semi-diurnal. Figure 1 shows the semi-diurnal tides at Opobo River. There are noticeable distortions in tidal data in a number of locations where meteorological and shallow water effects have great influence. Generally, the maximum tide does not exceed 2.82m, while the minimum tide hardly goes below 0.0m. Figure 1.1 shows tides for two days in Opobo. It is evident that this is semi-diurnal Ezeigbo *et al*).

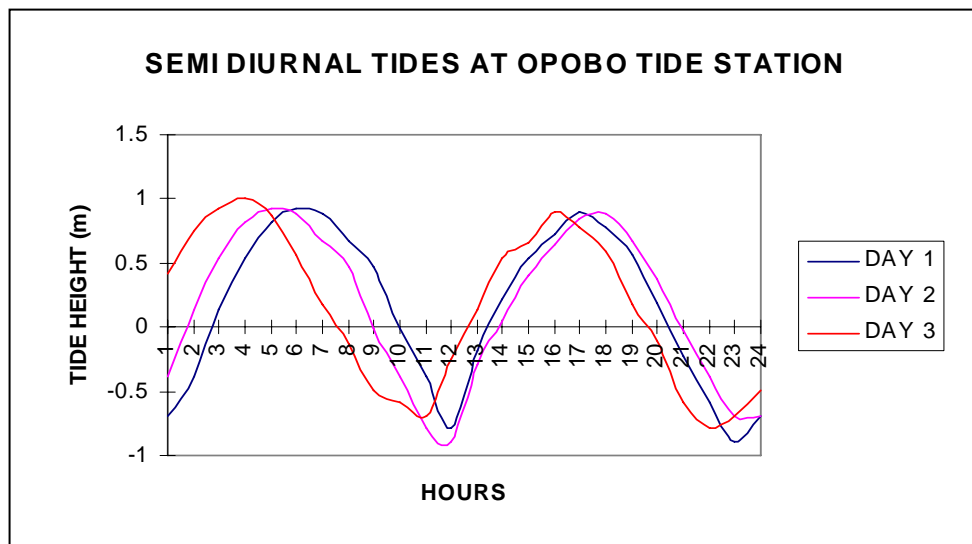


Figure 2.8 a: Semi diurnal tides in Opobo

2.8.1 AJAMIMOGHA RIVER

Only October – December 1988 data are available. The maximum tide lies between 1.51m and 1.61m while the minimum tide lies between 0.4m and 0.89m. The predicted and observed tides agree well.

2.8.2 BENIN RIVER

The data available here are for June to August, 1987; February – April 1988; January - November 1990 and August to October 1991. The maximum tide varies from 2.01m to 2.23m, while the minimum tide varies from 0.32m to 1.47m.

2.8.3 BRASS RIVER

The available data for this location cover 1992 to 1994. The maximum tide varies between 3.5m and 4.8m, while the minimum tide ranges from 0.7m to 2.2m.

2.8.4 DODO RIVER

The available data cover July – November 1990, January – December, 1993 and March – August, 1994. The maximum tide varies from 1.3m to 1.77m, while the minimum tide varies from 0.01m to 0.6m. For the 1994 data, the observed tide is higher than the predicted tide for the months of March and April. On the whole, the predicted and observed tides agree reasonably well.

2.8.5 NEMBE RIVER

The data available for this location cover October 1997 to February 1998. The maximum tide varies from 2.07m to 2.82m, while the minimum tide lies between 0.31m and 0.99m. The predicted and observed tides agree fairly well.

2.8.6 OGBOINBIRI RIVER

The data available at this location cover 1990 to 1994. However, only 1993 have a full year's data. The maximum water level is 4.15m, while the minimum tide lies between 2.67m and 3.57m. The sharp rise of water level from 2.67m to 4.15m is clear evidence that flood influence is present in this location. See Figures 1.3a and 1.3b.

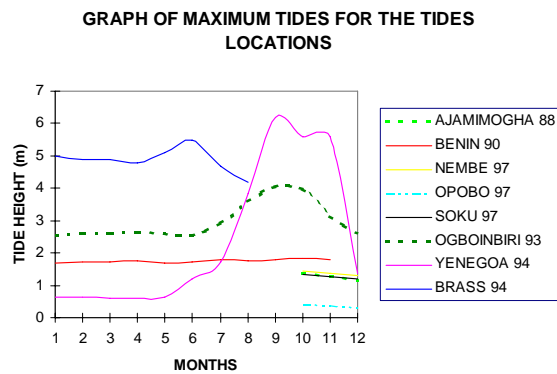


Fig 2.8b: Maximum Tides in the Area (after Ezeigbo *et al*).

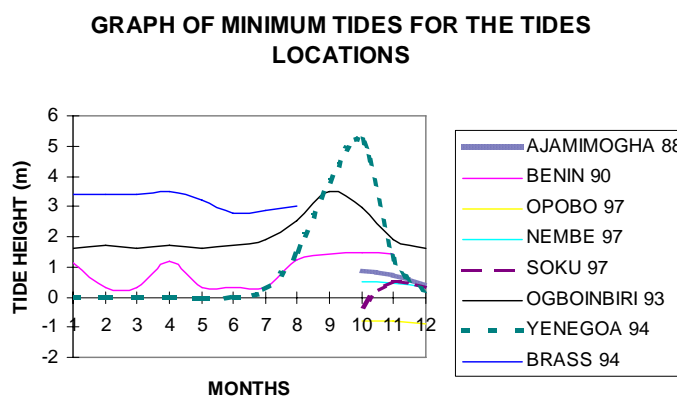


Fig 2.8c Minimum Tides in the Area (after Ezeigbo *et al*).

2.8.7 OPOBO RIVER

The available data cover only October – December 1997 and January - February 1998. The maximum tide lies between 1.01m and 1.23m, while the minimum tide lies between -1.19m and -0.80m. The predicted and observed tides agreed most of the time.

2.8.8 SOKU RIVER

The maximum tide varies from 1.7m in November and December 1997 to 2.58m in February 1998 while the minimum tide varies from -0.3m in October 1997 to 1.08m in February 1998. The observed tide in October 1997 is lower than the predicted tide. For other times, the predicted and observed tides agreed reasonably well. In some cases, also, the predicted tide is out of phase with the observed tide.

2.8.9 YENEGOA RIVER

The data at this location cover May – November, 1992; January – April, 1993 and January to December, 1994. This is a location where the tidal influence is also obscured by flooding. The amplitude of the actual tide is small. It hardly exceeds 0.2m, from January to April. For the rest of the year the river is flooded, with flood level reaching the height of 6.2m in September and October.

2.9 MAJOR FEATURES OF TIDES IN THE NIGER DELTA

The following tidal characteristics have been observed in the Niger Delta: Yenegoa and Ogboinbiri Rivers are flooded for most period of the year, with maximum flood level in Yenegoa exceeding 6.2m in October, while the flood level in Ogboinbiri reaches 4.15m. Table 1 shows water levels at Yenegoa and Ogboinbiri. The flood at the two locations therefore overshadows the tidal influence. Furthermore, between January and April, when the effect of flood is absent, the tidal influence is very slight. The amplitude of the tide is less than 0.2m. The tidal influence at the other locations is quite evident. The maximum height attained at most locations does not exceed 2.82m, while the minimum tide does not go below –0.30m, except for Opobo River, where a minimum height of –1.19m is attained. See Table 1 and figure 1.4. Except for Opobo and Nembe Rivers, where the average monthly tidal range is fairly constant, the range at the other locations varies substantially. Within the limits of the observational errors and the systematic distortions in the data, the observed tides agree reasonably well with the predicted tides. It is also evident that shallow water and meteorological effects are among the factors that influence the tide in the area.

Table V: Maximum, Minimum and Mean Tides at each location (after Ezeigbo *et al*).

| LOCATIONS | MAXIMUM TIDES (m) | MINIMUM TIDES (m) | MEAN TIDES (m) |
|------------|----------------------|----------------------|-------------------|
| AJAMIMOGHA | 1.61 | 0.43 | 1.26 |
| BENIN | 2.23 | 0.32 | 1.74 |
| DODO | 1.77 | 0.01 | 0.91 |
| NEMBE | 2.82 | 0.31 | 1.64 |
| YENEGOA | 6.20 | -0.26 | 1.57 |
| OPOBO | 1.72 | -1.19 | 0.46 |
| SOKU | 2.58 | -0.30 | 1.54 |
| OGBOINBIRI | 4.15 | 1.57 | 2.79 |

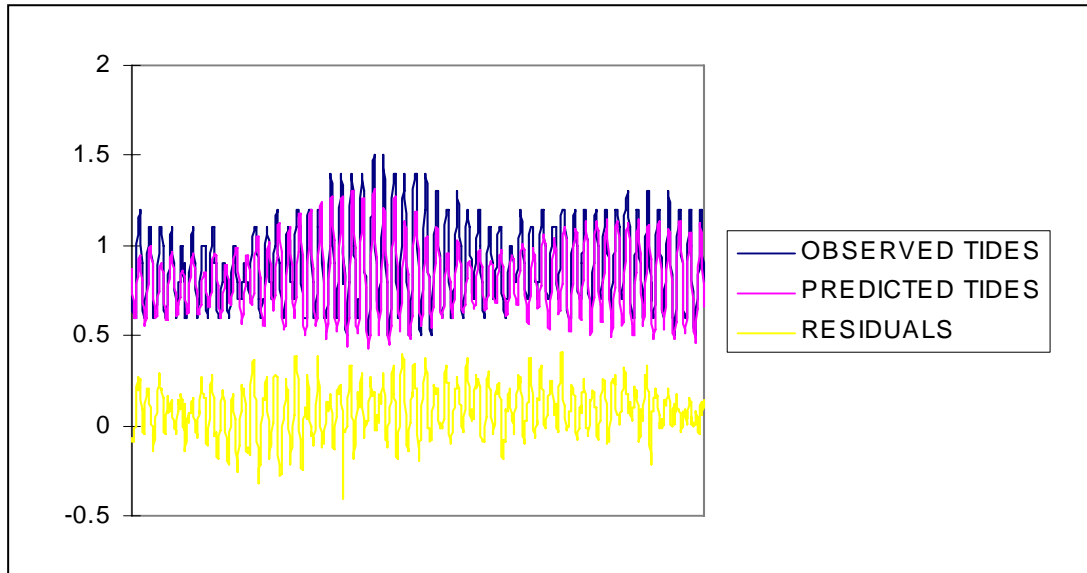


Fig 2.9: Observed, predicted and residual Tides at Dodo for February 1993 (after Ezeigbo *et al*).

2.10 CONCLUSIONS

This section's study has focused on the use of tidal observations at eight tide gauge locations in the Niger Delta to determine the tidal characteristics of the rivers in the area. Optimum harmonic constants needed for tide prediction, which, in turn, are useful in the determination of tidal characteristics, could not be obtained because of the poor quality, insufficient quantity and poor distribution of data used in the study.

A more serious obstacle to the determination of tidal characteristics of some of the rivers, such as, Yenegoa and Ogboinbiri rivers, is the influence of flood in such rivers. Sufficient tidal data, say four or more years' data, would be needed to separate the flooding effect from the tidal readings to ensure accurate determination of tidal characteristics of Yenegoa and Ogboinibiri Rivers.

Furthermore, an improvement in the quality of data and the distribution of tide gauge locations is also needed to reveal the trend in sea level variations in the Niger Delta. It is also necessary to use the Global Positioning System (GPS) in the harmonization of tidal datums in the area, as against the use of the method of "Tidal Datum Transfer", used in this study. This approach will improve the reliability of the derived heights in the Niger Delta. It is only when these requirements are met that the knowledge of the derived information would be useful for planning and execution of coastal projects.

3.0 GLOBAL DISTRIBUTION OF MANGROVES

Mangroves exist in tropical areas of all the continents as well as sub-tropical areas of Asia, North America, Africa, Australia and New Zealand. The arid areas of the Middle East especially along the Arabian Peninsula and West Africa also contain mangroves. Approximately one fifth of the global mangrove vegetation is located in sub-Saharan Africa. Seventy percent of these are found in 19 countries of Central and West Africa.

3.1 IMPORTANCE OF THE MANGROVES

Coastal populations have developed intricate relations with heavy dependence on access to the natural resources found in their environments. Mangroves are important in this complex relationship.

The Millennium Ecosystem Assessment classifies environmental services into four. Mangroves perform some of these:

- Regulation: shore-line protection, atmospheric and climate regulation, human disease control, water processing and erosion control;
- provisioning: (goods from the mangrove);
- cultural: amenity, recreational/tourism, sacred areas and taboos education and research
- Supporting: cycling of nutrients, fish nursery grounds sediment trapping, treatment of waste (e.g sewage), biochemical and toxin absorption.

UNEP-WCMC (2006) estimates that 1 kilometre of mangroves provide US\$200,000-900,000 of values and services.

Biodiversity values of mangroves include provision of habitats for several animal species, including endangered mammals, reptiles, amphibians and birds. It has been estimated that 60% of the fishes caught between the Gulf of Guinea and Angola breed in the mangrove belt of the Niger delta.

Mangroves offer strategic grounds in the breeding and nursery of a very large variety of commercially important fish and shell fish species. Larval and post-larval as well as juvenile stages of shrimps, including *Penaeus* and *Macrobrachium* reside there. Juveniles of mullets, tilapia, shinynose, sciaenids and clupeids feed in the mangrove environment. Other organisms found in the mangrove are crabs, bivalve mollusks (oysters and mussels) and gastropod mollusks and periwinkles. Sessile organisms attach themselves to

mangrove prop roots. Fell and Master (1984) have shown that the leaf litter of the mangrove system is important in nutrient recycling and primary production. Mangrove rooting system provides resistance against waves which would otherwise cause erosion.

4.0 STATUS OF MANGROVE FOREST IN NIGERIA

4.1 Background

Nigeria, the largest country in Africa with a total area of 923,769sq km (land 910,768 and water 13,000 sq km) is located between 4° and 14° latitude north and 2.30° and 14.30° degrees longitude east (Figure 2.1). It is bordered in the west by the republic of Benin, in the east by the Republic of Cameroon, in the North by Niger Republic and Chad in the northeast and the Gulf of Guinea of the Central Eastern Atlantic in the south. The Nigerian coastal and marine area is a narrow coastal strip of land bordered by the Gulf of Guinea of the Central Eastern Atlantic. The coastal areas stretch inland for a distance of about 15km in Lagos to about 150km in the Niger Delta and about 25km east of the Niger Delta.

The Mangrove ecosystem is a globally significant interface between the marine and tropical rain forest. From the perspective of biological diversity, the mangrove ecosystem in many wet tropical areas represents one of the most, if not the most productive of natural ecosystems. Several unique animal species some of which are endangered are found in this ecosystem type. Mangrove forests are important for the economy, society, and the environment. In economic terms, many different types of mangrove wood are used for construction, furniture making, and the extraction of useful chemicals such as tannin, alcohol, citric acid and wood tar. Mangrove are also a source of fuel, particularly wood from *Rhizophora* trees, which can be used for firewood and to make high quality charcoal. They also serve as fisheries, breeding grounds, and nursery areas for marine animals. Within the environment, mangroves act as a natural barrier which help to protect against storms, Tsunami and coastal erosion. They help to protect the environment from toxic substances and their aerating roots can screen out debris carried by the currents, helping to clean water flowing from rivers and streams into the sea. Mangroves cause the deposition of sediment suspended in water, creating mudflats which are suitable for further mangrove colonization. Moreover, mangrove can absorb CO₂ and fix C inside its body which lead to decrease green house gas. Socially and culturally, mangrove provide livelihoods for communities and are source of food from plants and animals as well as

providing a source of medication from plants with medical properties. From the climate change perspective, mangroves are accepted to be good environmental indicators.

Nigeria's unique mangrove ecosystem, the largest in Africa and the third largest in the world, which is part of the Large Marine Ecosystem of the Gulf of Guinea, covers the restive Niger Delta, Ondo and Lagos states. The nation's fragile the mangrove vegetation in this zone occupies an area of about 7,500km² in 30-40km wide belt. They are characterised by three species of *Rhizophora*. The red mangrove, *R. racemosa*, which make up about 90% of the vegetation of the mangrove ecosystem, is the pioneer at the edge of the alluvial salt swamp, *R. harrisonii* is dominant in the middle of the *Rhizophora* zone and *R. mangle* on the inner edge. Other species, more often found in stunted and shrub form, are *Avicennia nitida* and *Laguncularia racemosa*. Associated with the main mangrove formation is strand vegetation with *Conocarpus erectus* and other woody species that grows at the edge of the swamps, mainly near the sea.

Table VI; Fig. 2.1 The distribution of mangrove vegetation in Nigeria (In Land Use Area Data of Nigeria (F A O, 1981)

| Coastal State | Area of Mangrove (km ²) | Mangrove Forest Reserve (km ²) |
|-------------------------|--|---|
| 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 |

4.2. Modification of the Mangrove Ecosystem in Nigeria

However, the integrity of these biological resources is threatened by modifications in the Mangrove ecosystem in Nigeria. The coastal areas of Nigeria, which house the Mangrove ecosystem have undergone wide modifications especially in the last thirty years. Most of the modification had been due to increasing pressures on coastal resources, conflicting

exploitation methods, increasing population and other anthropogenic activities. These activities include oil pollution, gas flaring, industrialization, soil degradation, heat stress, acid rain, water resource degradation, introduction of alien invasive species and deforestation. Most of the modifications have resulted in loss of biodiversity, reduced ecosystem viability and value of coastal systems.

In many cases for example, mangrove ecosystems have been on the decrease since exploitation for oil and gas commenced in the Niger Delta. Most areas, which had dense mangrove vegetation, have been replaced by new vegetation like grasses and climbers. Cutting down of mangrove vegetation by local people for building and firewood also result in deforestation of the mangrove vegetation. This has also encouraged the spread of *Nypa* palm (an exotic species) which is fast displacing mangroves in many disturbed areas. Below are the most prevalent agents responsible for modification of ecosystems (Awosika, 2005):

(viii) Coastal Erosion

Erosion rates range between 18-24m annually at Ugborodo/Escravos station, 20-22m annually at Forcados station, 16-19m annually at Brass Station, 15 – 20m annually at Kulama station, and 20-24m annually at Bonny station and 10-14m annually at (Opobo river entrance) station (Ibe, 1988). The Mahin mud coast in Ondo State is another area experiencing very high rates of erosion

(ix) Flooding

The beaches along the Nigerian coastline are very susceptible to flooding due to their very low topography. Whenever storm surges coincide with spring tides most beaches at a maximum elevation of 3 m above sea level are usually topped by wave resulting in flooding. Flooding of the Victoria Island and other low-lying areas of the state are common especially during the rainy months of June to August. These floods are more pronounced during the months of April and August when ocean swells which develop far out in the Atlantic pound the coast with devastating effects. The August 1984 and May 1990 storm surges resulted in large scale flooding of Victoria Island (Figure 4.5). The coincidence of spring and high tide conditions coupled with blocked drains and low drainage heads lead to the flooding of streets and houses.

The nature of the topography of the Mahin Mud coast (beach elevation averages at 3m above mean low low water) renders the coastline susceptible to flooding especially during high tides (Figure 4.6). Though the tidal range is low, large areas of the back beach are perpetually wet and water logged. The coastal area especially the Niger delta

and the adjoining Mahin Mud coast also experience very high rainfall. The poor drainage allows storm waters to collect in the hollows and eventually flood large areas within the Delta. Thus flooding which has industrialized the Mahin mud coast has exacerbated the erosion problem along the Awoye/Molome areas.

Rising sea level could exacerbate flooding in the coastal areas. The barrier lagoon coastline in Lagos State could lose well over 284 to 584 square kilometers of land from erosion and inundation arising from sea level rises of 0.5 and 1m respectively by the end of the 21st century (Awosika et al 1992). Flooding and inundation of coastal areas lead to modification of the coastal systems. Fresh water areas or brackish areas when flooded with sea water results in the dearth of native vegetation that cannot withstand the new saline environment. Typical areas could be found in the Mahin Mud coast and the once fresh water areas in the Niger Delta.

(x) Pollution

Increased industrialization and other socio economic activities inevitably results in the release of varied types and amounts of wastes into the environment. In the recipient environment, these wastes sometimes reach and even exceed toxicity thresholds and can thus be classified as pollutants – a class which includes; petroleum hydrocarbons from the oil industry, solid wastes (especially from domestic activities) and sewage.

(iv) Oil spills

The impact of an oil spill depends among other factors on the type of oil, the volume spilled, the nature of the spillage (continuous or intermittent), the nature of the impacted environment and the prevailing meteorological and oceanographic conditions.

In 1970, only one oil spill (of 150 barrels) was reported; in 1971 the number increased to 14 involving 15,110 barrels. By 1974, there were 105 oil spills, increasing to 154 and 241 reported oil spills by 1978 and 1980 respectively. Nest (1991) reported that between 1970 and 1982, there were 1,581 reported oil spills involving two million barrels of oil. Apart from equipment failure, sabotage by disgruntled groups also occurs: According to Shell petroleum, 50% of the total number of spills in 1999 and over 70% of the total volume spilled was due to sabotage. The number oil spills in 1999 was 319, which was 32 percent higher than the 1998 figure of 242.

Depending on spill circumstances, known and potential impacts include:

- Mass mortality and or tainting of animals as well as other aquatic resources;
- Ground water contamination;
- Abandonment of Fishing ground and associated livelihood pursuits;
- Devegetation and other forms of ecological damages;
- Loss of biodiversity in breeding grounds;
- Loss of drinking and industrial water sources;
- Reduction of land area available for agriculture;
- Loss of recreational facilities and aesthetic values of the environment;
- Increased economic burdens of pollution cleanup, population rehabilitation ;
- Impairment of human health; and
- Worsened rural underdevelopment, poverty and heightened community embitterment

(v) Solid wastes

Solid waste constitutes a major environmental problem in the coastal areas of Nigeria especially from major coastal cities like Lagos, Warri and Port Harcourt. Due to rapid increase in coastal population, the volume of solid waste generated by residents has quadrupled in recent years. Facilities for disposing of solid waste have been over stretched hence manual clearing of solid wastes have been rendered inadequate. The use of mechanical devices has become inevitable.

The largest generators of solid wastes are the steel, food processing and tanning industries. Estimates of annual generations of municipal solid wastes for Lagos, Calabar, Port Harcourt and Warri are 1,400,000; 190,000; 650,000 and 66,721 tonnes respectively (Lagos Waste Management Authority (LAWMA 1999). Wood-shavings and saw-dust from the wood processing industry which are sometimes located near water-fronts pose peculiar problems which include; BOD imposition, smothering of benthos and alteration of hydrodynamic conditions.

(vi) Sewage

In most large Nigerian cities, there is no central sewage treatment plant except in some relatively new estates and factories. In most cases, households are connected to self – contained septic tanks. Therefore, raw human waste evacuated by dedicated trucks is

generally disposed into coastal waters. This practice is very prevalent in Lagos, Warri and Port Harcourt where coastal population is very high.

(vii) Global climate change and sea level rise

Probably the main coastal consequence of an increase in global temperature is an accelerated rise in sea level. Latest projections of sea level rise predict a sea level rise of between 65 + 35cm by the end of the 21st Century (Second World Climate Conference, Geneva 1990). The rate of sea level rise along the Nigerian coastline in the past has not been quantified due to paucity of data. The average mean sea level obtained from tide gauge records (Lagos) spanning 1960 to 1970 was found to be 0.462m above the zero of the tide gauge (Udoffa and Fajemirokun, 1978). The Nigerian coastal zone is no exception as shown in the past assessment of impacts of sea level rise on the Nigerian coastal zone (Ibe 1990, Awosika et al 1990, 1992 and 1993).

5.0 MANGROVES IN NIGERIA

Mangroves are found to some extent in all the nine coastal states of Nigeria (Lagos, Ogun, Ondo, Edo, Delta, Bayelsa, Rivers, Akwa Ibom and Cross River). The major concentrations however are in the key Niger Delta states of Delta, Bayelsa and Rivers. The widest reach of mangroves is in the edges of the Niger delta and specifically Delta and Rivers states. The Lekki and Lagos lagoons have the largest component of mangroves in the western axis. The Cross River has a secondary delta associated with the branching of the river into an estuary. This reaches 7-8km in width and stretches inland into the estuary for about 26kilometre (FAO, 2005). Edo state though not on the Atlantic coast has a tiny mangrove section along the Gwato creek. A further amount is along the boundary line with delta state as the Ossiomo enters the Benin River.

Mangrove is a distinct sub-set of the Nigerian rainforest and estimated to cover about a tenth of the forest and wooded area of 31.59 million hectares (Ibianga, 1985). It is found on the coast and stretch into the rivers and its complex lagoons in several places. Spalding (1997) estimates the Nigerian mangrove to be about 10,500km².

Annual rainfall is very high in the delta and range from 3000-4500mm. the rains commence about March/April and the peak is experienced about July and September. The dry season is between December and February. A break is usual about August. The mean monthly temperature is 27⁰ C and humidity is generally very high oscillating around 80%.

Table VII: Niger Delta Mangrove Forest Estimates

| Forest size (ha) | volume (million m ³) | Source |
|------------------|----------------------------------|---|
| 404,500 | 7-9 | Niger Delta Development Board (1962/63) |
| 512,200 | 30-40 | Niger Delta Development Board (196/64) |
| 404,500 | 5.64 | FENCO |
| 540,000 | 13.9 | Adapted from Okigbo |
| 540,000 | 1.7 | Adegbehin and Nwaigbo |

Source: Adegbehin and Nwaigbo

The mangroves in Nigeria's delta are served by the two large rivers which take their origin from outside Nigeria-Niger and Benue. Parts of the delta, especially in the western and eastern flanks, are, however supplied by headwaters rising from forests lying just outside the region within Nigeria.

The ecological boundaries between the four zones are fluid and influenced by seasonal fluctuations in discharge of water related to rainfall patterns. Salinity increases during the dry season with reduced discharges making it possible for sea water to intrude high up the estuaries. During the rainy season, the delta becomes a huge flood plain due to the combined effects of flat terrain, poorly drained soils and river discharges.

The mangroves are the least disturbed ecosystem in the delta and by the early 1990s, it was estimated that the mangrove is put at about 5-10% (Hall, 1994). This is largely due to the inaccessible nature of the region, difficulty and specialized nature of the demands of removal of timber from the area.

Table VIII: mangrove area in coastal states of Nigeria

| State | Mangrove size km ² | Mangrove in forest reserve |
|-----------|-------------------------------|----------------------------|
| national | Circa 10,000 [973,000ha]* | |
| Akwa Ibom | 721.86 CRS and Akwa | |

| | | |
|-------------|---------|------------------|
| | Ibom | |
| Bayelsa | | |
| Cross River | 959 | 57.19 crs and ak |
| Delta | 3470.32 | 143.75—bendel |
| Edo | | |
| Lagos | 42.20 | 3.17 |
| Ogun | 12.18 | ? |
| Ondo | 40.62 | |
| Rivers | 5435.96 | 90.62 |
| Total | 9723.14 | 304.69 |

* A slight volume may have been lost with the recent boundary adjustments in the Rio del Rey/Bakassi area.



Plate 1: the crab *Calinectes*, an occupier of the mangroves is an important crab species harvested in Delta state.



Plate 2: prawns from the mangroves on sale in a local market

Globally, 70 plant species have been shown to be in the true mangroves (Spalding, 1997). Eight species are found in West African mangroves.

Table IX: Mangrove types in Nigeria

| Common name in Nigeria | Red mangrove | White mangrove | Black mangrove |
|------------------------|--------------------|--|--------------------|
| Genus | Rhizophora | Avicennia | Laguncularia |
| Species | <i>R. racemosa</i> | <i>A. germinans</i> (<i>Africana</i>) | <i>L. racemosa</i> |
| | <i>R. mangle</i> | | |
| | <i>R. harsonii</i> | | |

Mangrove swamps show distinct zonation. Zonation is linked to ecological factors such as salinity, texture of sediment deposits and frequency of immersion due to the diurnal rhythm of tide. A sequence which begins from open water with species tolerant to salt progresses to communities not tolerant of immersion in sea water.

Deposits of grayish mud or clay in mangroves develop into characteristic hard compact soil known as chikoko. Chikoko has high content of ferrous sulphide. When the soils are exposed and dry the acid sulphides are oxidized into sulphuric acid with pH as low as 3. Unpleasant gases are trapped and accumulate in anaerobic condition so created. The soils tend to be almost neutral pH when wet. The high salinity and acidity combine to exclude other vegetation. This accounts for the depauperate species assemblages found in mangrove forests.

In Nigeria, there are eight species usually associated with the mangrove ecosystem to varying extent- *Acrosticum aureum* (leather fern), *Conocarpus* (buttonwood tree), *Hibiscus tiliaceus* (hibiscus), *Thespesia populnea*, *Drepanocarpus lanatus*, *Chrysobalanus* spp, *Pandanus candelabum* Early in the twentieth century, a mangrove species from Asia, *Nypa fruticans*, was introduced into Nigeria from Singapore.

Nigeria has the third largest mangrove endowment in the world after India and Indonesia (Macintosh and Ashton, 2003). Various sources have attributed conflicting quantities to the volume of mangrove in Nigeria. Figures quoted include 5,400km² and 6000km² (SECAL, in Sayer, Harcourt, and Collins, 1992, 231); Adegbehin and Nwaigbo, 13), 9900km², 9980km², 7422km² and the highest being 11,134km².

Estimates on extent of mangrove indicate a decline and has reduced by 26% since 1980. Some authors however, put the commencement of the decline at 1970 with the advent of the oil boom (Ohimain 2006a).

6.0 EXTENT OF MANGROVE LOSS IN NIGERIA

There is a wide range of ecological goods and services provided by mangrove forest including their important roles in acting as nursery and habitat areas for fish, crabs, shells and other aquatic fauna. Mangrove forest also prevents the coast erosion, filtrates land runoff and controls flood, etc. Mangrove also supports biodiversity as well. Many birds, other vertebrates and invertebrates are found commonly inside and nearby mangrove forest. Mangroves provide socio-economic value to coastal communities in the form of both wood and non-wood products. For example, poles and timbers were used to build material for boats and houses, charcoal, firewood, tannins and food as well as medical herbs. Fishing within and surrounding mangrove forest areas is also another importance of mangrove resources to the people.

However, in many areas of the world, mangrove habitats are being destroyed as rivers are dammed, their waters diverted and the intertidal zone extensively developed for agriculture or aquaculture and generally dried up. Large tracts are being converted to rice fields, industrial and land development and other non-wood uses. In response to the lucrative shrimp export trade, a new breed of small- and large-scale farmers are carving out vast chunks of tidal flats for shrimp farming and pisciculture. Remaining mangrove resources are overexploited for fuelwood and charcoal-making. The depletion of mangroves is also a cause of serious environmental and economic concern for many developing countries, given the pivotal role of this vegetation in coastal protection.

All over the tropical world, mangroves are regularly harvested by coastal communities to meet their needs but mangrove use is not confined to subsistence, small-scale harvesting. Mangroves and associated mangroves were used for charcoal, firewood, wood distillation, poles and *Nypa* products (FAO, 1985). Species mostly used for charcoal were *TRhizophora spp.*, *Avicennia spp.* and *Laguncularia spp.* Mangrove poles were used for foundation piling, scaffolding and fishing stakes.

For example, before the discovery of oil in Nigeria, about 20 000 m³ of mangrove wood was utilized annually in the coal mining industry as pit-props (Adegbehin and Nwaigbo, 1990). Even though the demand for coal has drastically declined, mangrove wood is still extensively used in Nigeria and the extraction of much higher volumes of wood is undertaken exclusively as selection harvesting under licence agreements with the competent authorities (Isebo and Awosika, 1993).

6.1 Threats and drivers of change in mangrove vegetation

Of the four ecological zones encountered in the delta, mangroves are the least disturbed. The main sources of loss are urban growth, industrial development and oil activities (Hall, 1994). West African mangroves have been shown to be in moderate decline. Decline of the mangrove resource is associated with the following: rapid growth, high poverty, low development indices, poor governance in rural areas and open access of coastal resources.

Four drivers have been identified in west African mangrove:

- population growth,
- economic and political trends,
- climate change and
- changes in upstream habitat.

Traditional uses of mangroves which contribute to the degradation of the vegetation are; cutting trees for producing racks for drying fish, fish traps, cages and fuel wood (Ashton-Jones and Douglas, 1994). Large tracts of mangrove have been converted to rice farms, fish ponds industrial and urban development projects.

In Nigeria, the main drivers of change in mangrove status have been identified as follows:

- Petroleum and gas exploration and production
- Deforestation
- Urban development
- industrial and domestic wastes
- Plantations of oil palm and rice fields
- Drainage and digging of canals
- Pesticides and industrial sources of pollution

- Agriculture- experiments to use mangroves for rice production started in the 1930s. Though production levels could not be sustained, a few patches have been embarked upon here and there.

- Changes in upstream habitat

Increases of pollution and toxic influxes have invariably followed industrialization and urbanization, changes in fresh water regimes elicited by developmental projects such as dams and conversion of forest for agriculture and increased sediment runoff all have adverse impacts on mangroves.

- Climate change

From both scientific and policy viewpoints, concern for mangroves has been expressed due to climate change. While most predictions deal with sea level rise (Ellison and Farnworth, 1999; Blasco et al 2001), the possible engineering designs for building of dikes and other hard structures may pose barrier to the horizontal movement of mangroves (Bird, 1995; Nicholls, 2004).

- Economic and political trends

Levels of poverty in mangrove environments are some of the worst nationally. Conflicts over oil activities and arising from 'resource control' by various tiers of government have heightened in recent times with a concomitant resort to exploitation of natural resources.

Military and militia operations also restrict opportunities for research and conservation in these areas

- Oil export take place mainly in mangrove ports, a predisposing factor to spills and great danger to the health of mangrove ecosystem (NDES 1997).
- In the past thirty years, seismic lines have been placed in the delta mangrove forests (Elijah 2001) exposing these sensitive areas to impacts by petroleum and its products (Ekweozor, 1989). Other threats include gas flaring, canalization, siltation, sand mining and construction of embankments (Isebor and Awosika, 1993).
- Population growth and urban development in the coastal zone

Over 20 million people live along Nigeria's coastal zone. The mangrove ecosystem has some of the fastest growing population centres in Nigeria. These include Lagos, Nigeria's economic capital, Port Harcourt and Warri with huge investments of oil and gas. Others are Calabar, Onne, Koko, Forcados and Bonny which serve various export and import terminals.

More recently, fresh additions to LNG 'trains' are taking place in the mangroves as exemplified by the Brass plant.

This fast development is exerting pressure on coastal natural resources. Rural-urban migration has heightened poverty in rural areas.

7.0 STATUS OF THE MANGROVE FORESTS IN NIGERIA

7.1 DESTRUCTION OF MANGROVES

An intricate relationship exists between man and the mangrove. The activities which impact on the mangrove range from ordinary attempts at subsistence, eking out a living from the ecosystem to illegal activities such as bunkering of crude oil and refined petroleum.

Sources of stress from which mangrove may die include suffocation through clogging of roots of mangroves near flow lines, compromised pipelines and discharges. Pipelines, flow-lines and seismic lines are veritable routes through which fast growing alien species such as *Nypa fruticans* invade and then displace mangroves. Clearance of lines may reach 5 metres.

Slow regeneration rates of mangroves results in affected areas being not re-vegetated long after the cutting of mangrove has occurred.

7.2 THE PETROLEUM INDUSTRY

The impact of the petroleum industry on the vegetation of the Niger delta was subjected to in-depth analysis in the RPI/NNPC study of 1984. Some dramatic revelations were made in a number of oil spills. Particularly severe incidents include the Funiwa 5 blow-out and oil spill at the coastal community of Fishtown.

Box I: impacts of petroleum industry activities in selected sites

- Funiwa-5 Fishtown blow out revealed that 5 years after the incident the vegetated had just started re-establishing itself.
- Upomami discharge site –reported disturbed vegetation. Prop roots of *Rhizophora racemosa* were black, showing the remains of oil. The species most affected were *Mariscus sp*, which was completely brown instead of green
- Egwa Field development is associated with the appearance of nypa
- Choba area-dead *Rhizophora*, disturbed and damaged mangrove community evident from Choba downstream. High mortality of mangrove associated with the oil industry facilities there. Downstream to Port Harcourt, localized, total habitat destruction owing to the construction of wharves and jetties. From Port Harcourt, most of the mangroves showed stunted re-growth with places along the foreshore completely denuded. Slight to moderate defoliation over much of the area appear related to small spillages and/ or chronic low-level pollution.

7.2.1 Oil industry stresses

○ Bunkering

The waterways of Delta state though distinct actually form one huge mesh of wetlands. Access from one point usually leads to other distant points through a network of creeks and canals. A seamless mesh is thus created. Probably the single most pervasive stress on the mangrove ecosystem from the oil industry today, in Delta state is the incidence of illegal bunkering. This activity is extensive and has chronic and insidious effects. This variety of bunkering involves the illegal removal of items as varied as crude oil and refined products. It is done haphazardly with reckless abandon.

No care is taken to avoid spillages and sometimes there is deliberate discharge of product into the creeks. Bunkering is rampant in the numerous creeks of the Benin River and also in the Warri/Forcados axis. Illegal discharge points near land and on freshwater locations compound the problem further inland along the Ethiope and Warri Rivers. This latter aspect ensures that the hydrocarbon load in the aquatic environment is constant as tidal movements continuously bring spills from upstream and downstream the Benin River. Tidal movement also spreads the oil deep into the swamps.

Sleek and sheen is observable as a continuous film in creek communities such as Abe-Ugborodo, Ubakporo, Ajosolo, Omadino Egbokodo and Orere lacing the roots of plant species along the creeks. This has the effect of suffocating the roots at the inter-tidal zone and reducing the ability of the plant to carry out regular physiological activities. Spills spread far and deep into the swamps and backwaters smothering creatures as varied as crabs, fish, shrimps and their developmental stages. Spills and outright abuses therefore persist in the creeks and tidal action ensures that the sleek is transferred through the whole system.



Plate 3: oil sleek from bunkering on roots and stems of *Pandanus* and *Rhizophora*

Box 2: Experiments on impact of oil on mangroves

Experiments to Study the Effects of Oil Pollution in Mangrove Vegetation

La & Feng (1984) reported on field experiments that showed that relatively large concentrations of fresh crude oil were needed to cause significant mortality in mangroves. Young mangroves, shorter than 180 cm, were more susceptible while larger

plants could survive long exposures to high concentrations. Most of the seedlings survived the impact of oil as long as their leaf surfaces were not 100% oiled.

Getter et al. (1989) reported on experiments with different oils and oil dispersant combinations and their effects on different species of mangroves. The study shows that lighter oils (diesel and oil, light crude) are relatively more toxic to seedlings of mangroves. Bunker oil and heavy crude were relatively non-toxic. The studies showed that red mangroves(*Rhizophora*) was less sensitive to oil contamination than white mangroves(*Avicennia*). The study also showed that certain stocks of

Mangroves are less sensitive to oil contamination than others.

McGuinness(1990) studied short- and long-term effects of oil spills on mollusks and crustaceans mangrove forests. Mortality of some species was noted but densities reached control levels within a few weeks. Sampling of areas previously affected by spills also provided little, if any, evidence of long-term effects. There were few residual effects of the oil; re-colonization occurred rapidly, depending on size of the patch affected and the rate of recruitment from plankton.

Grant et al. (1993) studied the effects of weathered Bae Strait (Australia) crude oil (2 l/m²) on mangrove seedlings survival. 6.4% of the seedlings died within 14 days.

Source World Bank

Box 3: Oil spillage in Delta State

| DELTA STATE | | | | |
|----------------------------|--------------|--------------------------------|--------------|--------------------------------|
| ALL COMPANIES | | | SPDC | |
| | No of spills | Quantity spilled in Barrels | No of spills | Quantity spilled in Barrels |
| 1991 | 78 | 950 | 50 | 705 |
| 1992 | 129 | 12,232 | 55 | 1220 |
| 1993 | 116 | 909 | 58 | 617 |
| 1994 | - | - | 59 | 315 |
| Total | 14091 | 222 | | 305 |
| Average/yr | 4697 | 50 | | 764 |
| Average m ³ /yr | | 746 | | |



Plate 4: A “Riser” receives and stabilizes pressure of fluids in the oil and gas industry. It brings it down at a point and sends it out at a higher pressure or vice versa as appropriate.



Plate 5: Section of a “Riser”, at Egbokodo, Warri South LGA.

The oil and gas industry is aware of the need to ameliorate damage done to mangroves. In this plate, SPDC is actively taking steps to ensure mangrove re-vegetation.

ENVIRONMENTAL PERFORMANCE

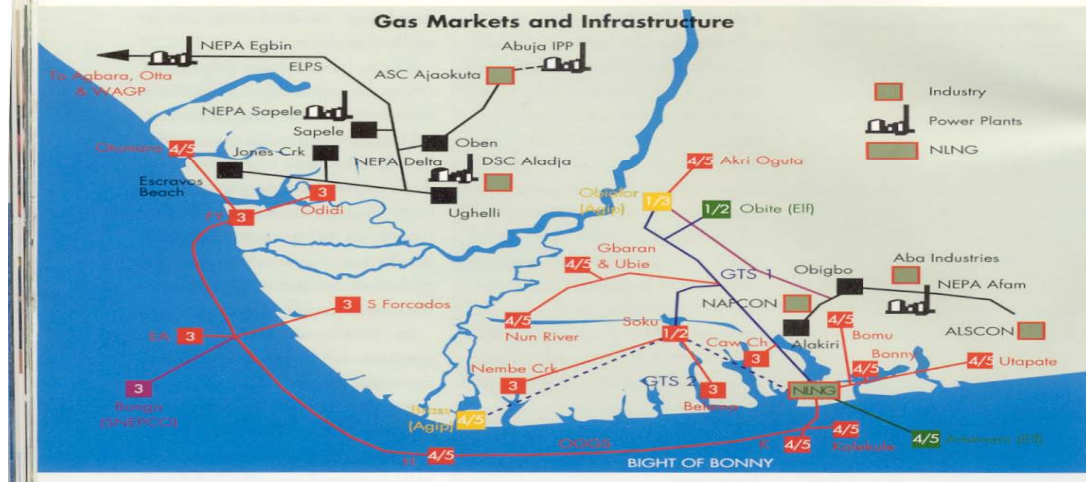


Plate 6: pipeline network in the Niger delta

Source: SPDC annual publication; People and Environment

- Flow stations, risers, tank farms, aircraft landing facilities

In Delta state, huge investments in oil industry infrastructure have been centred on the mangroves and associated land. Land take is therefore a big issue. Specifically, wells and fields are developed using processes that remove large tracts of mangrove.

In the state, the following are recorded:

- ✚ Dibi
- ✚ Olero
- ✚ Opumami
- ✚ Omadino

Two aircraft receiving facilities for ease of movement of staff are in Delta state: landing strip at Forcados for choppers and the Escravos hangar which can receive medium sized aircraft. These have been built in mangrove reclaimed swamps.

7.3 Impact Of Human And Other Activities Over Time On The Mangrove And Associated Resources

Sewage and waste disposal and the cutting of mangroves for fuel have degraded mangrove stocks in most villages or cities.

Several factors are responsible for the low degradation of the mangroves. Communities prefer gathering dead wood than cutting live mangroves (Leh, 1994). Other uses are low intensity activities and are carried out on a subsistence level. Consumption rates were put at about 4m³ by inhabitants of the mangrove zone see table below (ESMAP)

This has led the World Bank to conclude that mangrove utilization is not threatening the resource base or its ability to provide its ecological functions.

Table X Fuelwood demand and supply balance

| | TOTAL CONSUMPTION | SUSTAINABLE YIELD | SUPPLY DEMAND |
|------------------|-------------------|-------------------|---------------|
| BALANCE | | | |
| | mil adt* | mil adt | millionadt |
| Region/State | | | |
| Bendel | 4.00 | 11.30 | +7.30 |
| Rivers | 2.50 | 5.6 | +3.10 |
| Southern average | 4.08 | 4.83 | +0.71 |
| Northern average | 3.25 | 2.94 | -0.31 |

*adt air dried ton

Source ESMAP, 1993

An estimated 5-10% of mangroves had been lost in the Niger Delta. The oil companies have been implicated in the destruction of mangroves in their areas of operations. By the mid 90s the World Bank estimated that 1% of the mangroves of present Bayelsa and Rivers state had been destroyed by operations including seismic, exploration and transportation of oil and gas resources.

○ Subsistence use of mangroves

The use of the mangrove for subsistence by the inhabitants of the ecosystem range from fishing, picking of periwinkles, use of fruits as attractants in fishing, cutting of chikoko and traditional medical recipes. Other items obtained from the mangroves include thatch and fuelwood. Fuelwood has become an important domestic item with the epileptic access to kerosene in most urban centres.

Harvesting of fuelwood is an open access right and controls do not exist largely because it is unregulated. A lot of inefficiency attends the extraction of fuelwood. Huge logs are left to rot after the choice parts have been removed.

However, on a regional basis, it has been estimated that demand is lower than the forest yield. Ashton-Jones and Douglas, 1994, 1994 166) have alluded to a preference for kerosene even in the remote villages as a major reason which keeps the mangroves from being over-exploited.



Plate 7: rural dweller coming home with harvest of firewood, Abe-Ugborodo, WNLG

Table XI: distribution patterns in the collection, processing and marketing of NTFPs in Nigerian mangrove

| Ecozone | NTFPs | Collectors |
|----------|--------------------|--------------------|
| Mangrove | Fuelwood | Women |
| | Periwinkle | Women and children |
| | Palm fruits | Men |
| | Raphia wine | Men, Women |
| | Wrapping leaves | Men |
| | Chewing stick | Men, Women |
| | Medicinal plants | Women, children |
| | <i>Irvingia</i> | Men |
| | <i>Raphia</i> palm | Women, children |
| | Fish, mollusks | Women |
| | Native salt | Men, men, Women |

| | | |
|--|------------------------------|----------|
| | Poles Sand chalk and clay | children |
|--|------------------------------|----------|



Plate 8: Dead and abandoned *Rhizophora* tree branches along a tributary of the Benin river between Abe-Ugborodo and Arun-Owun.

Products from the mangrove compete favourably with other vegetation zones

Table XI: Estimate of annual gross income from major NTFPs in the major zones of Nigeria

| Ecozone | Est. Qty Marketed (million) | Price/unit =N= | Gross income (Million) |
|--------------|--------------------------------|------------------|---------------------------|
| Mangrove | Fuelwood | 6/m ³ | 4,289 |
| | Wildlife (Periwinkle) | 5/kg | 44,360 |
| | Mangrove native salt | 15/kg | 48 |
| | | | S/T 48,697 |
| Moist forest | Palm oil | 11 | 30,215,626 |
| | Rattan | 35 | 3,205 |

| | | | |
|-------------------------------|-----------------------------|------|-------------|
| | Chewing stick (billets) | 56 | 5651 |
| | Palm wine (litres) | 4 | 658 |
| | <i>Irvingia gabonensis</i> | 230 | 1,240 |
| | Wildlife numbers | 250 | S/T 26,682 |
| Southern guinea savanna | Fuel-wood | 20 | 648 |
| | <i>Parkia</i> seeds | 20 | 1,034 |
| | Wildlife numbers | 10 | 76 |
| | Shea butter | 65 | 315 |
| | | 33 | 149 |
| | | | S/T 2,222 |
| Sudan savanna | Fuelwood | 80 | 1,200 |
| | Vegetables | 10 | 536 |
| | Fodder (<i>A. albida</i>) | 2 | 193 |
| | <i>Parkia</i> seeds | 20 | 77,797,320 |
| | Gum Arabic | 1622 | S/T 100,026 |
| | | | T 177,627 |

Source: Non-Timber Forest Products Nigeria FORMECU, 1994, Reported in Nigerian Forestry Action Plan, main report, vol. II, June 1995



Plate 9: periwinkles are picked from mud flats on the creeks away from the waterfronts of the mangrove ecosystem

SECTION 2.0

8.0 EXTENT OF MANGROVE LOSS AND MOST IMPACTED SITES OF EACH STATE

8.1 DELTA STATE

8.1.1 Summary

8.1.2 State of the Mangrove in the State

○ Dredging, dredge spoils, Sand-mining

Dredging of river channels in Delta state seems to be a regular activity. This is focused on the Warri, Forcados, Escravos and Benue rivers. Dredging actively imperils stability of the edge of river channels thereby weakening the base of mangroves which eventually lop into the channels of creeks and rivers. Fallen mangrove trees die and decay, thereby depleting the standing stock.

When dredge spoils are piled on the sides of creeks and rivers, they alter the hydrology and smother mangrove plants. These fallen trees in the water die-off eventually and decay. Sand-miners eventually remove the dredged materials and in the process disturb the process of re-colonization of the swamp by seedlings of mangrove species.



Plate 10: Dredging of the Ugbuwangue creek leading into the main channel of the Warri River



Plate 11: removal of dredge spoil from Gere, Orugbo opposite the Port of Warri.



Plate 12: Physical and chemical changes attend dredging of river channels. This plate shows turbidity along the Orugbo-Ode-Itsekiri creek during this survey.



Plate 13: dredging along the Orugbo creek showing booms and destroyed mangrove, mainly *Rhizophora* along the banks and sand-filled area.

8.1.2. ROAD CONSTRUCTION ORUGBO-BIG WARRI

Clamour for development to reach the grass-roots and yearnings for the 'dividends of democracy' has led to an appreciable level of infrastructure coming into areas that were once thought impossible to host road construction projects. Policy instruments such as 13% derivation and the trickle down effects are beginning to translate into concrete projects and with enough resources, the mangrove swamps are beginning to see transformations using modern technology. In Warri South Local Government Area, the islands of Orugbo, Odogene, Usele, Inorin and Ajigba are being linked by road that is being developed in the mangrove swamp.



Plate 14: construction of new road network through mangrove swamp in WSLGA

8.1.3 OIL INDUSTRY INFRASTRUCTURE

The oil industry has a variety of infrastructure ranging from seismic equipment, heavy duty rigs for drilling, a miscellany of bizarre construction equipment, refining and transporting of crude and refined products.

○ Pipelines

Pipelines convey crude oil and gas from the points of production, usually within mangrove vegetation, through a gathering process and transportation to tanks and inland to refineries such as Kaduna. In places such as Warri, terminals are also

provided for the receipt of imported heavy crude oil from Venezuela which is then pumped to designated refineries.

An adjunct of pipeline laying is the construction of canals to aid navigation and transfer of products. Table VII below is indicative of the level of mangrove conversion arising from placement of infrastructure

Table VII: Mangrove Conversion in Rivers* State by Shell Petroleum

| | | |
|--------------------|---|---------------------|
| | | 56.4km ² |
| Seismic operations | 56,400km of seismic lines | 4.5km ² |
| Drilling | 349 sites | 10.5km ² |
| Production | 70mk of flow lines 400 km of pipelines 22 flow stations 1 terminal | |
| Total | 1% of mangroves in Rivers state | 71.4km ² |

After van Dessel and Omoku, 1994

* = Rivers and Bayelsa States



Plate 15: Gas pipeline from Delta state to Kaduna at a point near Egbokodo, WSLG.

8.1.4 URBANIZATION

The length of the “Warri marina” beginning from the SPDC Residential Area/Industrial Area extending past the Ogbe-Ijo market, market road, timer shed, Pessu market to the current position of the houses after the Pessu market were once mangrove stands. These have been converted to ship building, timber processing and saw mill centres and abattoirs among other use types.

In other circumstances mangrove habitat have been converted to include office buildings (Texaco and Chevron offices), moorings (B+B; Beger+ Bilfinger) in Warri.



Plate 16: Portion of Market Road showing mangrove poles and sawdust on sale along the Warri marina. The Warri marina was a mangrove shoreline.

Box 4: The ‘Warri marina’; over a century of mangrove removal

| The case of the Warri Marina: Mangrove loss due to Uurbanization, Pollution |
|---|
| <p>The island opposite the marina has also been occupied and the vegetation largely removed. The development of the marina has spanned a period of over a century with the original vegetation being gradually removed as the trading houses-UAC, McIver, John Holt and others acquired land and went into business. Port development around the present NPA has also removed a lot of the original vegetation.</p> <p>The marina in Alder’s Town is the main reception point for timber that is rafted from the creeks. Sawdust from the mills has over the years piled up and are regularly burnt. The shoreline of the timber market is also used as mooring for floating timber and serves as a</p> |

public latrine. The original mangrove vegetation has largely given way to the floating exotic water hyacinth which is benefiting from the raw sewage constantly let into the river.

Progressively, the marina has extended past the Pessu market and is close to the town of Aladja currently.

Besides the timber market and its associated sawmills, the marina hosts other facilities such as living houses, abattoirs, a big market, shops for sale of spare parts serving the regional maritime industry and mechanic and artisan workshops.



Plate 17: background is a thriving community across from Warri opposite the market road portion of Warri marina derived from mangrove swamp forest. Note floating timber, water hyacinth and grass on beach of community.



Plate 18: hulk of exploded and burnt barge left to rot on the Warri marina the barge was originally carrying petroleum product. Such items litter the marina and serve as a constant of pollution I the mangrove ecosystem.



Plate 19: a modern mansion built right next to the shore along the warri marina. Notice imperiled mangrove vegetation along a creek in the background.

8.1.5 FISH POND CONSTRUCTION

Fish pond construction has become a veritable way of land use in Delta state. Fishponds are constructed in several communities for the breeding of a variety of fishes. Fishes used range from brackish species to freshwater species.

In fish pond construction, the mangrove vegetation is cleared and the pond dug out. The chikoko is used as a construction material to stabilize the dykes.

Plates 20-22 below show various aspects of the stages of pond construction from land clearance to stocking of fishponds constructed in the mangroves at Ubeji, a suburb of Warri.



Plate 20: conversion of mangrove to fishpond



Plate 21: interface between mangrove, human habitation and fishponds



Plate 22: detail of chikoko use in fishpond construction

8.2 EDO STATE

The quantum of impact recorded from the oil industry is directly related to the mangrove endowment. Edo state mangrove at risk due to oil industry activities is restricted to a handful of a narrow strip of exposed mangrove stands along pipelines constructed to evacuate products from the littoral flank of Ovia North Local Government Area. At least two canals run into the Benin River from Gelegele and other points.

8.2.1 EDO STATE MANGROVE ENDOWMENT

The main mangrove ecosystem in Edo state consists of small stands on the Gwato creek and Ossiomo River at the Benin River. The mangrove on the Gwato creek decreases as the boundary line between Delta and Edo states is approached. At Gelegele town, there is no mangrove and the vegetation is purely freshwater swamp.

The Ossiomo River enters the Benin in a wide birth. The mangrove stands improve as the salt water increases from the freshwater of the Ossiomo. A few other sources of negligible stands of mangrove vegetation occur along two canals dug to convey oil industry products from the Gelegele area.

In the uncharted waters of the Benin River/Ossiomo area, the boundary lines not indicated making the exact quantum of mangrove uncertain for Edo State.

8.3 MANGROVE STUDIES EDO AND DELTA STATES.

The Visit into the Warri River started at the Nigerian Ports, (NPA) Warri N05.30.906, and E005.42.739. Our destination was the creeks along the Warri River. (Orugbu, Odogene, Ajiba Creeks all in Warri South LGA), it is very important to note that this creeks are named after the towns in the area but unfortunately most of the towns are not in existence either due to migration or due to the last Ijoh and Itsekiri War in Warri some years back. (Source Interviewed Itsekiri woman).

At Orugbu Creek N 05.30.018 and E005.42.590, there was heavy Mangrove destruction due to River dredging. It was noticed that as the river got dipper due to dredging, the mangrove trees by the shore line fell into the river.



Fig 1 above showing the Dredging Ship on the Warri River at Orugbu Creek.

Fig 2 below showing the Orugbu Sand fills (N 05.30.018 E 005.42.590)



Sand gotten from dredging of the Warri River from the Orugbu Creek was used to do the sand filling as shown in figure 2.

At the Odogene Creek N 05.30.118 and E 005.42.734, mangrove there was not affected by any form of human activity, when asked why we were told that this was due to some religious belief. Again, the site had been abandoned over many years due to human migration.



Fig 3a and 3b Mangrove on some parts of Odogene Creek left untouched due to religious belief.

Ajiba Creek 0.5.30.118 and E 005.42. 734, mangrove was heavily affected as it was noticed that there was a road construction cutting heavily across the mangrove. Figure 4a and 4b



Figs 4a and 4b showing Road Construction cutting across the mangrove on the Ajiba Creek, Warri River.

At Ubaja end of the Warri River N34.00.000 and E.068.54.375, It was notice mangrove destroyed due to the Gas and crude oil pipe lines laid to the Escravos River. Figs 5a and 5b



Figures 5a and 5b showing gas Pipe lines cut across the Mangrove in Ubaji Warri South East, Delta State.

Also in Ubaji Mangrove was also destroyed for the construction of fish ponds for domestic and commercial use.



Fig 6a, 6b and 6c Mangrove Site Cleared for Fish pond Construction

Bini River I (From the Sapele End).

The Benin River was coursed for mangrove from the Sapele End, Sapele LGA, Delta State. The Staring point was at Ugbekoko N 10.00000 and E.005.34.486; heading towards Abeugborodu town Warri South East LGA, the village of the new Governor of Delta State.



Fig 7 Abeugborodu Town.

Along the Abeugborodu creek, it was noticed that the mangrove vegetation was flourishing however we could still see felling of the trees by natives.



Figs 8a and 8b showing felled mangrove of wood along Abeugborodu creek

Abeugborodu Salt Making Camp N 0.5.56.436 and E 005.31.633.



Fig 9: Abeugborodu Salt Making Camp.

One of the uses of the mangrove prop roots in Abeugborodu is in the making of native salt; the process of Salt making using the prop roots of mangrove is as follows.

- A. Roots are cut and burned to ashes.
- B. The Ashes are collected and put in a special kind of plate where it is mixed with water.
- C. The Ash water is then heated up till dryness and salt is sun dried.

It is very important to note that the roots of the mangrove not only act as the source of material for salt making but also used in the cooking of the salt water to dryness.



Figs 10 a-c Native Salt process.

During an interview in the village, we were also told that the mangrove stems were used to construct the skeleton of houses.



Fig 11 Mangrove Stem used as Skeleton of Houses.

A Trip further into the Atlantic, away from the Abeugborodu village, it was noticed a large Mangrove reserve Island N.05.56.203 and E005.30.390.



Fig 12 Isolated Mangrove Island.

Bini River II (from the Koko end Warri South West, Delta State)

At the Dudu Village N05.56.354 and E005.15.578, Gwato creek, off the Bini River, there was a great reserve of Mangrove in the area, when the team interviewed some people; we were told that the inaccessible networks by boats as well as the Ijoh/Itsekiri fight which sent the dudu people away from the area were some of the possible reasons.



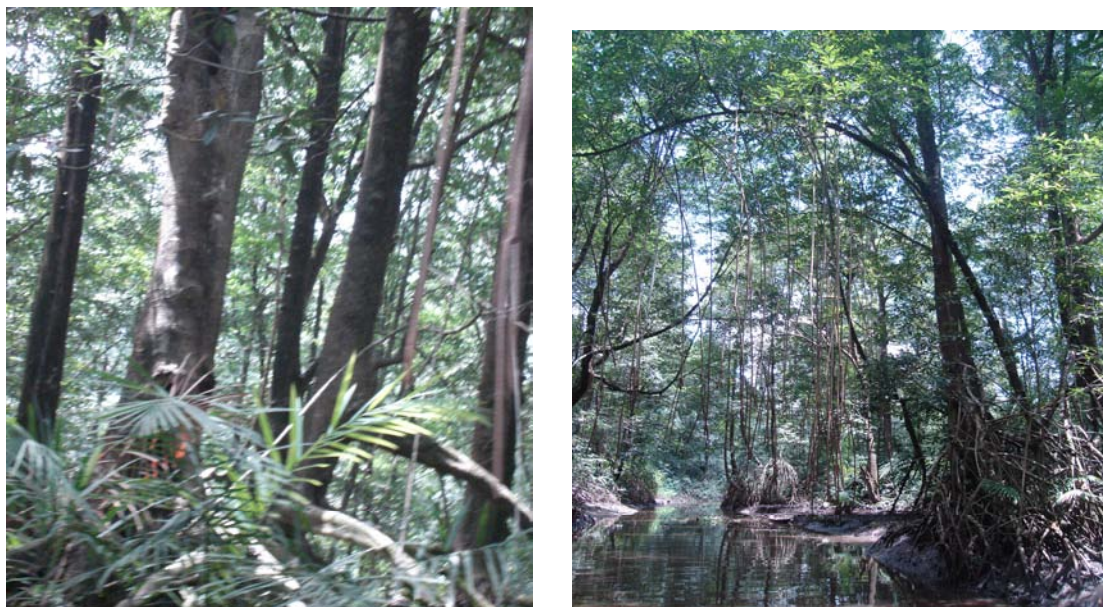


Fig 13 a-c Mangrove reserve in Dudu village off the Gwato Creek (Bini River) N0.5.56.412 and E005.15.317

Towards the Gelegele creek Ovia North East, Edo state there was no visible sign of mangrove, further investigations revealed the water to be fresh water.

It is important to note that the team had very hostile reception from the Ijoh people in Gelegele village; due to this no Picture, and GPS reading could be taken.

On the Ossiomomo River N 06.13.260 and E005.27.794, there was also no sign of mangrove but as the team cruised towards the Atlantic by the boundary between Edo and Delta State the first Mangrove was seen, further into the Atlantic mangrove could be visibly seen N 05.58.797 and E005.19.656



Fig 14 Continuous Mangrove at the Boundary between Edo and Delta State in the Ossiomomo River.

Market Survey for mangrove Wood Sale.

This took the team to the Warri Wood market in Warri town and the Ugbekoko wood market in Sapele, heavy Mangrove sale was noticed, Interviewing the Market people we were told that the woods are gotten from the creeks of Warri and Bini rivers.



Figure 15a and b showing mangroves wood sale in Warri Wood Market.



Figure 16 a and b showing Mangrove sale in Ugbekoko Wood Market in Sapele

8.2.2 EXTENT OF MANGROVE LOSS

Most Impacted Sites

The level and kind of use by indigenous populations is such that mangrove maybe harvested in perpetuity. The impacts are mainly of the type of tree and root harvesting for a variety

The most impacted sites are those related to oil industry activities. These are listed in the sections under impacts from the oil industry.

Level Of Awareness On Mangrove As A Resource

Awareness of the strategic role played by mangroves is very high among all strata of users and impact sources. Even among oil industry operators, there is evidence that there is need to ameliorate mangrove depletion. Two oil companies, SPDC and Chevron have shown some level of commitment to mangrove replanting in sites affected by their operations.

Plate 23 below shows site under mangrove re-vegetation by SPDC.

Chevron also has a mangrove re-vegetation project and instituted a training programme in which staff of the Federal Ministry of Environment was beneficiaries.

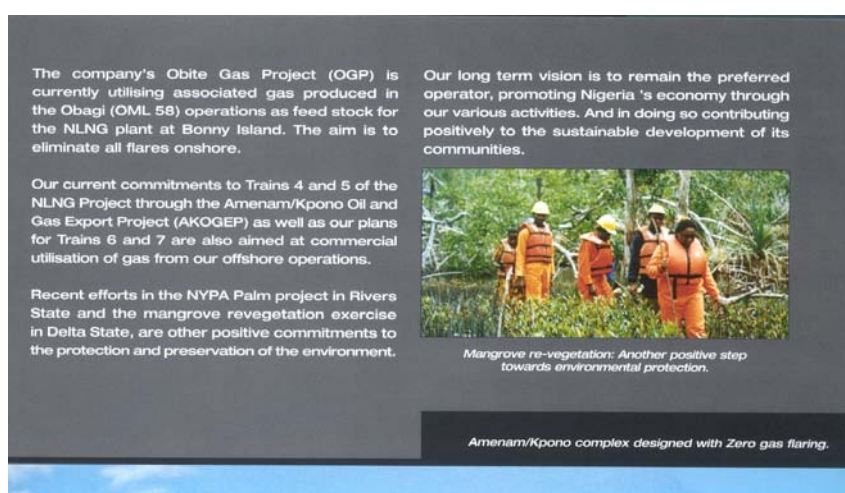


Plate 23: mangrove work in the environment programme of an oil company, SPDC



Plate 27: First lone stand of *Rhizophora* on Ossiommo River, Edo state few nautical miles to the exit into Benin River

Level of Dependence on the Mangrove by Delta and Edo People

Ethno-botanical consideration

Two ethnic groups in Delta state, the Itsekiri and Ijaw depend heavily on mangroves. This dependence has gone into cultural and culinary levels with very indigenous technologies and local knowledge evolving to meet their requirements in this “wet desert.”

The different species provide goods and services as distinct as mangrove-salt, medicine, food, source of income, fish (shell and fin), bait and attractant for fish, building materials and materials for reclaiming land (chikoko).



Plate 24: Mangrove salt making plant, Abe-Ugborodo, WNLGA



Plate 25: Timber size mangrove trees. These are currently sought after in Warri North LGA. These trees are being felled and transported by raft to the port city of sapele. Currently *Rhizophora* is being sawn into various plank sizes and also used for furniture.



Plate 26: Fruit of *Raphia* used as attractant/bait for shrimp in shallow mangrove creeks.

8.3 LAGOS STATE

EXECUTIVE SUMMARY

Lagos State is the commercial city of the nation and is considered the most fast-moving cities in West Africa. The mangrove species in this state have mostly been deforested as a result of urbanization except for reserves by the government. The Red Mangrove- *Rhizophora racemosa* is the prevalent mangrove specie in Lagos. A few of the White mangrove is however seen floating on water at the Ologe lagoon as well as across the length of the river under the third mainland bridge.

It will be noticed from our Lagos trip that most of the areas where these mangrove species are found are with government reserves. The management of reserves for the purpose of biological conservation is now a widespread practice, but the methodologies applied and the philosophies upon which they are based are frequently diverse.

One major constraint upon the types of management that are practiced is imposed by the relative scarcity of natural and semi-natural areas that may be available for reserves. We observed that when reserves are small, their managers are often tempted to indulge in intensives manipulation of natural processes so as to maximize conservation values; but the wisdom of a policy of extensive interferences is rarely questioned when much of the land surface, outside reserves areas, is even more intensively managed for non-conservative purpose.

It is an indisputable fact that over-population, industrial and agricultural expansion including the proliferation of dams, over-grazing, frequent burning of forests, incessant poaching of wild animals and over-exploitation of land resources outside and around conservation areas in Nigeria have already set in motion a chain of irreversible changes which makes it extremely difficult to protect the ecology. This pressure on the land is such that it is rather rare for biological conservation to be the only land-use that must be catered for on any reserve, most usually, a range of amenity and recreational use, must also be

**A) REPORT ON MAJIDUN MANGROVES LOCATED IN MAJIDUN AWORI
COMMUNITY (IKORODU LOCAL GOVT. AREA)- AN EXTENSION OF
THE OGUN RIVER FOREST RESERVES**

Introduction

The name of the mangrove site is MAJIDUN AWORI. Majidun is situated in Ogun River forest, which is situated in the Ikorodu Local Government area of the state (see map (FIG 1). It covers an area of 5,220 ha (52.2km). this reserve is the only gazetted forest reserve in Lagos State. The reserve is encompassed by the Lagos lagoon to the South, the river Ogun to the West and Majidun creek to the East. Ogun river from Magodo / Yakoyo community flow down from a tributary near Igboedun before draining into the lagoon. The Northern boundary of the reserve stretches from Mawere / Mokiti community down to Orisha near Isheri Olofin.



Figure 2- Map showing the location of Majidun Mangrove

Majidun river has a geographical area with characteristics of both dry land and bodies of water. This site has been known to meet Ramsar criteria for classifying wetland sites of international importance.

Majidun provides habitat for a wide variety of plants, invertebrates, fish and larger animals including many rare threatened, or endangered species. The plants and animals found in Majidun include those that live on dry land or in the water and those that can live in a dry or wet environment. Majidun wetlands, therefore constitutes these natural land and water area that have been modified by human activities through agricultural, forestry, industrial fishery, housing etc.

The predominant mangrove species found along Majidun River is the red mangrove- *Rhizophora racemosa* (known as “egba” in Yoruba land).



Figure 3,4-Predominant Mangrove Specie- “*Rhizophora racemosa*”(Egba)

Designation and general location of the majidun river and the proposed reforestation site

The Majidun mangrove site is one being proposed for reforestation because of its richness in biodiversity, and the fact that it qualifies as a wetland of economic importance.

The boundary delineation of Majidun Awori mangrove is such that it follows a catchment boundary, which is under the supervision of the community. The site lies in the Ikorodu Division of Lagos State and the nearest large town to it is Ikorodu township. The estimated total area of the Majidun Awori mangrove is 1,168 hectares.



Figure 5- A satellite picture of Majidun Awori River showing the predominant mangrove

Majidun mangrove separates Lagos from Ogun and the area where it terminates is to the West as shown below:



Figure 6- Boundary between Ogun State and Lagos State

RAMSAR CRITERIA FOR IDENTIFYING WETLANDS OF INTERNATIONAL IMPORTANCE

As mentioned earlier, the proposed site at Majidun meets the Ramsar criteria for identifying and earmarking wetlands of international importance all over the world. These criteria are mentioned below:

- **CRITERION ONE** : It contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate bio geographic region.
- **CRITERION TWO**: It supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
- **CRITERION THREE**: It supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
- **CRITERION FOUR**: It supports plant and/or animal species at a critical stage in their live cycles, or provide refuge during adverse conditions.
- **CRITERION FIVE**: It regularly supports one percent of the individual in a population of one specie or sub-species of waterbed.
- **CRITERION SIX**: It is an important source of food for fishes, spawning ground, nursery and /or migration part on which fish stocks, either within the wetland or elsewhere, depend.
- **CRITERION SEVEN**: It regularly supports 1% of the individuals in a population of one specie or sub-species of wetland dependent non-avian animal specie.

PHYSICAL FEATURES OF THE SITE

GEOLOGY

Lagoon, sandbars and marshy lands are the dominant features of the physical landscape of the site. The lagoon and sandbar system dates from the late Pleistocene times when a rise in sea level led to submergence along Nigeria Coast. The area is made up of aluminium and hydromorphic soil on riverine and lacustrine deposits.

SOIL

Both the Northern and Eastern part of the chosen site have clayey and muddy soil, which support lowland rainforest (high forest), mangrove forest and riverine vegetation

WATER QUALITY

The water quality is originally clear but oil spillage and waste had made the water dirty unsafe for drinking.

DEPTH

The water is mostly shallow but is found deep on some parts further down.

TIDAL VARIATION

As is the case with all river, there are tidal variations with different parts of the river and time as influenced by the winds and current. We noticed on our trip that the current was greater on the right than the left hand side. When asked, the villagers informed us that the “River Goddess” resides on that part; which explains why you can never swim from the right to the left hand side and back. They claimed that all who have tried to do so have drowned in the process, however good a swimmer he or she is.

PHYSICAL FEATURES OF THE CATCHMENT AREA

The area in question has no meteorological facilities but records from Oshodi meteorological station showed that rainfall data for Ikorodu and other climatic data for Ikeja could be used to describe the climate information for the reserve.

The wet months are April to October and the dry season cover a period of five month (November –March). January is the driest month with mean rainfall of 6.6mm. It is assumed that the conservation area receives about 1398.7mm of rain per year.

SUMMARY OF OUR VISIT TO MAJIDUN AWORI COMMUNITY

On arrival to the community, we were warmly welcomed by the community elders who had been previously informed of our visit by the Ministry officer in-charge of the area.

We were first offered some prayers by the assistant of their chief community head (“Balee”) after which a general introduction was made. The following were the names of the elders present:

Chief Balogun Dondodawa (Rep. of the Balee)

Chief Bada Babasuwe (Head elder)

Mr. Muda Lawal (Secretary of the village committee)

Mr. Tajidun Badabuin (Youth Leader)

Chief Ajadon

Mr. Sahid Balogun

Mr. Ibrahim Oketola

Mrs. Lawal

When asked about the poor representation of the womenfolk, we were told that they have already gone to the markets while some have gone fishing and they will only be back in the evening time. However, a representative (see above) was later called to join the meeting.

INTERVIEW SECTION- INTERVIEW WITH THE MAJIDUN AWORI COMMUNITY AND ANSWERS TO QUESTIONNAIRE



Fig 7- The team with the elders of the Majidun Awori Community.

Below is a summary of findings using the questionnaire:

NAME OF COMMUNITY:

The community is known as Majidun Awori Community.

LAND TENURE / OWNERSHIP OF THE COMMUNITY

The land tenure / ownership is community land tenure system, which hitherto have been released (excised), to the community by the Lagos state government when it was carved out of Ogun River Forest Reserves. So the land now belongs to the Majidun Awori's and specifically the "Amusu" family. The surrounding area falls within Ogun Forest Reserves under the supervision of the department of forestry services.

MAJOR OCCUPATION OF THE COMMUNITY MEMBERS

The community members are mostly-

- (a) Fishermen and women;
- (b) Sand sellers- they excavate sand and sell to builders coming from inside Lagos town.

GENDER ISSUES

The women in the community play an important role and are in no way regarded as less important in decision making. Most of the women go to the market to sell the fish which was caught by either them or the men (see picture of fisherwomen below). The money made from the sales are then used to buy food for their family and some for petty trading. That, they explained, was the reason why they were not present in the gathering.



Fig. 8- The women are good fishers and are major contributors to income-earning

NAME OF THE RIVER & BRIEF HISTORY

The river wherein the mangrove is found is called "Majidun River". It is a tributary and an extension of the "Ogun River". It flows unto the Lagoon and is the river that separates Ogun and Lagos.

GENERAL ECOLOGICAL FEATURES

-Flora /Vegetation Type

The different in vegetation type in the study area was largely due to soil condition and human influences. The swamp forest occurs in places like Magodo, Agboyi, North of Itowolo and Majidun. The mangrove forest is present in two blocks to the east and southeast of the reserve. It was observed that the mangrove forest recedes into the swampy forest where the extent of tidal waves from Lagos lagoon falls into Ogun and Majidun rivers. The dominant species found in the mangrove forest zone is Rhizophora racemosa with 80% frequency of occurrence. Apart from the mangrove specie, other species found were; Phonix reclinata, Fern, Carex specie Chromolina odorata were other tree specie found occasionally. Cinometra Megalophylla and Mitrigina Ciliata were also encountered. Palm were also seen occasionally.



Fig. 9- Major flora of the Majidun River

-Fauna Types

The inventory of Mammalian, Fauna and avifauna resources of Majidun in Ogun Forest Reserve was based on direct and indirect method (information).

The footprint and activity sites of bushbuck (Tragelaphus Scriptus) were most abundant follow by calls of tree squirrel (funiscinus pyrrhopus), a green monkey (cercopithecus specie) or lizardveranus niloticus), blue duiker (cephalophus moniticola), grasscutter python, black cobra, crocodile, alligator were among animals at the site. (Thryonomys swinderianus), Salamander, crabs, etc.

The birds noticed at the site among others were: Grey Heron (Ardea cinerea) Cattle Egret (Ardeola ibis), black –headed Heron (Ardea melanocephala), Black kite (Mulvus migrans) River eagle (Hailaetus vocifera), little sparrow Hawle (Accipiter evgythropus).

MANGROVE SPECIES FOUND IN THE RIVER

The mangrove specie found in the river is *Rhizophora racemosa*. It is the predominat specie found along the entire expanse of the river.

FUNCTIONS OF THE MAJIDUN MANGROVE TO THE HOST COMMUNITY

The mangrove species serves the following uses to the Majidun Awori people:

- (i) Firewood
- (ii) Sawn timber serves as raw material for building houses.
- (iii) Also used in baking.
- (iv) Medicinal Uses- Leaves are used medicinally to bath new-born babies and their mothers.
- (v) Roots used as base of houses, to act as barrier against tides.



Fig. 10- The cut mangrove to be transported back to the village as firewood



Fig. 11- Houses built with mangrove and roofed with aluminium



Fig. 12- Leaves of Mangrove used medicinally for bathing new born babies and their mothers



Fig. 13- Roots of the mangrove used as base for their houses

9. OTHER TECHNICAL USES



Fig. 14- Mangrove serves as habitat for diverse fauna and their roots helps check erosion

LIFE SUPPORT FOR BIODIVERSITY OF SPECIES: Rhizophora provides nursery grounds and feeding habitat for freshwater fish e.g. obokun (catfish). These fishes stay underneath the Rhizophora and are usually found in the sheds provided by these plants. A variety of birds associated with inland wetlands includes ducks (pepeye-Odo), Geese, Redwing, blackbirds, and a large number of nesting songbirds. These birds perch on the mangrove trees.

CLIMATE CONTROL: Include flood and erosion control by temporarily storing and slowly releasing floodwaters. The mangrove trees help protect adjacent and downstream property owners from flood damage. They also help slow the velocity of floodwaters. This action combined with water storage allows the mangrove trees to lower flood heights and reduce the water's erosive force.

On the other hand, they buffer stream banks against the forces of erosion by binding soil with their roots and by reducing current velocity of wave action. Bio-engineering techniques, using coconuts finer mats in combination with willow cuttings usually provide habitat and aesthetic value not afforded by structural shoreline protection measures such as breakwater, rock rip-rap etc.



Fig. 15- Mangrove important for climate control

10. SOCIAL AND CULTURAL VALUES

The Majidun wetland holds social and cultural importance to the aborigines called the Aworis or 'Omo-Oniles'. The wetland is of significance to the people of Majidun in the areas of: religion; historical; archaeological and other cultural values for the community. For example, there is an annual Ibogun festival for the worship of the Majidun River; that can only be carried out on that river.

11. CURRENT THREAT TO THE MANGROVE:

The mangrove species are not under much pressure because the activities of the inhabitants witnessed there is minimal. The major activities witnessed there is the local fishing and cutting of *Rhizophora* for firewood.

However, the surrounding area have witnessed reclamation for development which is not sustainable, houses had started springing up fast, while the Ijaw people have started the construction of their bamboo houses on the catchment area.

A lot of factors are seriously affecting the mangrove in Majidun because of advert poverty and the eagerness of the villagers to sell land and even the swampy part of the area for sand filling.

Also observed are the unchecked activities of the settlers who live on the opposite side of the river. These settlers include the Ijaws, etc. Their activities are even more of concern as they carry out daily felling of the wood and can be seen transporting these from morning till evening.



Fig. 16- Settlers across the village carrying the cut mangrove to the bridge

Besides, as their chief ("Bale") rightly pointed out, the activities may appear as not drastically affecting the mangrove due to their vast presence, however, come 20years from now, there will be no mangrove; if the rate of deforestation continues.

12. CAUSES OF MANGROVE LOSS

(i) Wood Felling



Fig. 17a- The mangrove drawing back further inside due to felling



Fig 17b- Some of the community members about to carry out the wood

(ii) Use of mangrove tree roots as base of houses



Fig. 18- A man seen transporting the roots of mangrove to a building site



Fig 19- Roots of the Rhizophora used as base to check against tides

(iii)Over-Fishing



Fig. 20- Fisherwoman holding one of the fishes up

(iv)Oil Pollution



Fig. 21- The oily water caused by spillage flowing from “Akute”

(v) Cutting of the trees to create passages



Fig. 22- Artificial passage created by the villagers for easy navigation

(vi) Dumping of refuse by settlers cross the community



Fig 23- Settlers across the community

The settlers found across the community are quite environmentally unconscious and nonchalant about the mangrove species. The river all around their houses are used as dumping ground and this slowly kills the fauna and flora around them.

(vii) Land Reclamation:



Fig. 24- Secluded area being reclaimed for extension of the local church

13. ANY EXISTING LAWS OR PENALTIES FOR MISUSE?

We learnt from the communities that there were no laws against the illicit use or excessive cutting of the mangrove trees. The settlers across the river whom are most responsible for the clogging of the water (used for dumping refuse) and cutting of the trees are equally not challenged by the community.



Fig. 25- Heavily deforested mangrove site

14. CONSERVATION MEASURES TAKEN- Are there any previous attempts by the Government or other organizations to preserve this mangrove?

In the area of conservation, no official conservation is currently on-going for the preservation of the Majidun mangrove. Even the village does not have any laws or restrictions regarding the use of the mangrove. This holds a great danger for the future of the mangrove. Encroachment has started to rear its head in this beautiful phenomenon.



Fig. 26- The team with some villagers at a deforested site

15. WILL THE VILLAGERS WELCOME THE UPCOMING REFORESTATION PROGRAMME?

The villagers assured us that they were very much in support of the upcoming project.

16. IF SO, WHY?

Several reasons were given for their enthusiasm of our visit and the upcoming programme and these include:

Increased attention from the Government: The visitors will bring forth more attention from the government and subsequent solution to their plights.

Tourism: There will be more probability of the area used as a tourist centre.

Increased revenue: By attracting foreigners and other individuals and organizations, the villagers will benefit more financially through payments made to tour guides, renting of boats and purchase of items.



Fig. 27- The team returning back from the survey

INTERVIEW WITH THE LOCAL GOVERNMENT CHAIRMAN OF IKORODU LOCAL GOVERNMENT AREA



Fig. 28- The team with the Chairman, Ikorodu Local Government Area (man in blue sports outfit).

Besides reiterating the opinions of the communities earlier visited and assuring us of their support of the upcoming reforestation programme as well as any assistance required, the chairman went ahead to supply us the following additional information:

CONSERVATION MEASURES PROPOSED BUT NOT YET IMPLEMENTED

Among the conservation methods proposed by the government but not yet implemented is to control the rate at which local fishermen operate and to ban the hunter from poaching of Animals so as to prevent them total extinction. Although, the Ogun River Forest Reserve is the only gazetted reserves in Lagos State in which the mangrove site is located, the non-enforcement of this law and lack of manpower in the state has contributed a lot to the abuse of the mangrove site in the state.

CURRENT SCIENTIFIC RESEARCH & FACILITIES

Although, there is no any existing field research station for now but the site has witnessed various higher institutions of learning with their students for various researches and many students both under-graduates and post-graduates have written their thesis (projects) on the richness of biodiversity of Ogun River Forest Reserve (Majidun).

This is why the community welcomed this project as the upcoming reforestation programme will be the first attempt at restoring the mangrove.

COMMUNICATION, EDUCATION & PUBLIC AWARENESS

The site needs to be developed to have all the communications required because of the proposed Reforestation programme at Majidun.

CURRENT RECREATION AND TOURISM

A proposed Royal Park Garden will soon take off at Majidun where nature will be at its best for recreation and tourists attraction and the wetland is going to play a significant role in the development of the garden and for its sustainability.

B) VISIT TO OTHER COMMUNITIES IN IKORODU, LAGOS

On our way back from Majidun, the communities found before Majidun all had the major problem of sand filling of the rivers to reclaim land. Major companies and smaller industries can even be sited along the way and all these land had been reclaimed.



Fig. 29- Land being reclaimed

With development comes settlers and people who service the neighbouring industries. These people are found right in the middle of the mangrove swamps and the rate of settlement is on the increase daily.



Fig. 30- People living right in the middle of mangrove sites

INTERVIEW WITH THE OWODE OWIRI'S

Since the area has very much been urbanized, we found it quit difficult to assemble the villagers as most are not originally from the area.



Fig 31- Interview with two prominent chiefs of “Owode awori” community

However, we interviewed two of the chiefs (see above) and the following interview was carried out:

-Name of the site: Owode owiri

-Location of the site: The site is located in Ikorodu Local Government Area, Lagos State.

-Land Tenure/ Ownership: The land is owned originally by the “Owode” people but most of the land has been sold out. The government was also said to be responsible for selling most of the land as most of this land is still owned by the Lagos State Government.

-Occupation: The community members are mostly

Sand sellers

Wood sellers

Petty traders

Fishermen

-Mangrove Species: The mangrove species found in the community are mostly the “*Rhizophora racemosa*” (Red mangrove) with also a few “*Conocarpus eratus*” (Combretaceae).

-State of Mangrove before and at present: The mangrove was seen everywhere close to the major road as seen below. It formally covered the whole area and there was no

settlement then. However, the mangrove can hardly be found now as they have been cut down and the area now covered with either sand or buildings.



Fig. 32- Mangrove sites are close to the major road

-Use of the Mangrove: The mangrove trees are only cut and used for firewood by the communities and by the bakeries for making bread.

-Causes of the loss of the mangrove: As mentioned above, the mangrove in the area is hardly found except in the deeper parts and this is largely due to deforestation due to human activities.

-Any existing laws protecting the use of the mangrove? No, there are no existing laws guiding the cutting of the trees provided the land is owned by the person. However, the government approves the commercial use of the land.

-Other Fauna and Flora: Fishes, salamander, and crabs are mostly found in the water while the vegetation includes palms and ferns.



Fig. 33- Flora of "Owode owori"

Other predominant fauna include the bushbuck (*Tragelaphus Scriptus*) grasscutter, python, and black cobra. crocodile, alligator were among animals at the site.

As in Majidun, the birds noticed at the sites include the: Grey Heron (*Ardea cinerea*) Cattle Egret (*Ardeola ibis*), black –headed Heron (*Ardea melanocephala*), Black kite (*Mulvus migrans*) River eagle (*Haliaeetus vocifera*), and little sparrow, Hawk (*Accipiter evgythropus*).

C) REPORT ON OUR VISIT TO BADAGRY

We spent a whole day at Badagry and below is a list of the villages and sites visited:

- Iba village
- Mebamu village
- Iyano-era village
- Agbara village
- Ologe Lagoon
- Oko-afo village
- Ilogbo-eremi village
- Igborosu village
- Ibiye village
- Esekpe village
- Musin village
- Badagry Lagoon
- Badagry town

Several people were interviewed along the way but what was mostly done was awareness creation on the project and upcoming reforestation programme and picture taking. The most important interview being that held with the area community head (i.e. the Chief “Bale”) of these villages.

INTERVIEW WITH THE CHIEF “BALEE” OF BADAGRY



Fig. 34- BDCP representative with the Head Chief of Badagry communities.

NAME OF THE CHIEF:

The chief gave his name as Chief Gbangbasa. He is the head chief of the neighbouring communities in Badagry.

MAJOR OCCUPATION OF THE COMMUNITY MEMBERS

The community members of the respective villages are mostly sand diggers/sellers and fishermen.

GENDER ISSUES

Unlike the case of Majidun Awori community, these Badagry villages do not have women as major contributors in their decision making and income earning. The women are however, also petty traders and fish sellers while others stay at home as housewives. The men in these communities seem to be more eager to work thereby making the burden less on the women.

PREDOMINANT FLORA FOUND IN THE COMMUNITIES

The predominant plant species found in the Badagry communities are

Calamus calamus

Fern

Abora

Mosanga

The red mangrove specie “Rhizophora” is found in the deeper parts of the villages towards the lagoon.



Fig. 35- Major flora of the communities



Fig. 36- The most predominant specie- “Abora”

MANGROVE SPECIES

As already mentioned above, the red mangrove “*Rhizophora racemosa*” is found in the deeper parts of the forests near the Badagry lagoon. However, these areas were hardly accessible.

USES OF THE MANGROVE

The Balee told us that the mangrove is mostly used for:

- Firewood
- Building houses
- Building small rafts
- Medicinally- He said he had heard of the *Rhizophora* being used for medicinal purposes but he is not sure what they are used for.

CAUSES OF MANGROVE LOSS

-Settlement- Most of the mangrove is destroyed by people who choose to build their homes there. These are mostly the fishermen along with other villagers.



Fig. 37- Settling found in former mangrove sites

-Land Reclamation- The mangrove areas are found covered with sand after deforestation has taken place. The sand is continually poured on them to cover the water until the land is strong enough to build their homes.



Fig. 38- Land being reclaimed

-Use as Firewood and in building small houses- The mangrove trees are cut and dried after which they are used for either firewood or for building houses. These uses are done unsustainably and without any re-planting done.



Fig. 39- Stubs of cut mangrove trees

-Sand Filling- This is perhaps the major loss to mangrove seen in this area and as this also is the major occupation of the villagers, it will prove quite difficult to contain.



Fig. 40- The villagers are predominantly sand fillers-seen here at Badagry lagoon

ANY EXISTING LAWS? As Badagry mangrove communities and the Ologe lagoon are all of high interest to the Government- the former for reasons of being at the border and the latter as a result of the gas project located there- the area is somewhat restricted. However, this is only so for the areas around and along the length of the lagoon, but not so for the areas surrounding to the communities. There have been clashes in the past and we learnt from the Balee that a few people died in the last communal clash.

ANY CONSERVATION INITIATIVES? The Federal Government of Nigeria, in collaboration with the Lagos State Government under the Department of Forestry have created a reserve (Ologe Forest Reserve). However, other plant species besides the mangrove are the flora found in this botanical garden.



Fig. 41- Federal & Lagos State Forest Reserve at Ologe, Badagry

OTHER RESEARCHERS OR PREVIOUS PROJECTS- The balee was unaware of any previous researchers working in the area of mangrove neither were there any previous projects planned or executed.

UPCOMING REFORESTATION PROGRAMME- Will the Badagry communities welcome the upcoming reforestation programme? Yes they will. The communities have always welcomed any form of development and if the mangrove indeed has as many uses as we had enumerated (environmentally and community-wise), then it will be a welcome development.

SUGGESTIONS; QUESTIONS

Having it in mind that the mangrove is only de-forested for daily sustenance- Does it mean that the indigenes will not be free to cut these mangrove species when they are replanted?

Will the reforestation actually take place and if so, when?

Will the community members be employed in this exercise?

The interview ended with the Balee offering us prayers and giving us a guide.

D) OLOGE LAGOON

1. BACKGROUND INFORMATION

Ologe Lagoon is situated in the Bdadgry Local Government Atrea of Lagos State. It is bound to the West by Obele and Asepe/Mushin Community; to the South b y Gbanko, Ikotun and Idoluwo communities and to the North by the Lagos-Badagry express road. The Ologe Lagoon is centrally located in the Ologe Lagoon Forest Reserve (OLFR). OLFR covers an area of 4,784ha (47.84km²).

2. DESCRIPTION OF THE AREA.

LOCATION

Figure 1 shows that the location of Lagos State on the map of Nigeria while the administrative map of Lagos State is shown in Fig. 2 .OLFR is situated in the Badagry Local Government Area of the State [Fig. 3]. It covers an area of 4,784 ha. [47.84 km²]. It is bound to the west by Obele and Asepe/mushin community, to the south by the Gbanko, Ikotun and Idoluwo Communities and to the north by th Lagos-Badagry exoress road. The Ologe Lagoon is centrally located in the reserve.

In general, the Lagos State total land area is 3,577km² and 22% [787 km²] is made of Lagoon and creeks.

2.1 Conservation Objectives.

No clear cut objective was defined for the management of the reserve but activities of the conservation officers suggest that the main objectives are;

1. To develop the reserve for ex-situ conservation of Flora and fauna resources, through the development of Zoological/ Botanical gardens; establishment of crocodile breeding unit and grass cutter rearing unit
2. To protect the animal and plant life, soil and water-sheds, geological formations and historical monuments in the locality.
3. To pursue rural development in the area by involving the natives in decisions regarding conservation, infrastructure and occupation.

3. PHYSICAL CHARACTERISTICS

3.1 Relief.

The creeks and Lagoon areas of OLFR is a low-lying area with a general elevation of about 10 meters above sea level, rising to about 15 meters along the area zoned for Zoological/botanical garden. Generally, the highest point of the reserve is made up of firm ground near Obele and Asepe-Mushin.

The OLFR is drained by creeks flowing out of the Ologe Lagoon to Asepe-Mushin and Iworo areas. River Imade from the northern section drains into the Ologe Lagoon, while tributaries of the Badagry creek either flow to join the Ologe Lagoon Idowu area, or blinds off completely between Moba and Ikotun communities.

Much of the area between Gbanko and Ikotu is rugged but the area can be described as a plain without attractive features.

3.2 Geology

Lagoon, sandbars and marshy lands are the dominant features of the physical landscape of OLFR. The lagoon and sandbar system dates from the late Pleistocene times, when a rise in the sea level led to submergence along the Nigerian coast. The deposition of sandy materials brought by long-shore drift led to the development of a sandbar which enclosed part of the sea to form the lagoon.

3.3 Soil

Soil type is closely related to parent materials. Porous sandy occur along the narrow stretch of the Ologe lagoon zone which is bare of vegetal cover, except for the plantations of coconut palms which occur in the lowland side. Both the northern and the southern borders of the lagoon have clayey and muddy soils which support lowland rainforest and very dense stands of both oil palm and raphia palm.

Table 9: plant Species Frequency [%] in Ologe forest Reserve [Transect 1]

| Species | F[%] | |
|--------------------------|------|------|
| Hyparrhenia chrysargynea | 73.7 | |
| Sporobolus jacquemontii | 20. | |
| Phylanthus amarus | 6.7 | |
| Cnestis ferruginea | 73.7 | |
| Blighia unijugata | 20.1 | |
| Azadiractha indica | 6.7 | |
| Chromolina odorata | 67.0 | |
| Grewia flaveraeance | 13.4 | |
| Barteria sp. | 6.7 | |
| Icacina trichantha | 67.0 | |
| Bredelia ferruginea | 13.4 | |
| Vitex doniana | 6.7 | |
| Urena lobata | | 53.6 |
| Cyathula prostrate | 6.7 | |
| Pennisetum polystachyon | 40.2 | |
| Cnestis longiflora | 13.4 | |
| Lindackeria dentata | 6.7 | |
| Drypetes floribunda | 40.2 | |
| Newboudia laevis | 13.4 | |
| Digitaria debilis | 6.7 | |
| Pentaclethra macrophylla | 33.5 | |
| Smilax kraussiana | 13.4 | |
| Rauvolfia vomitoria | 6.7 | |
| Hibiscus suranthesis | 26.8 | |
| Secamone afzelii | 13.4 | |
| Trichilia emetia | 6.7 | |
| Dissotus rotundifolia | 26.8 | |
| napoleana vogelii | 13.4 | |
| Cisus quadrangulare | 6.7 | |
| Holarrhena floribunda | 26.8 | |
| Abrus precatorius | 13.4 | |
| Dispyros mesipiliformis | 6.7 | |
| Albizia ferruginea | 26.8 | |
| Aspilia Africana | 13.4 | |
| Trema orientalis | 6.7 | |
| Mondia whitei | 26.8 | |
| Dispyros spp. | 13.4 | |
| Sthenocentrum jullyanium | | 6.7 |
| Fagara lepreius | 6.7 | |
| Commelina benghalensis | 26.8 | |
| Rothmannia longiflora | 13.4 | |
| Danielia ogea | 6.7 | |
| Carpolobia lutea | 26.8 | |
| Annona sensgalensis | 6. | |
| Ananas comesus | 6.7 | |
| Sterculia stragacantha | 26.8 | |
| Gmelina arborea | 6.7 | |
| Eliaes guineensis | 6.7 | |
| Baphia nitida | 26.8 | |
| Coleus Sp. | 6.7 | |
| Diocoreophyllum | 6.7 | |

Table 10: Plant Species Frequency [%] in lagoon Lagos Forest Reserve [Transect II]

| Species | F[%] | |
|-------------------------|------|--|
| Cyrtosperm sensgalense | 70.8 | |
| Pennisetum polystachyon | 17.7 | |
| Lanea acida | 5.9 | |

| | |
|--------------------------|------|
| Raphlia hookeri | 53.1 |
| Chromolina odorata | 17.7 |
| Eucalyptus sp. | 5.9 |
| carapa procera | 41.3 |
| Commelina benhalensis | 17.7 |
| Cnestis sp. | 5.9 |
| Smilax sp. | 41.3 |
| Canthium vulgare | 17.7 |
| Icacina tracantha | 5.9 |
| Dissotus sp. | 35.4 |
| Piper quineense | 17.7 |
| Bambusa vulgaris | 5.9 |
| Eliaes quineensis | 35.4 |
| Afzelia Africana | 17.7 |
| Sterculia trangacantha | 5.9 |
| Mitrax ciliate | 29.5 |
| Sporobolus jacquiemontii | 11.8 |
| Alstonia boonei | 5.9 |
| Calamus sp | 29.5 |
| Cnestis ferruginea | 11.8 |
| Ficus vogelii | 5.9 |
| Cleitopholis patens | 29.5 |
| Garcinia cola | 11.8 |
| Landolphia oweriensis | 5.9 |
| Napoleona vogelii | 29.5 |
| Uapaca togoensis | 11.8 |
| Thaumatococcu | 5.9 |
| Bernilia sp. | 29.5 |
| Costus afer | 11.8 |
| Anthocleista nobilis | 29.5 |
| Annona sensgalensis | 5.9 |
| Piptadeniastrum africana | 5.9 |
| Alchornea cordifolia | 23.6 |
| Imperata cylindrical | 5.9 |
| Vetex doniana | 23.6 |
| Baphia nitida | 5.9 |
| Harungana | 5.9 |
| Hyparrhenia chrysargynea | 23.6 |
| Aspilia Africana | 5.9 |
| madagascariensis | |
| Musanga cecropioides | 5.9 |

In the savanna –woodland, the vegetation included the following species: *Vitex doniana*, *Albizia ferruginea*, *Pterocarpus erinaceus*, *Newbouldia laevis*, *Pentaclethra macrophylla*, *Bridelia ferruginea*, *Trichilia emetica*, and *Diospyros mespiliformis*. Other species found were *Penisetum polystachyon*, *Cnensis longiflora*, *Chromolina odorata*, and *fagara lepricus*.

The *Raphia* swampy vegetation found mostly in the marshy area was composed of the following species: *Anthocleista nobilis*, *canthium vulgare*, *Alchornea cordifora*, *Raphia bookeri*, aquatic *colocasia* spp. *Bamkusa vulgaris*, *Carapa procera*, *Napoleona vogelii*, and *Nymphae lotus*.

As is noticed in the above tables, the mangrove species are not listed in the work carried out and this goes a long way to show that they are not in abundance and secondly, are not regarded of economic importance.



Fig: Mangrove forest of Ologe Lagoon

3.6 Fauna.

Inventory of mammalian fauna and avifauna resources of OLFR was undertaken according to the methods dscribed in Appendices 4 and 5. Based on the combination of all the direct indices measured, 12 mammalian species were found in the reserve.

Thryonomys swinderianus [grasscutter] was in the abundant, followed by *Myescirus pumilo* [pygmy squirrel] and *Tragelaphus scriptus* [Bushbuck] in that order.

Most of the animals were found within the Raphia and Palm Oil vegetation but the open grassland and wooded savanna essentially contained grasscutter, African giant rat [*Cricetomys gambianus* watrehouse] and striped ground squirrel [*Xerus erythropus*]. All the animals enumerated in the OLFR with the exception of green monkey [*Cercopithecus sabaeus*] are usually associated with fallowed land or secondary forests. Consequently, none of the animals found in the reserve fall under schedules 1 and 2 of the IUCN endangered and threatened [vulnerable] species list.

In all, a total of forty-four [44] bird species belonging to twenty-five [25] families were observed and recorded. The commonly seen birds are the Black kite [*malvus migrans*] the Double-spurred francolin [*francolinus bicalcaratus*], the plantain eaters [the musophadae], swallows and swift, the hornbills and the finches which are very abundant. There is a great deal of the human disturbances in the area in the form of villages, farmlands and clubs organization, meeting ground. The reserve is also criss-crossed by illegal routes used by smugglers. All these activities render birds very wary.

3.7 LAND-USE

The OLFR can be divided into two broad areas. The first is the strict conservation area comprising the botanical/zoological garden, the crocodile and grasscutter rearing units, and the administrative offices of the reserve. The second is the reserved land outside the fenced botanical/zoological garden. Within the strict conservation area are five cassava farms of about 2.5 ha. Each, pineapple farm and abandoned/fallowed farm sites. Outside the strict conservation area, land is principally used for farming, settlements, air-strip, communication/transmitting station, spiritual churches and horticultural ground.

Livestock rearing is in small holding, involving goats, area, i.e. Obele, Asepe, mushin, Ikotun and Idowu. Within 3km of the park boundary are 10 other villages, the Badagry town, Agbara, Ilogbo and ojo.

COMMUNITIES

The Asepe, mushin and Obele people are of the Awuri tribe while the Ibiye people originated from Lagos and Abeokuta.

Table 14: Demographic estimation in the village enclaves within Ologe lagoon Forest Reserve

| Villages | Population | Houses |
|----------|------------|--------|
| Gbanko | 300 | 13 |
| Obele | 1,200 | 150 |
| Asepe | 300 | 25 |
| Mushin | 50 | 7 |
| Ikotu | 1,500 | 200 |
| Idowu | 300 | 27 |

It is estimated that about three thousand, three hundred and fifty people live within the OLFR and they all speak the Yoruba language. The population inside the park area as shown above is very dynamic as the people are well engaged in training, and each of the men-focus has a minimum of two wives this an indication that natality will too high.

The primary occupation of the men-focus is farming, fishing, and hunting while women-focus engage in the weaving of mats, At leisure times, the men-focus engage in the tapping of palm-wine, and gathering of firewood while women-focus concentrate in the processing of Gari from cassava.

The main crops grown by the farmers are cassava, maize, yam, plantain, sugar-cane, and coconut. There was no mention of mangrove growers and the villagers hardly considered it of much interest.

A detailed education on the use of the mangroves will be needed to upgrade the level of living of these communities. This is because the villagers suffer to get to good markets as the nearest market centers to the conservation area are Ojo, Badagry, Agbara, Mile 2, Ilogbo and Lagos. Also, the provision of social amenities is very poor. The sunk borholes by DIFRRI are yet to be commissioned. The nearest primary school is about 5 km away from the conservation area and sick people have to travel down to Badagry before medical attention can be obtained. The roads which have been opened up are not regularly maintained.

3.10 Conservation Awareness

The villagers are quite aware of Government intention to conserve some parts of the area for forest trees but not for wild animals. Despite this awareness, the villagers claimed that government is yet to pay compensation for the acquisition of their land. Consequently, their right of ownership is not extinguished and they are free to use their land at will.

3.11 Wild Damage Problems

Agricultural crops are damaged or destroyed annually leading to a high degree of economic loss. The damage is usually caused by grasscutter, squirrel monkey, porcupine, and bushbuck and bush fowl. These animals have attacked human beings or caused damage to human habitation.

3.12 Land Tenure

Three categories of land tenure are recognized under the national legislation, viz: private property, national land and state land. OLFR falls within the state land category but villagers within the reserve still claim the reserved area as their private property. There may therefore be need to provide legal instrument for the proper establishment of OLFR.

3.13 Principal Economic Activities

The weaving of mat, gathering of firewood, fishing and fermentation of palm wine illicit gin the core activities of economic importance. These activities provide more than half the cash income of many household. Livestock and bush meat are eaten as a variety

animal protein source but fish constitute the bulk of animal protein supply. Data on total annual production of these resources were not available.

The firewood gotten from the mangrove species are used locally by the fishers for smoking their fishes.

4. EVALUATION OF FEATURES.

Most of the Ologe reserve has been subjected to human interferences through the establishment of permanent structures such as the airstrip, various churches, various village settlements, civic organizations, meeting grounds and club houses. There are also many cassava farms within the conservation area even the fenced botanical/zoological garden.

While the government's action to create the OLFR might be good intentioned, the non provision of legal framework and non-payment of compensation to original land owners are questionable and may result in total disintegration of the conservation area.

Notwithstanding, the conservation officers are engaged in the planting of trees inside the already fenced zoological/botanical garden. Permits are also given to firewood collectors and palm-wine tappers. There are evidence that the villagers are being involved in the management of the OLFR in that most of the guards, patrolmen and watchmen employed by management are from the community. In like manner, the village chiefs are consulted time to time on conservation measure

In the final analysis, the OLFR would serve the purpose of both ex-situ and in-situ conservation of renewable natural resources. This is so because a belt of riparian forest and the raphia palm grove in the reserve serve a safe haven for both birds and other animal, especially the aquatic ones. The fenced botanical garden also contained both native and introduced tree species as well as captive.

PICTURES FROM OLOGE LAGOON



Fig. 42- Ologe Flora



Fig. 43- Ologe Mangrove from a distance



*Fig. 44- Ologe Mangrove at a closer distance with palms resembling *Nypa**

E) REPORT ON OUR VISIT TO LAGOS ISLAND

As is expected, Lagos Island is surrounded by water and this water connects to the Atlantic Ocean. Lagos Island is continually being urbanized and most of the flora is lost in the process. The mangrove species usually grow in the shallow parts of salty water and since these parts are those being reclaimed, there is every need for afforestation in order for the mangrove trees not to go extinct.

Fig. 45- Prototype of Lagos Island Mangrove

The Lagos Island sites include the following:

- I. Lekki
- II. Ibeju-Lekki
- III. Etiosa (includes Lakunwe village; Shongotedo etc)
- IV. Lamgbasa
- V. Elero-igbe
- VI. Ado

A few communities are still found within the Island but they rely less on the mangrove species than the other sites visited except for a few of the very poor who use them for building houses.

The mangrove trees are also used for firewood but as they said, this is not very frequent.

SUMMARY- The major loss to the mangrove in Lagos Island is oil pollution due to the industries located there and land reclamation. Since the industries are very big, it is expected that there will be much impact on the mangrove species.

LEKKI

Lekki is regarded as one of the choicest part of Lagos and most of the foreigners prefer to reside there. Most of the land has thus been reclaimed and in its place are residential houses and offices. Even the land closest to the water is being sold out by the communities on a daily basis and the only vegetation found are those left around the houses or further down where a few of the communities still resided.

It is interesting to note however, that there is abundant red mangrove found in the deeper part of Lekki towards the Lekki free zone.



Fig. 48 “*Rhizophora racemosa*”

The length of the area is bordered by palm trees planted by the government. These trees serve as a barrier to the beautiful beach. Resorts are found built along the way but no communities were allowed within the area. It is indeed a very beautiful site to behold and is seen on both sides. Towards of the end of these palms were then the mangrove trees “*Rhizophora racemosa*”.



Fig. 49 *Rhizophora racemosa* found at the back of the palm trees

These trees were so beautifully outlined that one could stay for hours admiring their beauty especially as they directly overlook the beach also.



Fig. 50 The mangrove joins up with the palm trees to overlook the beach

Mature mangrove was seen and the roots of these mangrove showed they have been there for years without much destruction.



Fig. 51 Mature Rhizophora racemosa with well-established roots

After the mangrove comes a small forest and after the latter, communities were then seen in sparse numbers.



Fig. 52 A small community found in the Lekki free trade zone

As seen above, the palm trees are once more found around the communities. The community members who were interviewed said they were not relying much on the mangrove trees and only use it for firewood.



Fig. 54 Rhizophora is cut and used as firewood (covered against rain with white sac)

MANGROVE SPECIES

The mangrove species found in Lekki is the “*Rhizophora racemosa*”. There were palms noticed but these were not confirmed to be the Nypa palm.



Fig 54- Rhizophora racemosa (seen on the opposite side)

8.4 RIVER STATE

8.4.1 Meeting with Key Stakeholders

8.4.1A MEETING WITH DR. ELIJAH OHIMAIN

Dr. Ohimain has been associated with the Mangrove Ecosystem. He had carried out Mangrove restoration project for Chevron Oil. He had also done a mangrove study in Africa in conjunction with IUCN and UNEP. He assured us of his support and promised to render any assistance required from him.

He will be assisting the project in the following areas:

- 1a Gaining a clear background of the mangrove situation in the entire Niger Delta with a view to differentiating what it was 5-10 years ago and what it is now and also if there is any problem now.
- b. What are the causes of desiccation in the mangrove forests in the Niger Delta region?
- c. What are the implication of mangrove losses to the local economy and the welfare of those who live in the mangroves?
- d. What needs to be done to reverse the situation
- e. What are benefits accruable from reforestation
2. Solutions
3. Given the present situation of governance how do we get other stakeholders to buy into reforestation?
4. A Detailed Action Plan

It was learnt that at the last survey carried out, Nigeria has around 970sqkm of mangrove forests nationwide which makes us rank 3rd largest mangrove worldwide.

Before the time the locals used the mangrove resources for a lot of socioeconomic uses. The mangrove estuary is where the sea water fish come to breed.

The locals use the chikoko mud which is found at the base of the forest for their buildings. Nestling birds use the mangrove ecosystem as their nestling belts. The mangrove project protect the coastline from the sea by breaking flooding.

In Lagos, due to the clearing of the mangrove forests and sand filling in the coastal areas flooding now set in.

The causes of mangrove desiccation are:-

- a. Urbanization
- b. Oil and gas exploration
- c. Nypa palm extension
- d. Utilization by the locals which is sustainable

Mangrove soil contains pyrite. Hydrogen sulphide is in the mangroves. Mangrove trap wastes i.e. heavy metals in form of sulphides. Mangroves also contain methane gas.

Any solution to mangrove forest conservation should be sustainable.

Prof. Ekpere thanked him and told him to please suggest three sites that will be used as pilot sites for reforestation.

The following sites were suggested

1. Cawthorn channel
2. Alakiri or Gold coast (opposite Abuloma)
3. Elem Sangana

8.4.1B- MEETING WITH RIVER STATE MINISTRY OF ENVIRONMENT

A brief meeting was held between the BDCP team and the following persons from the Ministry:

| | | |
|--------------|---|---|
| C. Imabo | – | Director Environmental Assessment |
| Mrs. Oladele | - | Asst. Director Environmental Assessment |

The visit which was a follow up to the earlier visit held with them was aimed at thanking them for their support and informing them that the project had entered the second phase which was site identification and meetings with the communities.

The importance of the ministry to the project was emphasized once more and they were urged to relentlessly continue to assist us in any way they can.

The Ministry through the director thanked the team for deeming it good to come down to their state and partner with them in rural development of the coastal states and promises of continued assistance were given.

The Ministry will also be required to assist in forming a networking with the mangrove communities. The Ministry representative will also prevent any suspicion from the communities as they are usually very skeptical about genuineness of visitors. The environmental officer will serve as a tour guide for us not only for identification purposes but also for guidance, interpretation and protection.

SURVEY TRIPS IN RIVER STATE

Three designated communities were to be visited with Mrs. Oladele. These communities are:

1. Cawthorn Channel
2. Alakiri Or Gold coast (Opposite Abuloma)
3. Elem Sangana

Due to the restiveness in these areas, it was adviced that contact with the communities may not be possible. However, mangrove and Nypa sites can be seen along the way while contact with the communities will be at a latter time.

A) Alakiri or Gold coast.

Alakiri is a community found about an hour from the jetty park. The site needs urgent reforestation because the mangrove forests have fully been descried by:

- a. Nypa Palm
- b. Activities of oil companies

c. Desecration by the local community

State of the mangrove- Here it was observed that the chikoko mud base is almost eroded and that the Nypa palm has almost fully displaced the mangrove forests.



Fig: picture showing how the mangrove forests are being displaced by nypapalm at gold coast.



Fig: Site showing mangrove deforestation



Fig: Mangrove site coimpletely displaced by the Nypa palm

B) Cawthorn Channel

The journey to Cawthorn channel took one hour thirty five minutes. The mangrove forests were thicker here and the forests had some Nypa species here. Some mangrove animal species were seen on the mud banks like crabs and shrimps. The white mangroves were more dominant here than the red mangroves.



Fig: Mangrove forests that can be seen on the way to Cawthorn channel.



Fig: white mangrove forests on the way to cawthorne channel depicting the fast eroding mud banks.

C) Elem Sangana

The journey to Elem Sangana took approximately three hours forty minutes due to tidal waves. The mangrove forests were dominated by Red mangroves. Desecration of the mangrove due to activities of oil companies was noticed and pipelines, as well as some dredging activities, were seen.



Fig: Dredging activity by the oil companies



Fig: Red mangrove forests along sangana route.

Upon return from the journey, Mrs. Oladele asked BDCP to write and send letters to her for onward delivery to the three communities.

8.5 BAYELSA STATE

8.5.1 Preliminary visit to Yenegoa

In Yenegoa, the following persons were

1. Mr. George Amoru - Director Forestry Ministry of Environment
Bayelsa State
2. Mr. Gorsuch Erefamote - Forestry Department Ministry of
Environment Bayelsa State

Introductions were made after which the consultant thanked Mr. Amoru for the warm reception and then the meeting started by 12:00pm.

Mr. Amoru informed the team that after the first meeting he had with BDCP staff , the commissioner had minuted the file to Department of flood and erosion. The director there had to direct the file to him and that was why officially they had not replied our letter.

BDCP Consutant now urged the director to suggest three safe sites where we could visit and which could also be used as pilot sites for reforestation.

Mr. Amoru suggested the following sites:-

1. **Akassa LGA – Kongho**
2. **Nembe LGA – Etereke**
3. **Ekeremor LGA**

He also informed the team of an indigenous NGO that will be of great assistance to our project and it is named Akassa Development Foundation (ADF).

Mr. Erefamote, who is an indigene of Kongho in Akassa, was then mandated by Mr. Amoru to contact ADF and inform them of our arrival the next day.

The meeting ended on that note.

8.5.2 SITE VISITS

A) KONGHO- During the onward journey, the sea was calm and some communities and fishing settlements were passed before getting to Kongho. Another hour was used on water before coming in contact with the first mangrove forests. The mangrove forests were sparse and interspersed with date palms and other non-mangrove forests. Desecration was noticed with some felled trees clearly evident. A pipeline laid by NAOC (Nigerian Agip Oil Company) was also seen. In the process of laying the pipes, up to 30 metres in width of the mangrove forest was cleared while the length on both sides could not be easily estimated. The white mangroves were more dominant than the red mangroves here. We saw fresh and saltwater clams which live in the mangrove ecosystem. We saw birds too. The chikoko mud which forms the base of the mangrove forests was a nice sight to behold. Just after Akassa LGA we saw the estuary which is where the sea opens up to the ocean.

PICS OF DENSE MANGROVE FORESTS ON THE WAY TO AKASSA



Fig: Sparse mangrove forests interspersed with date palms



Fig: Thick vegetation of white mangrove trees on the akassa route



Fig: Picture showing the chikoko mud banks and also desecration by spillage

B) AKASSA

The team was welcomed at the jetty by a member of Akassa Development Foundation who now led us to their project office. We were told that the traditional rulers and members of the foundation had been prior-informed of our arrival and had been present but had dispersed, to reconvene upon our arrival.

On arrival to the project office a brief meeting was held in the conference hall with the head of administration of ADF- Mr. Duate Agiri.

History of ADF- ADF was formed by Statoil of Norway as a community development outfit that will assist the 16 communities of Akassa to develop.

Mangrove Communities- There are three islands Kongho is the largest but also there are about 120 fishing settlements asides from the 3 islands. Our project studies will be concentrated in the Northern part of the community which is fully covered by mangrove forests.

Past Projects- He intimated us that the Federal Ministry of Environment came in 2003 and told them to identify RAMSA sites which they have done but they are yet to hear from the ministry.

Arrival of Traditional Rulers and executive of ADF- At this juncture the chiefs and executive members of ADF arrived. Mr. Idogige Amain was introduced as the programme coordinator of ADF.

They introduced themselves as follows:

1. Chief Opinion Tengha Oloh
Of Biebiri Compounds in Akassa
2. Chief Emmanuel Kulegha
3. Chief Mark Mathew James – Piti
4. Mr. Friday Idogige Amain
Programme coordinator ADF
5. Mr. Ayebe Duate Agiri
Head of Administration ADF

Introduction of the Projects- This was given by the BDCP representative.

Support from Traditional Rulers- Chief Kuleha who is the spokesman for the Akassa national Council of Chiefs (ANCC) thanked the team for having the courage to come to the island despite the security situation in the area and gave assurances of their support.

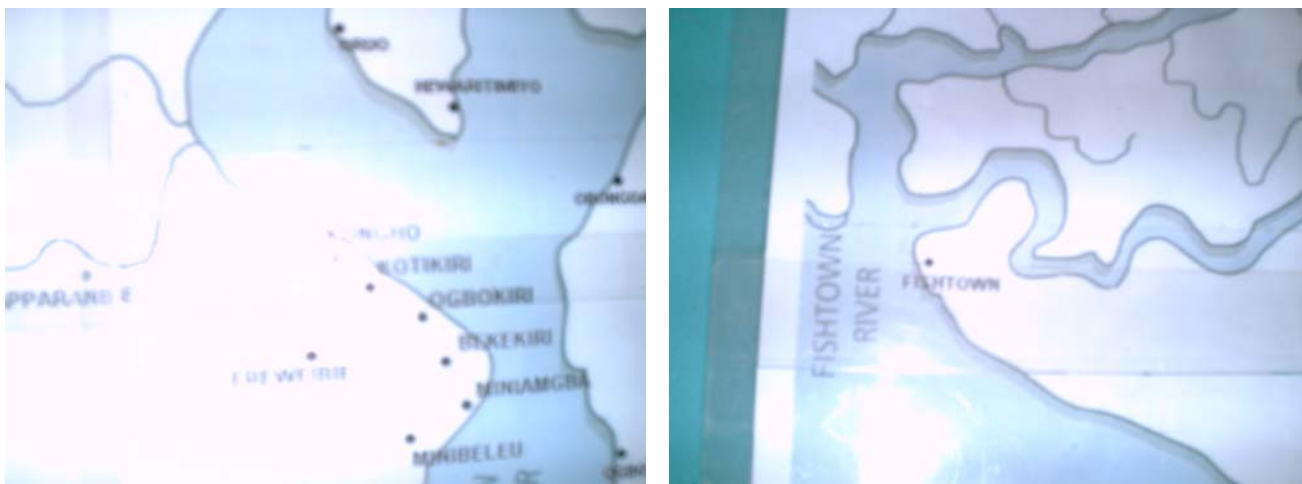


Fig: MAP OF AKASSA

Uses of the Mangrove- The communities make use of mangrove logs for cooking and also as coal for baking. The logs are also used for fish drying. He said that they have always thought about how to use it and not how to restore it. He noted that the domestic use of the mangrove forest has now been commercialized e.g. charcoal. Charcoal from the mangrove forests are sold as far as eastern Nigeria.

Perception of the project- He said our meeting is very timely in order to prevent them from an environmental disaster.

Causes of Deforestation- He was of the opinion that activities of the oil companies in their area is also decimating their mangrove forests e.g. oil spillage. A typical example of the drastic effect of mangrove was witnessed in 1980. This occurred on your way to fish town in an area that was seriously devastated by oil spillage and till date no effort has been made to remedy the effect the spill had on the mangrove forests. He said that in comparison to other areas in the world where oil is drilled e.g. Texas they are totally neglected and their source of livelihood is being decimated at an alarming rate.

Expectations from the Project- Mr. Agiri said that he hoped BDCP would be able to talk to those that help to desecrate their mangroves. He also wanted to know what other alternatives the project has as an alternate source of energy for the local communities.

They were then informed by the project team that the next stage of this project will host an all stakeholders meeting where they will be free to ask any questions and seek any clarifications needed. They were also assured that BDCP has liaised with the oil companies to participate in the projects and they are fully eager to do so. There will however, be a need for Akassa community to be accommodating with the oil companies so that the problems can be resolved.

Sustainable Use of the Mangrove- Mr. Amoru, the Director of Forestry in Bayelsa, now urged the Akassa Community to harvest the mangroves sustainably.

Suggestions by the traditional leaders- Chief Kuleha made several suggestions including:

- That the project be carried out in phases.
- He also brought to our notice that there is one important point we must not fail to emphasize which is the role of poverty in the socioeconomic lives of the locals.
- Due to the level of poverty in these communities, it was hard to convince someone to do what he feels is unnecessary. He noted that his people are so poor that they may not heed to this advice/request. It will thus take a lot of time to achieve the level of awareness on the need for conservation of the mangrove.
- The high cost of Kerosene is such that very few people can afford it in Akassa.
- He urged us to appeal to UN to talk to the federal government to reduce the price of Kerosene because the high cost is a great problem in the rural communities. The continuous cutting of the mangrove trees for firewood is as a result of the high cost of kerosene.
- Healthcare is another major problem being witnessed by the communities.

He summarized that if these project are to be meaningful to the rural communities then the issue of poverty should be addressed.

Appreciation- the stakeholders were thanked for their willingness to collaborate with the Project. The traditional rulers also expressed their appreciation for our visit and thanked us for our kind gesture towards them. The team was also praised for risking our lives to

bring a developmental project to them. Prayers were then rendered for God to lead us all safely to our homes.

Contacts-

Mr. Friday Idogige Amain

Project Co-ordinator

Akassa Development Foundation (ADF)

Erewei – Kongho

Akassa LGA

P.O. Box 667, Yenegoa

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E-mail: adf_akassa@yahoo.com

SURVEY TRIPS IN BAYELSA STATE

A) NEMBE

The journey from Yenegoa to Nembe takes about four hours.



Fig: The team that travelled to Nembe

1. Nnaoma Adimorah – BDCP Representative.
2. Mr. George Amoru – Director Forestry Min. of Env't. Bayelsa.
3. Mr. Gorsuch Erefamote – Forestry Department Bayelsa State.
4. Chief D.N.E. Spiff – A high chief from Nembe (Guide).

Mangrove Species- At around two hours to Nembe, patches of Mangrove forest can be seen. The red mangroves dominate the white mangroves in Nembe. Dense mangrove forests are found after a further fifteen minutes, with a distinct change of smell.

Deforestation- Deforestation of the mangrove trees can be readily seen and this is mostly as a result of oil spillage.

Invasion by Nypa palm- Ten minutes to Nembe, small patches of Nypa palm are seen. It was later learnt from the villagers as well as the guide (Chief Spiff-Dede) that they just started noticing Nypa.



Fig: pics of very thick red and white mangrove forests along the way to nembe.

In Nembe, meetings were held with two communities- **Bassambiri and Ogbolomabiri**. The meeting was held at the town hall of Bassambiri community in Nembe. The following high chiefs represented Bassambiri and Ogbolomabiri:-

1. Chief Naghabogote.
2. Chief C.N. Beriakuma.
3. Chief A.Z. Ala-Dede (Chairman)

Introductions were made by Chief Spiff-Dede and Mr. Erefamote after which a summary of the project was given by the BDCP representative. The highlights of the interview and answers to the questionnaire are given below:

Mangrove Species- The predominant mangrove species found in Nembe are (a) Red Mangrove (*Rhizophora racemosa*) and (b) White Mangrove (*Avicenna*)

Uses of the Mangrove- The mangrove trees are used for

- Firewood
- Building of houses
- Medicinally (The bark of the red mangrove)

Causes of Mangrove Loss- The mangrove trees are mostly affected by the oil spillage and over-felling of the trees by the community members. The advent of oil spillage was of great concern to the villagers and this was expressed by their chiefs who wanted to know if we intend to engage the oil companies.

Economic Values- Chief Aladede wanted to know if and how the two projects will affect them economically. They were then told of the various uses of the mangrove and how it helps to ensure that the fauna they depend on continue to be in abundance.

Cultural Values- There is no cultural value attached to the mangrove trees. However this is seen in certain other species. For instance, in Nembe LGA no indigene can trade in periwinkles. It is believed that an attempt to do so leads to death.

Support of the project- The community leaders were pleased that the projects were developmental projects which will improve their livelihood. They assured the team of their support and promised to be receptive at every stage of the projects.

Recommendations- It is expected that the project will be able to highlight the poor living conditions of the people of Nembe in particular and Niger Delta as a whole.

B) Mangrove forests in between Nembe and Brass

Chief Alorty Francis was sent to accompany the team to Brass. Mangrove forests were seen along the way during the journey from Nembe to Brass.



Fig: Thick mangrove forests found from nembe to twon brass



Fig: a view of tehe estuary where the sea joins the Atlantic Ocean

The journey from Nembe to Twon Brass lasted for an hour. The journey was very turbulent and the waves were very high. From Nembe to Brass the mangrove forests are very thick, and both the red and white mangroves are found in almost equal proportion. Small patches of the forest were seen to be desecrated due to oil spillage.

C) TWON BRASS

Brass is the largest and most developed of all the islands visited in Bayelsa.

Leadership- The community leadership were already awaiting our arrival and a list of their names is given below:

1. Chief Alorty Francis
2. Elder Edmund (Chairman Elders council)
3. Elder C.D. Sigismund – Amalagha Bagiste (Sect)
4. Elder Noah Francis
5. Elder Nimiboja Salomo
6. Elder Kelsy Seneto
7. Elder Des-Dokubo – PRO 1
8. Elder Solomon Gbalibo
9. Elder William Allison
10. Sir (Elder) H.E. Eleli (Chairman CDC)
11. Bomoebii Idna (youth leader)
12. Elder Ebi Amaseimo
13. Elder Karibi Debo
14. Elder Nyenre Prefegha PRO II
15. Georgina Ben-Abuli (Women Leader)
16. Mr Ishmael Teknikio

Introductory Session- The secretary of the traditional rulers' council Elder C.D. Sigismund–Amalagha Bagista introduced the villagers to us and welcomed us. An opening prayer was said by Chief Francis while a summary of the two projects was given by the BDCP representative, Mr Nnaoma Adimorah.

Support of the Project- The community through Mr. Alorty Francis said that they were happy to receive the project team and promised to accept the two projects and also to receive the project group at anytime they come.

Contact Persons-

-Sir (Elder) H.E.Eteli

Chairman CDC (0803-4911-034)

-Elder D.M.Amalagha

Secretary Elders Council (0806-3435-632)

-Elder Des-Dokubo

PRO I (0803-5852-585)

-Georgina Ben-Abali

Women Leader (0803-7493-486, 0807-5231-314)

Summary of Survey done in Rivers and Bayelsa

During a one-month period, visits were made to selected communities in the mangrove swamp of Rivers and Bayelsa States with a view of delineating the extent of nipa palm invasion. Preliminary results indicated that nipa palm have taken over most of the places visited. In order to delineate the extent of nipa palm invasion, it can not be done through ground work alone. In fact on ground, you will not see much. To accurately delineate nipa palm invasion, it will require the use of remote sensing and geographical information system GIS. It will require acquiring both old and new satellite imageries from where signatures of both Nipa palm and true mangroves (*Rhizophora*, *Avicennia*, *Laguncularia*) could be obtained. Models could then be created that would be used to accurately identify and quantify the extent and possibly the rate of Nipa palm invasion in the entire Niger Delta. The GIS study might require both ground work and helicopter overfly.



Fig- Nipa palm along the Opobo River

8.6 OGUN STATE

Executive Summary

Ogun State is one of the Coastal states of the Western part of Nigeria. The seat power is located at a small town known as “Akure”. The state is endowed with mangrove forests which are only found in the river-rine areas, hours away from the city.

It was discovered that the mangrove predominantly seen in Ogun State is the Red Mangrove- *Rhizophora racemosa* (known as “Egba” in Yoruba land). Ogun State Waterside is the only Local Government where mangroves were found. Ogun State Mangrove trees are found in the swampy area of the Ogun Waterside Local Government, including the big water ways of the Local Government. Besides a few colonies of these mangrove trees seen along the villages, the abundance of these mangrove species are seen in the interior parts where their beauty can be appreciated. Due to the inaccessibility of the areas where these egba are found, a journey has to be undertaken from Lagos through Lekki Etosa.

The tree is used mainly as fuel wood in the Local Government Area, while little is known of the medicinal values in the Local Government.

The tree is not usually felled as log, but the conservative properties of the roots as silt builder and conservation of the soil in order to prevent flooding and lagoon surge is not in doubt, hence the apathy of felling the tree for timber. Another important use of the tree is its use in the smoking and drying of fish; the major occupation of the women.

The trip suggested that the communities are not making maximum use of the mangrove but instead are leading to its mass deforestation due to its use as firewood.

Unfortunately, there has been no media publicity about the conservation of the tree in the local government area, because it is not regarded as one of the economic trees in the local government area.

ON-GOING CONSERVATION PROJECTS

The creation of forest reserves for the purposes of biological conservation is now a widespread practice, though the methodology intentions are frequently diverse. One major constraint upon the types of reserves and size is imposed by the relative scarcity of natural and semi-natural areas that may be available for such purposes.

On their part, the Ogun State Ministry of Forestry is currently taking advantage of the abundant natural environment within the Ogun Waterside Council to establish forest reserves. Within the area, there are about 3 of such reserves. And presently the ministry is collaborating with a private partner to establish a 500 acre Bamboo plantation.

OTHER GOVERNMENT PROJECTS

Government acquired about 10,000 acres of community land for Olokola LNG Joint project. This acquisition has seriously distorted the ecology of the community, as majority the florals of the area has been earmarked for cutting.

HISTORY OF OGUN WATERSIDE LOCAL GOVERNMENT COUNCIL

The British settled in Nigeria and established the crown conomy system of Government. The Ijebu-Dirisin was created as far back as 1900.

Ijebu waterside was then under a resident District office [D.O] at Ijebe- Ode. Later an advisory council made of waterside indigenes mostly from Lagos was set up.

In April 1955 Ijebu –waterside District council was set up with the headquarters at Abisi as one of the eight District councils that made up Ijebu Divisional Council with Headquarters at Ijebu –Ode.

Between 1966 and 1979 when Nigeria was ruled by military, Ijebu –waterside district council was managed by career civil servants as sole Administrators and caretaker committee chairman and council managers.

During this period of military rule, Ijebu waterside District Council was managed with 2 other councils-Osimayegun District council and Ojowo District Authority to make a local Government named Ijebu East local Government in 1926.

In 1921 during the civilian administrators of chief Bisi- Onabanjo, the district council was brought back and named waterside local Government with the Headquarters at Abigi among 30 Local Government created at that time in Ogun-State.

In January 1984 during another military rule, the Local Government again was managed with Ijebu East Local Government with the Headquarters at Ogbore.

Under another military rule in May 16th 1989, the Local Government was brought back and named as Ogun waterside Local Government with the Headquarters at Abigi as usual.

The rivers; towns within Ogun Waterside Local Government include-

1. Ifara-Abigi and many towns
2. Eri Dongo-Abigi
3. Sowore-Ibiade
4. Erimeki-Ibiade
5. Erigbofo-Efire
6. Afo-Ilisun
7. Erifun –Ilusin
8. Yemoje-Yemoje
9. Yalu- Ajana
10. Gbaragada-Gbaragada-Ayila
11. Arewon-Arewon
12. Iwopin-Lagoon[Agan] connecting many towns and villages.
13. Atlantic Ocean.

LIST OF OBAS IN OGUN WATERSIDE LOCAL GOVERNMENT.

1. H.RH OBA J.A ADEKOYA [LIKEN OF IWOPIN]

2. H.R.H OBA L.O OYELANA [OLONI OF ONI]
3. H.R.H OBA. BOLA RAIMI [ALARIGE OF IBIADE]
4. H.RH.OBA T.O ADESANYA [ONISIN OF ILUSIN]
5. H.R.H OBA S.A OSUNLAJA [OJO YOMORU OF ABIGI]
6. H.R.H OBA M.A. ADENIYI [ELEFIRE OF EFIRE]
7. H.R.H OBA LT.COL.ADE ADESOYE [OLOROFON LEMEHA OF AYEDE IKALE]
8. H.R.H OBA FREDRICK ADETUTU MANUWA [ELERO OF IJEBU ELA]
9. H.R.H OBA M.A ODUGBEFUN [OSOBIA OF MAKUN-OMI]
10. H.R.H OBA K. ADEHUGA OKUNIYI [LENUWA OF ODE OMI]
11. H.R.H OBA ELECT.OF IROKUN BUARI OLAYINKA BALOGUN.

MEETINGS

(a) Ogun State Project Steering Committee Meeting

On arrival to the State secretariat, we were informed by the project representative-Director of Environment and Conservation, Engr. Akinbowale, that a state steering committee had been set up. The latter was to serve as the coordinator of this PSC. This decision was taken after our last visit to the state and our subsequent correspondences

during which we specified that we will need all the host ministry to invite and incorporate all the other relevant bodies and parastatals, including CBOs. The list of the committee members is seen below:

1. Representative of Ministry of Environment
2. Representative of Ministry of Forestry
3. Representative of Ministry of Education
4. Representative of Finance
5. Representative of Ministry of Agriculture
6. Representative of NGOs -Justice, Development and Peace –JDPC
7. Representative of the Federal Ministry of Environment
8. Representative of BDCP



Fig 1- Ogun State Project Steering Committee Meeting

The inauguration of the Steering Committee members was done by the Honourable Commissioner of Environment- Engr. Anthony Ojeshina. After introduction of members, the Hon. Commissioner welcomed us all and assured us that reforestation is a very welcome programme. He said the upcoming reforestation programme by the UNIDO is very key to the State's environmental plans. Ogun State, which is recognized as a coastal state, has always had these mangroves in existence.

These mangroves have however been threatened by re-occurring environmental problems and it is one of the reasons why the past state government established the State Ministry of Environment. The interest of the government in environmental factors is made evident by the fact that 2-3 programmes were being supervised by the governor himself.

He mentioned that the composition of the State Steering committee shows how important the projects are to them and the fact that they recognize the fact that different departments have a role to play in the re-afforestation of these important mangrove trees. It is therefore hoped that the end of the project, the main aim of conservation is achieved.

He listed the following as the drastic effects of deforestation:

- Wood Chalking
- Loss of Biodiversity
- Extinction of species which improve the quality of livelihood of the indigenes of the state

He then went ahead to inaugurate the “State Project Steering Committee”. The Honorable Commissioner once again reiterated their unrelenting support. He assured us that as the Ministry responsible for the conservation of the state environment, they will assist us in every way possible and will be responsible for ensuring the other stakeholders there represented do likewise.

The commissioner then informed us of their provision of video coverage to cover the site visits.

There was a vote of thanks by the representative of BDCP (Ms. Ngozi Aligwekwe) as well a keynote address by the representative of the Federal Ministry of Environment, read by Mr. Afolabi.

The Hon. Commissioner then took his leave after which the technical session started. This section was led by the PSC chairman- Engr. Akinbowale and moderated by the Director of Finance (DFA), Engr.

Most of the session was used to give a brief account of the project; clarify the questions from the committee members; delegate duties; and map out a detailed workplan. The following list was given to them by the BDCP representative as the information needed for successful survey.

Table 1: Information required from Ogun State Project Steering Committee

| S/NO. | INFORMATION REQUIRED |
|-------|---|
| 1 | A list of the Local Governments where Mangroves are found and brief history |
| 2. | A map of the State showing the LGs |
| 3. | List of the LG chairmen |
| 4. | List of the communities and the names of the forests |
| 5. | Names of the contact persons and chiefs of each community |
| 6. | What is the level of deponce of these communities on Mangrove? |
| 7. | GPRS readings of these areas |
| 8. | Land Ownership and Forest reserves |
| 9. | Any previous work carried out by any persons, organizations or institutions? |
| 10. | Contributions of Ogun State government to the development of Mangrove |
| 11. | What impact has the Ogun State Government made on communities through the Ministries of Forestry and Environment? E.g. Conservation, Mass awareness etc |
| 12. | Information on Flora and Fauna found in these communities |
| 13. | Major Occupation and brief history of the villagers |
| 14. | Any previous enlightenment campaigns on conservation or reforestation as a whole? |
| 15. | The Way Forward |

During our visit to the Local Government, some of the above information were provided as written below.

Meeting with the Honorable Commissioner, Ministry of Forestry, Ogun State_Asiwajudele Odulaja

After a brief introduction of those in attendance, the meeting started with the Chairman of the State PSC giving an account of the two projects after which he itemized the following as the areas where we hoped to get the contribution /guidance of the Ministry:

- Support
- Supply of Information
- Assistance in terms of Logistics
- Contacts
- Forestry guide

The Hon. Commissioner assured us their support and was able to supply us with useful information on the work already embarked on by the State Government through their Department.

- The State Government had signed an MOU with key stakeholders to establish five thousand hectares (5,000 Ha) of forest and work had already started skeletally in the chosen site. This forest essentially consists of mangrove. It can be found along the way, before Igele. The sign post is seen visibly as you travel along the Ogun-Lagos way.
- The major occupation of the people is (i) Fish farming and (ii) Timber Contractors
- The “Balee” of the place is known as Kabiesi Irike of Oregun.
- The State had earlier carried out a project on Mangroves aimed at (i) Sustainable development; and (ii) Poverty alleviation.

The Hon. Commissioner agreed to help us establish link with the community through the help of their Forestry officer posted in the Ogun Waterside LG. He officially assigned the latter to guide us and help us arrange all logistics needed. He however said the Ministry does not have any boats available and thus we will have to pay for the services once arranged by the officer.

He thanked us for the visit and expressed assured us of their support as that the Hon. Commissioner of Environment had inaugurated the committee himself; an indication of how important the project is to the State.



Fig 2- Meeting with the Honorable Commissioner, Ministry of Forestry

Meeting with Director of Forestry, Department of Silviculture_ Mr. O. O. Odeyemi

The Director was able to provide the Ogun State Forest reserves as shown in Table 2 below.

Table 2: OGUN STATE FOREST REESRVES

| S | RESERVES | LOCATION | SIZE[KM2] | REMARKS |
|----------|---------------------------------------|---|-----------|---|
| 1 [a] | Omo Forest Reserves | Ijebu Area [Ijebu East and Ijebu North] | 1368.06 | This consists of Area J1,J3, J4 and Akilla Plantation |
| [b] | Strict Natural Reserve[Invinate Plot] | Etemi Area J1 | 10ha | Part of Area J1 |
| 2 | Olokomeji | Odeda Local Government | 38.88 | High Forest |
| 3. | Iilaro Forest Reserve | Egbado Sourth | 46.08 | do |
| 4 | Eggua | Egbado North | 41.47 | do |
| 5. | Ohumbe | Egbado North | 46.08 | do |
| 6. | Aworo | Egbado North | 212.99 | do |

| | | | | |
|----|--------------------|------------------------|--------|---|
| 7. | Edun Stream | do | 0.79 | Located within Iaro Township |
| 8 | Arakangba | Odeda Local Government | 2.39 | Plantain of Tea Watershed For Abeokuta Water Supply. Good recreation Center |
| 9. | Imeko Game Reserve | Egbado North | 954.88 | Proposed Game Reserve. |

He however explained that the reserves were established to conserve trees of economic importance of which the mangrove was not presently among. The seedlings planted in the reserves include trees like Melina, Terminalia and Mahogany.

He however knew the mangrove trees were being used by the communities in the waterside and believed this was not done sustainably. He thus believed the project was of utmost importance as this would create an awareness and possible inclusion of the latter amongst the plants to be planted at the reserves.

Below are the excerpts of the interview:

Q- What are the Forest reserves so far established and how many are there?

A- There are 8 Forest Reserves and 1 Game Reserve. The names are as seen in the table above. Altogether, there are 10 divisional offices.

Q- What is the annual output of these reserves?

A- The usual annual output is 1,200 hectares of these indigenous seedlings.

Q- Examples of these trees.

A- Melina, Terminalia and Mahogany.

Q-Any mangrove species planted in these reserves?

A- There is no conscious effort to plant these mangrove species but “Abora’ species are found in the reserves. The only mangrove species are found in the natural reserves.

However, the disadvantage of these mangrove species being found in the natural reserves is that the rate of deforestation is high.

Q-Management Challenges /What are the problems encountered towards the preservation of these trees including the mangrove species?

A- (i) Illegal Fellers-This is the most serious issue being contended with.

(ii) Inadequate number of Forest Guards.

(iii) Lack of adequate funds.

Q- What are the mangrove species found in the mangrove sites of the state?

A- The major mangrove trees found within the waterside is the red mangrove- “*Rhizophora racemosa*”, locally called “egba”.

Others include “*Lophira alata*” (known as “eki”) and “Abora”.

Q- What are the mangrove species used for in these communities?

A- There are used for the following

(i) Firewood

(ii) Building of Canoes used for short distance fishing

(iii) Roofing materials

(iv) Canoe paddles

(v) Local medicine

Q- What are the past or on-going efforts of the government towards the preservation of these mangroves?

A- Efforts have so far been restricted to forest reserves containing the indigenous plants considered of economic importance.

Q- How has it been so far?

A- The importance of the reserves and conserving of these trees can not be over-emphasized. However, the progress is occasionally hindered by lack of funds. For instance, no seedlings have been planted for this year /past year.

Q- Any documentation on the flora and fauna of these reserves or the LG containing the mangroves?

A- No. A comprehensive inventory is yet to be carried out.

OGUN STATE MANGROVE- Ogun Waterside Local Government

Upon arrival in Ogun Waterside Local Government, we met with the Local government Chairman who welcomed us and assigned us with those who will guide us. He gave his full support of the project and assured us of their willingness to assist us in any way they can.



Fig 3- Chairman, Ogun State PSC with the Chairman, Ogun Waterside Local Government

Visit to Ogun Waterside Local Government Communities

The journey from the mainland to the waterside took us hours on speedboat and a lot of vegetation was seen along the way. However, the red and white mangrove were not readily seen. Below are pictures of the common vegetation seen:



Fig. 4 (a) and (b)- Flora of Ogun Waterside



Fig. 5 (a) & (b) Diversified wetland of Odo Omi and Ibido showing different species at various stages of development - Fern, ficus, Costus afer, Palisota, Rhizophora spp.

As the river leads to Ondo State and Lagos also, people were seen living on water on transit to any of these areas. These rafts serve as home for these travelers and they sail on the water for weeks and months in these slow moving rafts. Others usually seen in the water are women transporting either their fish or mangoes for sale.



Fig 6-Water residents



Fig 7-Fisherwomen

A few villages were passed on the way such as that seen below:



Fig 8- A typical village entrance with locally made boats parked for future sail

There were several mangrove trees seen along these villages. These were the white mangrove and there were still young. However, they were many in number which means that in a few years time, if not cut down, there will multiply and perhaps become more mature and useful.



Fig 9- Young Mangrove forest

(A) ODE-OMI VILLAGE /COMMUNITY

The village we visited is known as “Ode-omi”. It is a community within the Ogun Waterside Local Government where the mangrove is found in abundance.



Fig 10 (a) & (b)- Ode-omi Community

Rulership- The name of the King (Kabiesi) of the village is “Oba Adenuga Beyioku Okuniyi Ojafoyewatu II Lenuwa Ode”. We had a lengthy discussion with him through his spokesman (Evangelist Otudeko).



Fig 11- King of Ode-omi with Ogun State team

Introduction- The team started by giving a detailed account of our mission and the projects. The oba (through his spokesperson) welcomed us and expressed his reervations about the project actually being to the benefit of his people. He gave his reason for doubt as their previous experiences with the State Government. There had been various initiatives and projects initially being carried out by the Government in the community, all aimed at improving their livelihood and poverty alleviation. However, despite their support, these projects had all been a faze and none was brought to a logical conclusion. He gave a good example of these projects as last year's rural electrification project. He then urged us to convince and assure them that the upcoming reforestation project, if their community is chosen, will be concluded. He also wanted to be assured that when these trees are re-planted, some of the community members will not be expected to vacate their houses or driven away. They wanted the Ministry representatives to assure them the Goivernment will not use this opportunity to claim people's land.

These objections were duly sorted out after which we were granted an interview.

Interview with the Kabiesi of Ode-omi; “Oba Adenuga Beyioku Okuniyi Ojafoyewatu II Lenuwa Ode”.

LAND OWNERSHIP: The land belongs to the people of “Ode-omi” . There are two different communities which make up the village- (a) Ode-omi and (b) Makun. Each of these communities stand on its own. There has been claims however, by the Makun people that they owned the Lagoon but the issue has been resolved and the Ode-omi can now claim ownership of the Lagoon.

USES OF THE MANGROVE: The kabiesi did not know of any other uses besides the building of houses and firewood; the latter being the most prevalent use. He ascribed his reasons for not having much knowledge to the fact that the mangrove is found in the inner part of Ode-omi which is only assessed by range-rovers or days of trekking.

We highlighted the additional uses of mangrove as thus:

- The mangrove contributes to the biodiversity of the State.
- The trees act as habitat to a number of fish species.
- The trees are used to build houses and for making several useful household items.
- They are also used medicinally.

ENDORSEMENT: The king endorsed the project and expressed their support. They were going to provide us with the necessary hospitality, sites and assistance we will require when we come for the next phase of the project as well as during the reforestation exercise. He expressed confidence that Ode-omi will be chosen as one of the reforestation sites owing to its vast abundance of mangrove and the level of dependence of the people living in these areas on the mangrove.

APPRECIATION: Vote of thanks were then rendered by both the team and the public spokesperson. We were then directed on how to get to the mangrove sites the next day. The session ended with prayers rendered by the Kabiesi.

Interview with the Community Spokesman- Evangelist Otudeko

Name of the Community: Ode-omi

Land Ownership: The land is owned by the Ode-omi people

Major Occupation: The people of Ode-omi are mainly

- (a) Rice-farmers
- (b) Fishers
- (c) Cassava farmers
- (d) Vegetable sellers
- (e) Banana sellers
- (f) Coconut farmers

They are mainly coconut farmers.

Gender: The women are very enterprising and join with the men to carry out most of their work. However, most of the women are petty traders. Others are fish farmers and sellers (the fishes are caught by them) and red-oil producers/sellers.

The women are important in decision making although the final decisions are taken by their king with the help of the village elders.

Types of Mangrove found in the community: The type of mangrove prevalent in the area and which they are aware of is the red mangrove- “*Rhizophora racemosa*”, known as “egba” by the community.

Uses of mangroves in the village: Although the settlement where the king resides does not make use of these mangrove species due to the fact that they are sparsely found, he grew up in the mangrove area and is well aware of the many uses they were being put into. Some of these uses are given below:

- i. Building of canoes
- ii. Building houses
- iii. Firewood

- iv. Timber for sale- some of the mature trees are cut into logs and shipped to nearby Lagos for sale.
- v. Smoking of fish
- vi. Roofing of houses
- vii. Medicinal uses- The detailed use of the leaves of the red mangrove for new born babies and their mothers were given by the oldest man in the village. The leaves of the red mangrove are plucked by the attendants of the nursing mother who has just delivered and cooked along with the bark of the tree. The woman is made to drink this thrice daily and to bath with it as well. The new born baby is also bathed with the liquid both morning and night. This practice ensures the baby stays healthy and that the skin is free of opportunistic infections. After about 8 days of use by the mother, the latter's body will revert as it was before pregnancy and she will even be fit to meet with her husband.

Occurrence of the Mangrove Species: These mangrove species are found in Osho water in the interior part of the village.

However, as mentioned by the Kabiesi, the mangrove species are found in abundance on the way from Lagos to Ode-omi using the Lekki-etiosa way by road. There, the mangrove is seen at a long stretch. The major occupation of the people in the villages along the way is fishing. The people in these areas are mostly fisher men and women. The women are often found cutting the "egba" for smoking of their fish. They are known widely as fish sellers.

Fauna: The fauna of the community comprises mostly of fishes, crabs and reptiles. The fishes are the major fauna found in the community and constitutes the livelihood of a major part of the population.

Flora: The predominant flora were listed in their native language- Yoruba.

- i. Okpekpe

- ii. Abora
- iii. Akun
- iv. Sida
- v. Okilolo
- vi. Odogbo
- vii. Okee
- viii. Akoriko
- ix. Anwu
- x. Ofu
- xi. Eki
- xii. Egba

Existing Regulations /Restrictions: There are no restrictions to the use of the mangrove in the village. The villagers believe the mangrove has been put in place by God and as such its use should not be restricted so long as it is being used for the daily sustenance of the indigenes.

Perception/support of the project and upcoming exercise: The community is happy that they will benefit and stand to gain from such a project, which is being carried out by the international and national bodies. As the Kabiesi has said, a large expanse of land located within the deforested area, will be willingly given to UNIDO when they come for the reforestation exercise. Also they will listen to the added information we have brought especially as pertains sustainable cutting and uses of mangrove.

(B) IBUDO VILLAGE

On the way back from Ode-omi through Makun, there was a village known as Ibudo village where the red mangrove was seen.



Fig 12 (a) & (b)- Ibudo village

The mangrove was only seen in a large expanse area just before the entrance of the village in the water.



Fig 13 (a) & (b)- Mangrove forest in Ibudo

We were told by the villagers that it is found in abundance right inside the village in the less-accessible areas. The mangrove, as can be seen in the picture is quite mature with long stems while the young ones are also seen around it.



Fig 14- Young egba is seen in front of the forest along a short stretch

However, one begins to wonder why it is only this area that has abundant mangrove species. The reason that readily comes to mind is that perhaps, most of the mangrove has been deforested both to be utilized locally and to make way for settlement.

However it is important to note that the mangrove of this community will face more problems soon due to the recently commissioned gas project. The site for the “Olukola Liquefied Natural Gas” Project (OLNG) found within the free trade zone of Ogun State was just commissioned recently by the then President (Olusegun Obasanjo).



Fig 15 (a) & (b)- Olukola Liquefied Natural Gas Project Site; future threat to mangrove

This site is found right next to the community with mangrove which invariably means the latter will soon start facing deforestation owing to oil spillage.

(C) ILETE VILLAGE

The route to Ilete which is the home of the Ogun State red mangrove can only be negotiated using the Lekki-Ekpe expressway. The journey was started from Lekki (Lagos State) from where we proceeded to Etosa. Then we passed through Eleko junction and on to Magbon. The villages passed on transit were:

- Orimedu
- Orofun ibeju Lekki
- Akodo town
- Olumeri

- Iyemovo
- Lekki Free Trade Zone
- Okun alasa
- Okunyare
- Oroko

We made a detour at Ikegun from where we proceeded to Ode-omi.

Journey to Ode-omi

The road to Ode-omi from Ikegun is very long (about two hours) and can only be plied by a truck or range-rover due to the nature of the soil (desert-like). The road is very narrow and rugged and quite unpleasant as a result of its bumpy nature. A couple of major villages were passed on the way- (a) Igboku village and (ii) Mafojuda village. A few minutes questioning of one of the villagers confirmed they were mostly fishermen and farmers but do not really have the red mangrove.

We then made a stop at Ode-omi village where we were met by the delegate assigned to us the previous day by the King. From Ode-omi we then proceeded for another hour to Ilete village



Fig 16- Ilete Village

Interview Session

The following people were met and network was formed.

- I. Mr. Jonathan Joseh (Representative of the chief /balee)
- II. Mr. Adebisi James (Deputy)
- III. Mr. Ikuburuju
- IV. Mr. Omokemi (Representative of the King from Ode-omi)



Fig 17 (a) & (b)- Interview with people of Ilele

A summary of the project was given by a member of the team after which we were welcomed formerly and granted an intensive interview.

Land Ownership- The Ilele community owns their land and even the forests are owned by them. The system of ownership is land tenure system. They have moved however, from their original position severally depending on the residing /shifting of the water. We were told that about 20 years ago, the place we were presently sitting on was all water. As the water moves, they move along with the water. This is why no modern houses are found since their houses are regarded as temporary. Some of the villagers, as shown below, have even moved much closer a distance away from others and right in the island surrounded by sea.



Fig.18- Part of Ilete community closer to the river side beyond the mangrove forest

It is interesting to note also that visitors are not allowed to build any houses besides that done with thatch from palm trees and wood mangrove trees. This is regardless of who and from where the visitor comes from.

Type of Mangrove species found: The only mangrove species which is found in the community is the red mangrove- *Rhizophora racemosa*. The latter is also known as “egba” by the community. This specie is seen all around the village right at the edge of the river as young seedlings.



*Fig 19- Young shoots of Red mangrove (*Rhizophora racemosa*)*

And as mature mangrove:



Fig 20- Mature Red mangrove

Perception of the mangrove- The assistant Balee assured us of the occurrence of mangrove species-egba. The egba is usually allowed to get to a mature stage before use. The longer the tree stays in water, the harder it is when it is harvested. It is then used for building of houses. The egba is more preferable than the other trees due to its strong nature which invariably means that better houses are built with it. Since the community has egba in abundance, they are appreciative that such a useful tree is found naturally in their midst. However, the major problem faced with the use of this tree is the effort used in cutting it. This reason, is perhaps why the mangrove is still found in abundance



Fig 21- Red Mangrove is the predominant flora of the community

as most villagers who are not strong enough to cut the mature trees prefer to cut and use other less energy-demanding trees.

The mangrove also occurs all along the opposite side of the river as shown below:



Fig 22 & 23- Egba is seen along the entire stretch of the river and on the opposite side

Uses of the Mangrove- The red mangrove is used for

- (i) Building of houses
- (ii) Catching of prawns, crayfish as bait
- (iii) Dying of net or boat ropes- The exudates that comes out of the egba tree is brownish and is used as dye. During the dying process, the net is soaked along with the bark in water and allowed to stay for 2-3 days before being removed.

Deforestation Level: As these trees are the most prevalent in the village, the villagers cut them on a daily basis for their basic needs.



Fig 24- Site showing massive deforestation

Regulations /Restrictions to the use of the mangrove- When asked if there are any laws regulating the use of the mangrove, we were told there were no established laws. However, depending on the number of trees being cut, you would have to get permission especially if from a neighbouring village. For those who want to cut about 2-3 trees, permission need not be granted as no one will stop you. However, if the number ranges from 10-15 or above, then you will have to seek the consent of the community head.

Economic Values (Trading) of the Mangrove trees- The mangrove trees are sold to people from other villages and outsiders at a price agreed on by the village rulership. Up to twenty thousand naira (N20,000) can be charged for about a 100 trees.

Flora and Fauna- (A) The Flora of the community consists of mostly of (i) Coconut trees; and (ii) Red mangrove- *Rhizophora racemosa*. Others found towards the village entrance and in their farms include (iii) Palm tree and (iv) Mango tree. The latter is also found in abundance all the way leading to the village and the trees are considered free for all with no restrictions to plucking of the ripe mango fruits.

(B) The fauna of the community is mostly different types of fishes including (i) Tilapia; (ii) Cat fish; (iii) Abokun; (iv) Atoko –which means flying fish. The latter is one of the most abundant and is called fly fish because it usually flies away from the net once caught. On looking at the water for a minute, one could even see the fishes flying out and in the water. The fish had some traditional beliefs attached to it- the mentally deranged people are not allowed to eat the fish.

Cultural Values- There are no cultural or religious beliefs attached to the egba tree.

Previous Projects or Initiatives- There has not been any previous projects or initiatives from either the government or private organizations to conserve the mangrove. There had not been any awareness campaigns either.

Occupation- The people of Ilete engage mostly in Fishing and Farming. The fishes are usually dried and taken to Lagos for sale at the border. The farming ranges from coconut production, cassava production to palm oil production.

Gender Issues- The women are fish sellers. They are seen drying the fishes which will be sold afterwards by the women who join the trucks in the morning and return in the evening. They also engage in petty trading with the money gotten from the proceeds from the sale of dry fish.



Fig 25- Women making palm oil and smoking fish for sale

Concern for Extinction- The villagers expressed concern for extinction of the trees because as they said, the number of trees found now are far less than it was years ago. The rate at which it was being cut was not the rate at which it was being re-generated. The idea of re-planting had never occurred to them.

Support of the Project- They equally expressed support of the project and were grateful that these trees which were found in abundance in their place was being considered of importance by the international and national bodies. They were ecstatic that the trees were to be conserved for them and indeed even re-planted.

Recommendations- They urged us to consider choosing Ilete as one of the sites for reforestation as this will ensure the survival of their future generations. Besides, when the younger ones learn of the importance of these trees they will put it to greater use thereby securing a good future for themselves whilst conserving the mangrove forest.

We were then assured that as is their practice, they will issue us land to build prototype traditional houses when we come for the reforestation exercise while houses can be rented to us on our next visit on awareness campaign.

PICTURES OF THE MANGROVE FOREST



Fig 26, 27, 28, 29- Ilete mangrove forest

8.7 ONDO STATE

Executive Summary

Ondo State is one of the oil producing states of Nigeria and comprises of people of rich culture and heritage. The mangrove forests of the State, as is expected, is found in the oil producing areas which are under Ilaje Local Government.

Unlike in the other South-Western states, there are both Red and White mangrove in abundance. In addition to these two, the Nypa palm is also found. These trees are known as “Egba”-Red mangrove, “Sekele”-White Mangrove, and “Akpejaja”- Nypa palm.

Ondo State can thus be said to have one of the richest mangrove forests in the country. The communities in these mangrove areas are also seen to make maximum use of these trees for their daily sustenance and well-being. The mangrove trees were used for diverse uses and in some cases, even medicinally in the cure of the most common ailment in coastal areas and indeed Africa as a whole-malaria.

The Ilaje land consists of 78 communities /towns. The poverty level of these coastal communities is high while the population is also very high. These communities are forced to use the only resources they have control over i.e. fishes, crabs periwinkle etc, as well as the trees there are blessed with- the mangrove.

However, the daily use of these mangrove resources by the communities pose a problem to the continued existence of the mangrove. This in addition to oil spillage and sea incursion makes it a top priority that action is taken soon to prevent the total loss of the mangrove.

The three at to Nigerian Mangrove ecosystems, and especially that of Ondo State includes

1. Oil and Gas production activities, which impact- rely on the mangrove, right from the drilling stage to spills.
2. Logging for fuel wood, which is used both for domestic cooking, and industrially in baking bread
3. Urban/Rural housing expansion
4. High threat of multi-million dollars shrimp aquaculture/farming
5. Invasion of Nypa palm along the coastline, this Nypa displaces mangroves species and is on high rate due to its mode of propagation.

Below is a comparative picture of the red and white mangrove:



Fig 1- Comparative picture of the White (left) and Red (right) mangrove

BRIEF HISTORY

ILAJE are the people of the Oil Producing communities of Ondo State. This is why there are two commissions in charge of development projects in the area namely: the “Ondo State Oil Producing Areas Development Commission (OSOPADEC)” and the “Niger Delta Development Commission (NDDC)”.



Fig 2: A typical project sign post found in most of the communities; in this case, Zion Ikorigho

There are different accounts of the derivation of the name. One account says that Ilaje was the symbol of traditional worship known as Oro , a slightly different account says it was derived from a cult State[Opa Oro] which was brought from Ife.

Another account says it was derived from their traditional occupation which is fishing, precisely from “Eleja”, fish people.

Still another account says it originated from the prosperity of the people. In that sense , the is pronounced Itaje;, meaning enjoy one’s riches. Based on their location, Ilaje people are classified into three;

- [1] Ilaje Ugbo [Ilaje in the hitherland]
- [2] Ilaje Ebaha [Ilaje by the riverside]
- [3] Ilaje Igbekun [Ilaje by the seaside]

Ilaje Igbekun can be found in Ugbo malin, Irrespective of locations, however, Ilaje are of four historical groups namely; Ugbo, Mahin, Aheri, and Etikan , whose paramount rulers are Ologbo of Ugbo; Amepetin of Mahin; Manpomre of Ahari and Olukan of Etikan. Ilaje people have been variously described overtime as Ugbo , Igbo, Iranje, Ilare mahin and Ilaje.

ORIGIN

Ilaje [or ugbo] people are Yoruba, but not descendants of Oduduwa, who is generally believed to be the progenitor of Yoruba race. They believe they were the people in Ile – Ife, that oduduwa met when he migrated, first to Ugbo- Ugbo, then to Okemafunranga which today is known as Oke-Igbo. They then moved to Odigbo and later to Ode Aye, until they finally settled in their present riverine environment.

Another account however has it they originated from Oni Ogboduwa who came from Ile-Ife and founded a towm called Igo or Ugbo. Hence Ilaje have the appellation “Igomoni”.

ILAJE TOWNS

Ilaje land contains the following towns namely:

[1] Abe Atala [2] Abe reke [3] Abe Oroyo [4] Abe Obe [5] Abe Olobo [6] Aboto [7] Agongo [8] Akata [9] Ajetumara [10] Apala Obi [11] Alijene [12] Beliegbofo [13] Ebute Upara [14] Elugbo [15] Eveke Awojimin [16] Ereke majofodom [17] Ereke mekuteyi [18] Ereke mogbojuri [19] Erekusu Eba [20] Eron [21] Eyin-oha [22] Gbabiju [23] Idiogba [24] Ideghele [25] Idogun [26] Igbokode [27] Ikoki [28] Ilepete [29] Imoluma [30] Imoluma [31] Itebu kunmi [32] Kurawe [33] Madagbaju [34] Mahinledo [35] Mogoho [36] Mofeginitokun [37]Obe Adun [38] Obe Arenegho [39]Obe-nla [40]Obe Onekanzulu [41] Obe Ogbaro [42] Obe Ojumole [43] Obe Pebimino [44] Obe Reghoje [45] Obe ufenla [46] Ode Mahin [47] Ode Etikan [48]Ode Ugbo [49] Odon la [50] Oogoro [51] Oke Edeba [52] Olomi didun [53] Orere Ara [54] Orogouni [55] otopo [56] Omagbeyinwa [57] Oroto [58] Uba metoro [59] Asiza [60] Ugbobi [61] Odun idogun [62]Odun Maran [63] OdunYaye [64] Odun Ogun [65] Odun Oloja [66] Odun Otutu [67]

Odun Ojan [68] Ulogho [69] Odun Seju [70] Odun seluwa [71] Ugbogunren [72] Umoluma [73] Upare [74] Ikorugbo [75] Woniteren [76] Upepe [77] Ugbolomi [78] Udon Aruminya.

CULTURE

DRESSING: Ilaje female wear buba and iro, oma ewu [blouse] , uro moji, kaaba [gowu] Igbeko [underwear] lobi [skirt liko] oja , gete , uhole/ uborun and delights in gold and coral beads while male adorn buba and sokoto, agbada, gbarije, kenbo, dansiki, caphtan, yeri etc. and adorn gobi, abetiaja, pereki as caps.

The Ilaje people love music and dancing; these interests are brought to bear in their worship service in the ubiquitous cherubim and seraphim Christian denomination in the area.

Obeisance is very important to the people- the male prostrate, while the female kneel down.

RELIGION

While Islam is hardly known in the area to this day, as early as 1890, there were over fifty large churches in Ilaje-land majority of which were United Native African Church[UNA], and the West African Episcopal Church .

NEIGHBOURS

1. IKATE

The Ilaje account says the Ikaje were originally Ilaje. Accordind to an account, the Ikate clan was founded by an Ugboland son called Atara who disobeyed or betrayed the king of Ugbo.

2. IJAW

THE Ijaw people have been unfriendly neighbors with the Ilaje for a largely long time. The Ilaje believe that the Ijaw migrated from the middle belt region of Nigeria, first to eastern Delta and from there to Gbaran, Apoi Ibe Area. They are normadic fishermen.

The first paramount is called [Agede gba]of the Ijaw people of Ondo State was installed in 1935.

3. THE ITSEKIRI.

Itsekiri is regarded as a sub- dialect of Ilaje because of the similarity between the two. Though the istsekiri are believed to have originated from the King of Benin, they were inter-married and lived with Ilaje for a long time and have assimilated or acquired their customs, tradition and dialect.

4. THE BINI

The Ilaje have long historical have been with the Benin people. Oronmaken first King of Ugbo Kingdom was said to have claimed the first Settlers of Benin left at the same time with him very close to Itaje.

5. THE IJEBU.

THE Ijebu are also neighbors of Ilaje. Ilaje people believe that the Ogborogen of Ijebu-Ode migrated from Ugbo because he failed to to step into Olugbo's throne and therefore left Ugbo with his two brothers namely the Likan of Iwopin and Nenuwa of Ode- omi . The Akarigbo of Ijebu is also believed to have historical link with the Ilaje.

MEETINGS; INTERVIEWS

I) Meeting with Deputy Director, Environment.

While waiting for the Director to come back we had a brief meeting with the Deputy Director.

- State of the Mangrove forest in Ondo State: The State is endowed with a lot of mangrove species mostly the red and white mangrove. These trees are found in abundance along the communities within the coast line. Years back, there were more red mangrove than the white mangrove. However, the white mangrove are more prevalent now.

- Uses- The mangrove trees are used mainly as (a) sources of firewood; and (b) during distillation. The wood is used for brewing of wine and oil. Due to the hard nature of the wood, it retains heat which is a major requirement for brewing.
- Suggestions on the way forward- We were advised to get to the “Ondo State Oil Producing Areas Development Commission (OSOPADEC)” where we will most likely get additional information on the mangroves, get assistance on the logistics and also a guide to travel with us since they have officers in place in these communities.

II) Meeting with Director, Environment and Water Resources

- Ondo State is surely a mangrove rich State and she had made a strong case of inclusion of the State as a coastal state rich in mangrove during the last meeting in Calabar.
- There are three major types of mangrove in Ondo State namely

| Common name | Scientific name | Local name |
|----------------|----------------------------|------------|
| Red mangrove | <i>Rhizophora racemosa</i> | Egba |
| White Mangrove | <i>Avicennia Africana</i> | Sekele |
| Nypa palm | <i>Nypa fruticans</i> | Okpejaja |

- The occurrence of these mangrove species is clearly defined and are all found in the Ilaje villages all the way to the boundary with Delta.
- As mentioned by the deputy director, we will be best off seeking the assistance of OSOPADEC. The project will also stand a chance of opening a channel of mangrove promotion by the commission, once we are able to make them see the importance.

III) Ondo State Oil Producing Areas Development Commission (OSOPADEC)

OSOPADEC is located in the centre of Ondo- Akure. They are the body responsible for ensuring the development of the people of Ondo State (and oil producing areas in particular) and the proper utilization of their resources. They carry out several

development projects using the funds reallocated from the community through their natural resource- oil. A brief meeting was held with the Permanent Secretary (Pastor A. G. Manuwa) and the excerpts are as follows:

- Mangrove Forests: There are indeed mangrove trees in abundance in the coastal communities under Ilaje. To the best of his knowledge, the red mangrove is usually used for firewood while the white mangrove is not in much use. (However, this notion was later proven wrong after our trip).
- State of the Mangrove: Before the sea incursion came, the white mangrove was very close to the sea. The coast is seen as a stretch of land which terminates where the water (Atlantic ocean) starts. At the other side of it, you have fresh water. The red mangrove is found on the fresh water side while the white is seen at the beach. The two hardly mingle.
- Occurrence: The white mangrove is found along Ilaje Local Government while the red mangrove is found both at Ilaje and Oteogun.
- Past Projects: OSOPADEC had never carried out a mangrove conservation or awareness campaign since its inception. However, they were presently reviewing a proposal from the Ministry of Forestry and Wild Life to develop a forestry policy for the river-rine areas.
- Support of the project: OSOPADEC is quite delighted at this project which clearly is aimed at development of the coastal communities and as such fall within their objectives. The project had come a good time when there is a growing awareness and plan towards reforestation to avoid extinction of the forest trees.
- As a clear indication of their support they will assist us financially with all logistics and payment of the necessary guides needed to take us round through the communities.
- In addition to the monetary support, their officers will be assigned to lead us throughout the duration and thereby ensuring we are not disturbed by the youths who may be apprehensive on seeing us.
- Their officer in charge of Ilaje area will also help us contact the communities before hand.

ONDO STATE SITE VISITS

Many communities were visited in Ilaje land. The starting point was Gbokoda from where a speed boat was boarded daily. The following were the communities visited:

- | | |
|----------------|-------------------|
| (i) Orokopo | (xiii) Ugbola |
| (ii) Bijiwo | (xiv) Obiela |
| (iii) Ajegunle | (xv) Odola |
| (iv) Mogohe | (xvi) Idiogba |
| (v) Mahin | (xvii) Obemagbe |
| (vi) Ilowo | (xviii) Agayebi |
| (vii) Ojumole | (xix) Ayetoro |
| (viii) Odifado | (xx) Obiogbaro |
| (ix) Ugbo | (xxi) Jiriwo |
| (x) Ilekpete | (xxii) Orototo |
| (xi) Ikoriwo | (xxiii) Oberewoye |
| (xii) Awoye | |

The white mangrove (sekele) were the predominant species seen in the above communities with their red mangrove found in the less accessible parts of the forest. *Nypa* palm is also found along some of these communities, with some found right at the back of the houses like a decoration.



Fig 3(a) & (b): White mangrove (“sekele”); found in abundance in these areas

However in yet another part of Ilaje, the red mangrove are the predominant species found; for example in

- (i) Ipepe
- (ii) Ereke
- (iii) Okesilo
- (iv) Abanla
- (v) Ayetoro

The detailed account of some of the visits made are given below.

(A) ZION IKORIGHO

This is a small community which can be regarded as a church settlement.



Fig 4: The entrance of Zion Ikorigho.

All the members of the community belong to a particular church and the community leadership comprises of the leadership of the church.



Fig 5: The team with the leadership of Zion Ikorigho

1. Name of Community: The community is known as “Zion Ikorigho”
2. Leadership: The balee of the community is the Most Rev. Apostle A. O.M Aboyewa
(Who was just recently enthroned on 7th of May, 2007)

The Elders present include:

- (i) Pa G.O Madome
- (ii) Most special senior apostle Number okuwunuwa (Baale Assistant/representative)
- (iii) C.I Aboyewa
- (iv) Asunenwo
- (v) Awopebijo
- (vi) Okenuwa Asiki (Christian soldier)
- (vii) Caleb Madume
- (viii) A.P. Orefohan Ogunfeyimi (Personal Assistant to the balee)
- (ix) Omotoyeshe (Deputy to the head of the community)

3. Mangrove Species

- i. Akpejaja (Nypa Palm)

- ii. Egba (Red Mangrove)
- iii. Sekele (White mangrove)



Fig 5: White mangrove (Sekele)



Fig 6: Red Mangrove (“Egba”)



Fig 7 (a) & (b): Nypa palm (Locally known as “Akpejaja”)

4. Uses of Mangrove:

- a. Firewood
- b. Building
- c. Used as silt for base of houses



Fig 8: Used as Firewood



Fig 9- Root of the red mangrove used on the base of houses as barrier to sea upsurge

5. Deforestation Level: The community considers the mangrove species as a nuisance, so they were happy that these trees can actually serve some uses. The trees were cut consistently and the level of deforestation was very high for the mangrove nearer to the community.



Fig 10 (a),(b), (c) & (d)- Sites showing Mangrove deforestation

5. Flora and Fauna: The flora is mostly the mangrove species with a few other trees like coconut. The fauna is dominated by water lizards and fishes. The tall grasses in the community also serve as breeding ground for mosquitoes.



Fig 11: The lizards are seen coming out of their holes, with no fear of human movement

6. Timeliness of the Project- The balee expressed the community's happiness because the village was about to organize those that will deforest the mangrove forests.

7. Planned Deforestation Exercise- Reason for this being that the trees were believed to invite and harbour the mosquitoes were seen all around the community. He said the menace of mosquitoes has to be fought and besides the mosquito net (which could barely be afforded by the community members), there was a need to clear the surroundings.

Mere observation of the swamps all around the community, one would see that it was indeed a breeding ground for mosquitoes. However, the mistake made by the community was in believing that the mangrove trees were responsible for their plight.

When asked if the mosquitoes have always been this much, the answer was "Yes" it has. The villagers were then told that the mosquitoes are as a result of the grasses around the houses and not the mangrove. These grasses all grow in water as the village houses are all within water (houses are suspended over water). As mosquitoes habitat in dirty water, the grasses provide proper breeding environment. The following advice was then given to them:

- b. Cut the grasses
- c. Link the river to the lagoon
- d. Try and clean the water
- e. The water will interact and exchange. The mosquito's larva and head will be washed away.
- f. Use chemicals e.g. kerosene around the house.

7. Support of the projects and upcoming reforestation exercise- The community will welcome the project and the upcoming reforestation exercise since they are now aware of the importance of the mangrove. However they will love to be taught the different uses of the mangrove and the team assured them this will be done in the next trip on awareness.

(B) AJEGUNLE

Ajegunle was a more populated community with the leadership also seen to be older than that of Zion Ikarrgho. It was in Ajegunle that our team was able to discover a few more uses of the mangrove. Both the Red and White Mangroves were predominant in this area although the white mangrove was more accessible and covered the frontline of the forests. It was apparent from the visit that the community was indeed largely dependent on the mangrove and not just on fishing. This is why there is every need to ensure the sustainance of these mangrove species.



Fig 12-Ajegunle community



Fig 13-Some team emmbers with villagers

Leadership- The Balee of Ajegunle community is Chief R.E Emupeme.

Mangrove Species- The Red and White Mangrove are the predominant species of this area.

Uses: There are many uses of the mangrove in this community and these can broadly be divided into three namely:

1. Used for firewood
2. Used for Building
3. Medicinal purposes
4. Used in making fishing tools and household equipments

[a] White mangrove /Sekele/ *Avicennia africana*-

- (i) Healing of leg infection- There are certain chemicals contained in sekele which has healing properties. The bark and leaves are cooked together, then it is used to heal /remove chigger i.e. a corn –like infection in the leg.
- (ii) Used as plank
- (iii) Also used for flooring of houses
- (iv) Used for roofing of houses [roof crossing]

[b] Red mangrove /Egba/ *Rhizophora racemosa*

This is the stronger of the two and is used for the following:

- (i) Dying- Barks contain certain red exudates that is used for dying the fishing net.
- ii. Comb- The wood is used for carving comb used by women
- iii. Shuttle- It is used to make shuttle known locally as “Aghen” (This is used as thread for sewing fishing net that is thorn).
- iv. Used as axe-handle.



Fig 14-Comb made of egba



Fig 15-Local boat made of egba



Fig 16-Floor of a house made of sekele



Fig 17- Roofing of a house made of egba

Major Occupation- Major occupation is fishing. The people of Ajegunle are mostly fishermen. However the oil has affected fish farming both in the sea and the river. Formerly there was a large expanse of water, but because of the incursion of the sea

Gender Issues- The women are also fisherwomen and fish in the river, while men fish in the sea. They also help the men smoke-dry the fish on a commercial scale. These they now transport to the bigger market in town either by joining the commercial ferries or by rowing themselves in small locally made boats.

Predominant Mangrove in the Community- When asked which mangrove is more predominant, the villagers answered both. The White mangrove is close to the sea while

the Red mangrove is further down. This explained the reason why the white mangrove were mostly seen.

During the raining season, people have to go further inside the forest to get the red mangrove.

Support of the Project- The villagers welcomed the idea of the project. They were doubtful of the fact that these mangrove resources could ever be depleted but did not hesitate to show that we were welcome to come for the reforestation exercise.

(C) ILOWO ZION

Ilowo Zion was a more developed community and appeared quite peaceful and less populated than the other communities visited. The people were also very receptive and like the people of Zion Ikarrgho, appeared to be educated. The white mangrove was the predominant mangrove specie in this community.



Fig. 18-Ilowo Zion elders with team



Fig 19- A modern house built above the swamp

Name of town: The community is known as “Ilowo”.

Leadership- The name of the balee is Hosea Aledetan and he also happens to be the oldest men in the whole ilowo town.

Others met include J.O. Omojuwa. The latter helped us answer most of the questions.

Mangrove Species- The community is blessed with the white mangrove which is seen in abundance a short distance away from the houses. The red mangrove can also be found but like the Ajegunle's, it is found further inside in the inaccessible part of the forest. This is because the white mangrove thrives better in the fresh water which is found closer to the community.



Fig 20- Mangrove forest of Ilowo Zion

Uses of the Mangrove- The white mangrove is used for

- I. Building houses (Flooring and Roofing)
- II. Firewood
- III. Women cut it and sell so it is sources of income
- IV. Used as bait for crayfish. [Used to create artificial habitat to attract the fishes].

Major Occupation- The major occupation of the people here is fishing, and wood selling. The Sekele serves as their major occupation here as a source of income.

Support of the project and upcoming reforestation exercise- The community will welcome any project which will bring about their development and as such they assured us of their unrelenting support.

(D) AWOYE COMMUNITY

This is by far the most populous community in Ilaje. Awoye was seriously faced with the problem of sea incursion. This has caused the people to shift from the original position about five times. Because of the canal the incursion caused, the people felt it has boosted their economy because they can easily get into the sea.



Fig 21- Fishermen at the edge of the sea

Because it is open to the sea they have direct access to the sea. Even little children can be seen standing in the sea to fish. That is what accounted for the population.

The dredging in this area has however affected the biodiversity of the Awoye community. The place where oil was being produced was right in front of the community; a short distance beyond where the sea joins the river.



Fig 22- Gas flaring

Initially the villages under Awoye were not all in this conecnterated area, but later on they started experiencing sea incursion and this caused a mass movement there. The areas where the oil spillage is seen is actually the area of the original settlers.



Fig 23 (a) & (b)-Oil spillage seen in water; Destruction of flora, Flora due to oil spillage

The oil is seen in the water and is quite close to the mangrove forests of the community. The fishes of these communities were also affected and since fishing is clearly the major occupation of the area, the villagers vwere forced to keep moving. However if nothing is done about it by the next few years, then the biodiversity of these communities will be lost.



Fig. 24 Oil rigs overlooking the community of Ilaje.

Fig.25- Expanse of mangrove marsh land threatened by constant oil pollution and ocean surge

When questioned the villagers said at the rate their water was being gradually poisoned, we may not see anyone in the area where they were seen at present.

The Ijaw- Ilakajo war [1998] affected them, but it was after the war that they built their houses. However the population boost is as a result of the nearness to the sea. The advent of oil spillage have, however, affected this mass settlement and will eventually deteriorate their already poor living standards.

All the areas are visited are under Ugbo kingdom-referred to as constituency 1.

Among the above areas visited, white mangrove is highly predominant and is seen on both sides. The towns are completely surrounded by white mangrove.

(E) IPEPE COMMUNITY

In this area, the left hand side has white mangrove, while the right hand side has the red mangrove. The red mangrove were seen to mix up with the white mangrove as if dividing the village into two while the predominant species were clearly the red mangrove.



Fig 26- Red Mangrove and White Mangrove

The community uses both the white mangrove and red mangrove in most of their building. Below is a typical house built with mangrove:



Fig 27- A typical house built with both species of mangrove

This community has many uses of mangrove and the most important of these being the medicinal uses for the treatment of malaria and skin infections.

Interview Session



Fig 28- Project team with the Community Leadership and Youth Leaders

-Name of community- Ipepe

-Leadership of the Community- The name of the Baale is Chief Warshal Arenewo

The following are the community leaders/council of elders.

- a) Ayole Ajesafe
- b) Pa Ogunfemi Mikial
- c) Mr. Maurice Ikwuomonisa [Acting /Assistant balee]
- d) Agbani Denis [Youth leader]
- e) Ogunfeno Bolaji [Assistant youth laeder]

-Support of the Project and Proposed Reforestation Programme- The community assured us of their support and their youths' help in the reforestation programme when the time comes for reforestation.

They believed that the project will bring will bring about the development of the community.

-Predominant mangroves species-

- I Egba (Red mangrove)
- li Sekele (White mangrove)

Right hand side – Egba; Sea side- Sekele



Fig 29- Red Mangrove on the right



Fig 30- White mangrove

-Uses of the mangrove:

- I. Used traditionally for firewood



Fig 31- Egba being dried for use



Fig 32- Freshly cut egba

II. Building

(a) Flooring of houses -sekele

(b) Used as pillar of houses- Egba



Fig 33 (a) & (b) - White mangrove used for the flooring and construction of houses



Fig 34(a) & (b)-Red Mangrove used for building support; Being dried for use as pillars

- III. Medicinally used for malaria = sekele: You pluck the leaves and rub together/squeezed to produce exudates. This is used for bathing and drinking to cure malaria.
- IV. Egba bark is used for loss of appetite.
- V. The bark is used for mouth sore- It is dried and grounded to fine powder after which a cube of sugar is added and this is then used to treat mouth sores. It is dual purposes – when wet you can cook it and use it. When dry it is ground and used.
- VI. Egba is used as dye- fishing net, clothes
- VII. Sekele juice is used on the skin for diseases e.g. Eczema. It is used together with some other plants.
- VIII. Building of bridges (White mangrove)



Fig. 35- Walkway constructed with white mangrove

Perception of the Mangrove: The mangrove is considered as economical by this community. They depend on the mangrove trees for their livelihood. The women cut the trees and used it for many purposes.

Reforestation: Considering that the mangrove is being used maximally by this community, one would have expected that there are attempts to re-plant the trees but this is not the case as the villagers consider the trees as being in-exhaustible.

Other flora: The other flora are those usually found with the mangrove. However it is interesting to note that these other trees /plants are regarded by this community as eroded species/weeds. The only indigenous trees are egba and sekele.

Fauna- The major fauna in this area is the periwinkle. As is expected there are different types of fishes but the periwinkles stand out as they cover the whole shallow waters. Even ponds within the village are filled with periwinkle.



Fig 36- Pond filled with periwinkle



Fig.37- Rare and endangered fauna. thrives in this natural habitat.

Major Occupation- Periwinkle and fish selling is the major occupation of the women while the men are mostly fishermen.

Support of the Project- The projects will be much welcome as the community can hardly do without these mangrove.

(F) EREKE

A visit was also paid to the settlement called Ereke. The surrounding area, a little further down, has other vegetation/ trees e.g *Chlorophlora seleostinum*. Mature white mangrove can be seen in between these other trees with a few coconut trees. Settlers are found mostly on one side.



Fig 38- Ereke Community

The area is used as fish poultry and they are widely known for this. The major occupation of these people is fishing and this is done in a commercial scale in the river and the artificially enhanced fish ponds.

The rooting system of the red and white mangrove can best be seen and appreciated in Ereke. This is because some mature mangrove trees whose roots are clearly above the ground, are seen on land quite close to the water and are before the rest of the mangrove trees like protectors. The area would have been subject to erosion if not for these trees.

The rooting system of sekele is in a symmetrical form /system as compared to that of egba which is horizontal in nature. This system is very resistant to sea incursion, hence the need for afforestation to help the town check erosion and sea incursion.



Fig. 39 & 40- Root systems of white and red mangrove.

(G) OKESILO

This is a small settlement which has predominantly red mangrove. The rate of deforestation of the mangrove forests in this small area is rather high and the villagers can be seen on both sides cutting the tree to be used.



Fig 41- Woman cutting the red mangrove- egba

(H) AJETORO.

This area has been modified into town. And as a result, their mangrove forest is deeper inside and less accessible than the other areas where the mangrove is like a back-yard garden. Because of sea incursion, the houses have been known to sink.

Below is a picture of other flora seen in the area.



Fig 42- Other flora of Ajetoro

(I) ISEPE

In Isepe, the white and red mangrove can be seen to intersect.

In other areas, the mangrove species were seen to have started the process of regeneration due to reduced human activities.



*Fig. 43- Re-colonization of Abaala/ Motoro marsh land
Natural habitat - new 'Egba' mangrove taking over from the dying ones*

Other communities visited include:

- Oyoro
- Ogogoro Zion

- Ogogoro
- Orekwamimo
- Gabijoye
- Asisa
- Seja-oke
- Seja-odo
- Ojan
- Setuwa
- Magbeninwa
- Petenu

The mangrove trees in the above areas are not as readily seen, and can be seen at a distance. The White mangrove is found on the left hand side while the red mangrove is found on the right hand side.

Gender Issues- The women as usual are (i) Fisher women (ii) Periwinkle sellers (iii) Wood sellers (mostly the red mangrove). Their children are usually seen in company of their mothers transporting periwinkles.



Fig 44- Woman and children with bags of Periwinkle species after a days work

Deforestation- The mangrove as seen along the whole length of the communities showed evidences of mass cutting and the women are even seen transporting the logs of wood in the river.

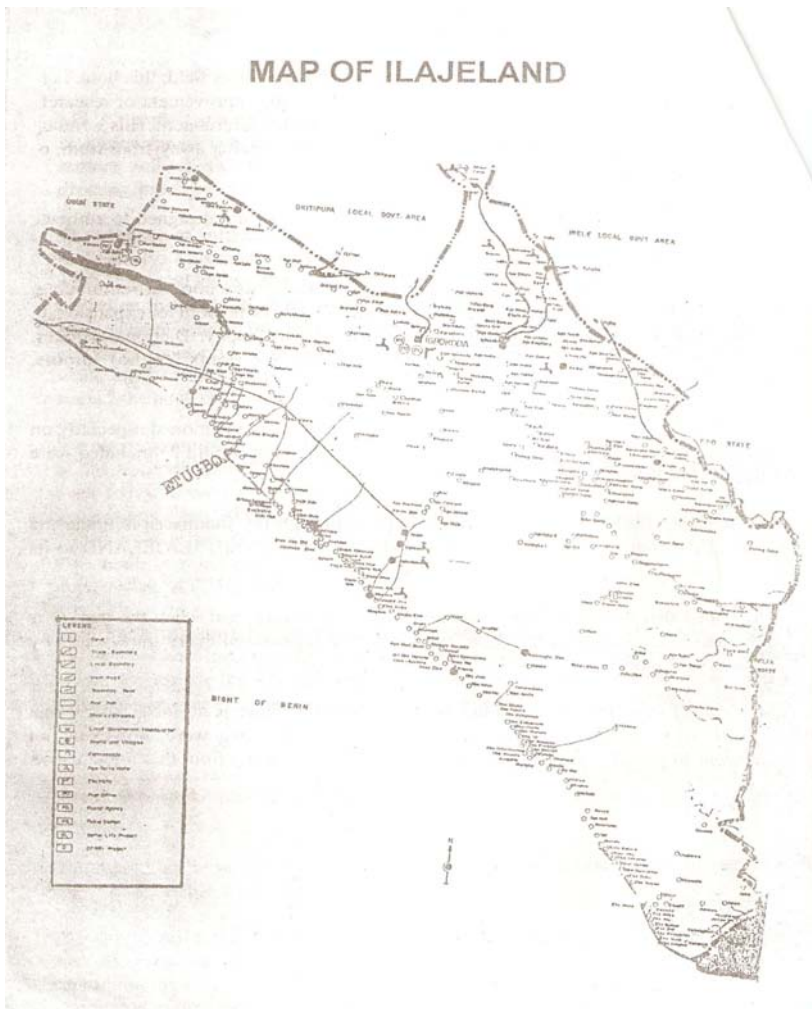


Fig 43- Deforestation site showing cut mangrove



Fig. 44 & 45 mangrove plants as an economic resource – as firewood and poles for building houses

Fig 46- MAP OF ILAJELAND



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8.8 IMO STATE

The mangrove forests in Imo are not as thick as those of the other states of the Niger Delta. As expected also, the mangrove species are equally not as abundant and are mostly the red mangrove. The red mangrove is found in the Imo River towards the boundary with River State and Cross River State. The people living in these areas are not much dependent on the mangrove and regard it as one of the many trees that can be cut and used as firewood. No knowledge is known of its medicinal values and indeed the communities were surprised that the mangrove could be put into many uses.



Figure- Mangrove Forest in Imo State

8.9 CROSS RIVER STATE; 8.10 AKWA-IBOM STATES

Executive Summary for Cross River state and Akwa-Ibom States

FIELD STUDY METHODOLOGY AND LOCATIONS

The survey methodology used is the ground survey method. The Local Government Areas (LGAs) constituting the coastal area in the two states were visited, particularly, those where mangrove ecosystem occur. Most field visits were by motorized boat, but in some cases, road travels preceded boat trips. The study team comprised of one Bioresources Development and Conservation Programme (BDGP) representative, one resource person, Ministry of Environment representatives from the two states and one NGO representative. A summary of the sites visited in the two states is presented in Table 1 below.

Table 1: Field locations for the mangrove-nipa palm management in Akwa Ibom and Cross River States

| Date of field visit | State | LGA | Name of village | Geo-coordinates |
|---------------------|-------------|---------------|------------------------|----------------------------|
| 22/05/2007 | Cross River | Bakassi | San San 1 Fishing Port | 04°47.196N 008°33.711E |
| 23/05/2007 | „ | Akpabuyo | Idundu | 05°00.968N 008°23.394E |
| „ | „ | Calabar South | Edibe Edibe beach | 04°56.185N 008°18.523E |
| 24/05/2007 | „ | „ | Ine Udo | 04°52.296N 008°17.332E |
| „ | „ | „ | Ine Akpando | 04°50.967N 008°18.718E |
| „ | „ | Odukpani | Adiabo Okurikang | 05°04.2 48N 008°15.387E |
| 25/05/2007 | Akwa Ibom | Mbo | Ata Akpa Ebughu | 04°42.873N |

| | | | | |
|-------------------|---|----------------------|--------------------------|---|
| | | | | 008°18.648E |
| ” | ” | Oron | Esuk Mma | 04°48.416N 008°15.581E |
| 04/06/2007 | ” | Ikot Abasi | Uta Ewa beach | 04°32.863N 007°32.946E |
| ” | ” | ” | UAC beach | 04°34.900N 007°32.940E |
| ” | ” | ” | ATC beach | 04°34.498N 007°32.929E |
| ” | ” | ” | John Miller | 04°35.261N 007°32.838E |
| 05/06/2007 | ” | ” | Okopedi | 04°31.210N 007°35.628E |
| ” | ” | Eastern Obolo | Obianga | 04°29.092N 007°36.765E |
| ” | ” | ” | Emeroke | 04°30.320N 007°40.287E |
| ” | ” | ” | Okorette | 04°30.561N 007°43.950E |
| ” | ” | ” | Iko fishing port | 04°30.742N 007°45.188E |
| 06/06/2007 | ” | Ibeno | Ibeno beach | 04°34.031N 007°58.316E |
| ” | ” | ” | Stubb’s Creek | 04°34.624N 008°00.208E |
| ” | ” | ” | Douglas Creek | 04°33.302N 008°00.142E |
| ” | ” | Mbo | Unyenge Community | 04°38.065N 008°11.168E |

Observations on status of mangroves were made off the boat. Each community or site was geo-located. Group discussions and interviews were held at the communities. Information sought for included utilization of mangroves, utilization of nipa palm, perception of any problem as regards mangrove – nypa distribution (past and present), and potential dangers as regards mangrove depletion.

The study sites were distributed among the LGAs within the two states of the study. However, the upper limits of mangrove in Cross River systems (covering Uruan and Itu LGAs in Akwa Ibom State and Calabar River (Odukpani LGA in Cross River State)) were not covered due to time constraint. Also the UNIDO Tourism Site at Nwaniba Beach in Uruan LGA in AKS could not be visited. Thus, the mangrove situation in these areas remains to be ascertained by ground-truthing.

Another limitation of this survey is that the area coverage of mangroves could not be quantitatively estimated, and remains a gap to be filled. It is important to further delineate the limits of nypa palm within the inland waters.

In each village/community, a contact was established (by obtaining phone numbers of the village head, village secretary, youth leader or women leader, and in some cases, a notable person e.g. a school teacher was chosen).

STATE REPORTS

General

The state reports are presented LGA by LGA in order to highlight the strength and/or weakness in terms of richness or depletion of mangroves. A general trend in most of the areas visited with respect to mangrove is that wherever the awareness of mangrove as a resource is high, dependence is high and depletion high. The communities admitted the rapid loss of mangrove forest. They were quick to point to nipa palm invasion, but were never mindful that their high consumption of mangroves, especially for fuelwood and construction, is actually the main contributor to the disappearance of mangrove forests. Oil prospecting and production activities, including gas flaring were also observed as culprits in the loss of mangroves and its ecosystem.

Three scenarios were observed, which define the relationship between community – population/occupation, resource availability (mangrove-associated resources) and mangrove utilization.

Scenario 1: Large communities with large fishing population, high productivity (in terms of fisheries resources) and high mangrove exploitation.

Scenario 2: Small communities with large fishing population, high aquatic productivity and high mangrove exploitation.

Scenario 3: Large/Small communities, small fishing population and low mangrove exploitation.

The above scenarios are not exhaustive. Other interacting factors on the community – mangrove relationship include nearness to market, accessibility other than water, types of fisheries engaged in, processing and preservation techniques (whether fisheries resources are sold fresh or dried), and nature of living apartments (whether solid houses of a permanent nature, or huts of a temporary nature which need periodic renewal/strengthening with mangrove products). These complex factors interplay with other anthropogenic activities to produce the final observable, state of the mangroves. For instances, logging intensity is high where sizeable mangroves (approx. 20-30m or more) occur close to a marketing outlet. Then, the processes of exploration and exploitation of oil/petroleum resources contribute to mangrove degradation and destruction.

8.9 CROSS RIVER

(1) *Bakassi*

The mangroves in this area are relatively not over-exploited. Most islands retain dense mangroves. The main genus here is *Rhizophora*. Tall mangroves of 30-50m high are still abundant in this area.



Fig 1. Mangrove forests along the river bank of the Bakassi River.



Fig 2. Mangrove roots collecting sediments and also help protect the coastline from erosion

Several dead mangrove stands thought to have died of senescence were observed. However, areas of intensive mangrove exploitation were observed. Dense nipa palm colonization was characteristic of areas where mangroves were fully extracted. For instance, around the area located at 04°43.658N and 008°32.454E, nipa palm had completely taken over. Therefore, using a three qualitative point scale: Low, Medium and High- the awareness of mangroves as a resource is high, dependence is high and impact of humans on mangroves and associated resources could be adjudged medium. Unlike most communities that were travelled to before reaching mangroves, one has to travel a good distance to cut nipa in our selected community here (San San 1).



Fig 3-The team in group photography with the host community

This underscores the relatively low exploitation of mangroves in this area. It is interesting that the abundance of mangroves in this area has attracted the establishment of a Mangrove Reserve in the area. This mangrove has been gazetted by the Cross River State Government.

(2) *Calabar South*

The mangroves of the Calabar South LGA is being heavily exploited, essentially for commercial purposes.



Fig 4-Mangrove trees cut for fire woods at Edibe Edibe beach for commercial uses.



Fig 5-Edibe Edibe Beach heavily infested with Nypa.

With the dense human concentration on this section of the coastline, the fringing mangroves have been clear-felled. However, beyond the immediate reach of the local communities, some reasonably intact mangroves exist.



Fig 6- Scanty Mangroves along the Calabar river.

Off the Anantigha coastal area, and around Ine Udo fishing community (West of James Island), dense mangroves of approximately 40m high were observed. Aptly, the Cross River Government has included this area in the gazetted Mangrove Reserve. On our 3 point qualitative rating, level of awareness of mangrove as a resource here is high, dependence high and human impact is medium.



Fig 7- The team in a photography with the caretaker of Ine Udo in 2nd right.

(3) **Akpabuyo**

The Great Kwa River is the main river contributing to the Cross River Estuary System. Curiously, the mangrove northern limit occurred just between Akpabuyo Bridge and Idundun village.



Fig 8, 9- Dr F.M Nwosu and Mr.Otu Bette of Environment addressing the town union people. Chief seated in the middle.

The factors responsible for this sharp limits should be investigated. The mangrove density in this area is scanty and of shrub-like nature. Over-exploitation has been the main factor. Awareness here is high, dependence has been high and impact high.

(4) ***Odukpani***

This LGA is located along the Calabar River. Mangrove density is scanty in this area, not necessarily due to exploitation, but it appears that the natural distribution factors have limited the extent and variety of mangroves in the area. The main species here are *Laguncularia racemosa* and *Rhizophora racemosa*. Awareness of mangrove as a resource is high, dependence is medium and human impact low-medium.



Fig 10- Mangrove trees standing side by side with Nypa Palm.

The main reason for the low human impact on mangroves in this area is that the communities live within the transition area from terrestrial to aquatic. Hence, they utilize other available terrestrial trees for energy needs. Also, their fishing activity is low and most catches are sold fresh .



Fig 11-L-R Mr. Otu Bette, Mr. Sunny U. of BDCP, Village Chief and Dr. Nwosu of IOC UNICAL

8.10 AKWA IBOM STATE

(1) *Mbo*

The mangroves of this area have been reduced to just sparse stands and found mainly within the Stubbs Creek section of this LGA. This LGA is characterized by large settlements/villages who are essentially fishers, high fish and shrimp production most of which require drying, and booming fish and shellfish markets.



Fig 12- Mangrove tree standing on the landing jetty at Ita Akpa Ebugbu. Mbo

These three factors, coupled with the fact that there is no alternative energy source available to the people, make over-exploitation of mangroves inevitable. Very large expanse of nipa palm has replaced the original mangrove forests. *Rhizophora spp* are the species in this area.



Fig 13- The team in a group photography with the host community.

(2) Oron

This LGA shares much in common with Mbo even as they are neighbouring LGAs. The mangroves in this area have been greatly depleted.

Since here was one of the earliest locations where nypa palm was introduced in the early 1900s, the mangrove forests have been replaced by nypa forests. Awareness is high, dependence is high, and impact is high.



Fig 14-Young Mangroves along the Oron Beach.



Fig 15- Young Mangrove side by side with Nypa palm



Fig 16- The team in a group photography with the host community.

(3) *Ikot Abasi*

The dominant mangrove species in this area is *Avicennia africana* (black mangrove).



Fig 17-Young Mangroves along the Eta Uwa River



Fig 18-Young Mangroves along the Eta Uwa River
Showing *Nypa* displacement



Fig 19- Nypa palm with White Mangrove along the Eta Uwa River



Fig 20- The team in a group photography with the host Community

This species has characteristic air-breathing roots known as pneumatophores, an adaptation to the characteristic anoxic sediments of the swamp. However, the species has been over-exploited, no thanks to the booming fisheries of the Imo River Estuary. Scanty mangrove forest was observed around Uta Ewa area. Other areas are dominated by nipa palm. Awareness of mangrove as a resource is high, dependence is high and impact is also high.

(4) *Eastern Obolo*

This area is the richest in mangrove forests. The abundance of mangroves here is only comparable to that in Bakassi area of Cross River State, with mangroves of about 40-60m

high. Awareness of mangrove as a resource is high, but dependence is medium and impact is also medium.



Fig 21- Mangrove forests in Eastern Obolo



Fig 22- Mangrove forests in Eastern Obolo



Fig 23- Mangrove forests in Eastern Obolo

The main reason is that most communities here tend to market their fishery products fresh. Another reason is that they engage in other socio-economic activities as sources of

income. The mangrove species include *Avicennia africana* and *Rhizophora* spp. The mangroves of this area should urgently be constituted into a Mangrove Reserve.



Fig 24- The team in a group photography with host community.

(5) Ibeno

Mangroves in this area have been seriously depleted. Two main factors are responsible: oil producing activities and utilization. Even within the Stubbs Creek, nipa palm is the dominant vegetation. Awareness is high, dependence is high and human impact is high.



Fig 25- Mangrove depleted area by the Oil Company.

9.0 CONCLUSION

The Southern part of Nigeria is rich in mangrove and there is every need to protect these resources due to the dependence of the majority of the population in these areas on these resources. This survey of mangroves in the coastal states of Nigeria has revealed the continual decline of the mangroves within the area. Reforestation and management mechanisms should be put in place for the sustainability of the services derivable from these resources.

The survey revealed that the impact of human activities on the mangrove ecosystem includes:

(i) ***Depletion of Mangroves***

Mangroves and mangrove resources are being seriously impacted on by several economic activities in the area. Most notable is the use of mangroves as energy source. This remains the major source of mangrove depletion in these states. The local communities are essentially fishers. Intensive energy input is needed to dry abundant catches of bonga (*Ethmalosa fimbriata*), prawn, “crayfish” (*Nematopalaemon hastatus*). Also, other energy requirements e.g. for domestic purposes, are met solely by mangroves.

(ii) ***Loss of habitat***

The deforestation of mangroves has a multi-dimensional effect on the ecosystem. Mangrove environment is permanent residence to a number of biological organisms including mudskipper (*Periophthalmus*), a variety of crabs (fiddler crab, ghost crab, mangrove crab), oysters, barnacles, winkles and aquatic snails. Barnacles (crustaceans), oysters (bivalve mollusks) and tube building gastropod mollusks (*Mercierella*) attach on or burrow into mangroves and nipa. Once the mangroves are cut down, these organisms become permanently displaced.

(iii) ***Loss of breeding and nursery grounds***

Fish and shellfish species utilize the mangrove ecosystem as spawning, breeding and nursery ground. Loss of mangroves destroys the breeding/nursery areas of

many commercially important fish species such as the croakers, snappers, catfishes and shellfishes like *Penaeus notialis* and *Macrobrachium* species.

This is one of the factors causing depletion of fish and prawn catches, but it is often misunderstood and misinterpreted as over-fishing/over-exploitation. Over-exploitation is only one of many contributory factors to resource depletion.

(iv) ***Resource depletion/over exploitation***

The concept of resource depletion and/or over-exploitation is a function of several interplaying environmental factors including man-induced influence. For instance, the fisheries of these states have been reported to be over-exploited due mainly to decline in catches. In most cases, this over-fishing situation is attributed to high fishing pressure in terms of fishing effort. However, loss of mangrove, implying loss of habitat, loss of productivity, loss of breeding and nursery areas, apparently results in resource depletion. In cases of oil pollution of mangrove ecosystem, death of mangroves and other biodiversity reduce the flora and fauna populations. The resultant of ecosystem contamination and modification could trigger off forced migration (to areas that may not be biophysically suitable for survival, reproduction and/or feeding).

The importance of mangroves as an ecosystem has been highlighted – biological importance, ecological importance, socio-economic importance. The results of human activities on the resources of this ecosystem have equally been discussed. Now, a balance should be drawn between the need of the mangroves by communities, and resource sustainability. Since the entire ecosystem is dependent on mangrove survival, mangroves should be re-planted. It is a known fact that mangroves are slow-growing plants, so allowing only natural replenishment will further cause mangrove-dependent resource depletion. Majority of the local population are fishers or are engaged in trade that services fishers. Collapse of these fisheries and other resources will inevitably lead to loss of livelihood by an already impoverished segment of the population. Loss of livelihood implies loss of employment (idleness is the mother of most social vices), loss

of income, loss of pleasure, satisfaction and food. In summary, loss of this ecosystem will lead to more poverty in the land. On the other hand, re-forestation and sustainable management of mangroves will lead to improved ecosystem health as well as all the services it provides for mankind and biological diversity. In this situation, the rural communities will be empowered toward self and environmental development.

As a step towards sustainable management of mangroves, re-forestation will ensure availability of this resource and the services it provides for future generations. The sites recommended for reforestation will be listed and detailed in the next report.

10.0 OIL COMPANIES

10.1. AGIP

A Meeting was held at **AGIP** on 25th April 2007 by 1:35 pm between

1. Prof. Sikoki - Resident Resource Person.
2. Nnaoma Adimorah - BDCP Representative
3. Engr. Joseph Onyia - Manager Health Safety & Environment
4. Ogechi Anuforo - Assistant HSE Secretary NAOC

The office is located at Mile 4 Ikwerre Road Port Harcourt

The meeting started with Prof. Sikoki introducing the two projects to Engr. Onyia. He then highlighted the importance of the Oil Companies to participate since most of their activities like *oil spillage, laying of pipes and dredging* alter the Mangrove Ecosystem. At the end of his narration BDCP representative was asked to intimate Engr. Onyia of the expectations of BDCP from NAOC. The following were enumerated as what the project expects from NAOC

- i. To collaborate with the project team in terms of logistics
- ii. Provision of existing information at their disposal.
- iii. Also current works either carried out by them or other oil companies on Mangrove forest conservation.
- iv. Their cooperation on the planned reforestation project.

Response from AGIP Representative, Engr. Onyia- The latter thanked the BDCP and UNIDO for these important projects and made the following points:

1. NAOC is presently trying to build a Geodata Network where any-kind of information on Nigeria vegetation will be contained. The network will contain Maps on the mangrove forests too.

2. NAOC has also carried out rehabilitation projects on areas that have suffered degradation due to pollution caused by oil spillage.

-A vivid example is seen at their site at Kalabilieama in Nembe LGA Bayelsa. In October 2006 there was an explosion on their pipeline located there and 5,000 barrels of oil was lost.

-The implosion was caused by oil bunkerers. In this incident ten hectares of the mangrove forest was gutted by fire. The area affected was then considered to be zero regeneration or regrowth areas.

-The first stage of the rehabilitation was to conduct a PIA test to determine the depth of damage of the topsoil which was found to be 0.3m. Then a macro-ecology was carried out on the burnt soil.

-The next stage was to clear the debris of the burnt forest foliage. After this stage was addition of nutrients to the soil (in this case NPK was added to enrich the soil).

-Then came reforestation to bring back the vegetation. That was done by collecting seedlings of different species from non-affected areas. Seedlings are offshoots of plants that are dispersed naturally by the parent plants in their natural habitat in the wild. They are procured and nurtured in controlled atmosphere.

-The next stage was to reintroduce the seedlings to the tilled and enriched soil which has been done and they are now growing.

-The project is 80% completed.

3. NAOC has done some work on the **NYPA** palm but more work has been done on water hyacinth.

4. NAOC as much as possible tries to minimize their footprint on the environment. We try to resolve the environment to its former status after our activities that tend to alter it.
5. NAOC will assist us in terms of logistics to places where we have access but a lot of things will be put into consideration. By virtue of the current security situation there are places where can not be easily visited. Also insurance cover will have to be arranged for those *personnel* who will embark on such trips. In the area of logistics, AGIP will respond to specific requests.
6. With respect to reports and information, these will be released after cross-checking the confidentiality clause.
7. He thanked us for deeming NAOC important to partner on this project and also promised to be of any assistance when needed.

Prof. Sikoki thanked him for the warm reception and also promised him to get back to NAOC with any specific requests during the course of the project.

10.2. SHELL (S P D C)

A meeting was held on 26th of April 2007 at shell petroleum development corporation (SPDC) by 1:15 pm between:-

1. Prof. Sikoki – Resident Resource Person
2. Nnaoma Adimorah – BDCP Representative
3. Dr. Damian – Paul Aguiyi – Senior HSE Adviser SPDC

The meeting started with Prof. Sikoki intimating Dr. Aguiyi about what the two projects are all about. BDCP representative then went ahead to state what was expected from SPDC for the two projects.

As in the case of AGIP, the aspect of collaboration from SPDC on the two projects in terms of logistics and also availability of data pertaining to the two projects were highlighted. Also cooperation on the planned reforestation programme was needed. He also intimated SPDC that there was a letter sent to them on these projects. He ended up

by handing then a reminder letter. Dr. Aguiyi now thanked us for the nice presentation. However when asked to confirm receipt of the first letter, his secretary said the first letter was not received. This served as a hindrance to an immediate endorsement. He stated that SPDC can only partner with BDCP on these projects if the following are done.

- (1) A presentation to be done sometime in June where the team will show to the management what SPDC stands to gain.
- (2) UNIDO should write to SPDC requesting partnership on the two projects. SPDC is always wary of NGOs because of their past experiences which resulted in the latter tarnishing their image, even after collaboration.

Dr. Aguiyi also felt that the outcome of the upcoming public awareness programme will turn the host communities against SPDC because this enlightenment campaign will make these communities see oil companies as destroying their vegetation.

Also, in the partnership on the projects SPDC will need to know what they stand to gain - money, improved reputation or relieving of tension of the public. They needed to ascertain and clarify these issues because they are not a philanthropic organization.

He also advised us on where to get the most recent data on mangroves namely:-

1. Environment Resource Managers-They are company based in Lagos owned by Victor Imevbore
2. GIS unit in University of Lagos- Here we are ask for a man named Dr. Demola who works in the GIS unit. He has recent maps on Mangrove.
3. Website www.esri.com that we can order for the most recent maps in the world.
4. Others that have done work in the past such as Dr. Elijah Ohimain who has done a lot on mangrove forests in Nigeria, Africa and Worldwide.

He ended by saying that if SPDC is convinced about the benefits they stand to gain in our two projects then they would like to partner fully with BDCP and UNIDO and even finance it.

Contact person

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10.3 . MOBIL (Mobil Oil Producing Company, Nigeria)

At Mobil in Eket, Cross River state, a meeting was held with Mr. Green. The latter is the Head, Health, Safety and Environment. Mr. Green was quite receptive and assured the team of Mobil's support of the project. He informed the team of an existing network which we can use once we are able to convince them of how serious the project really is and give assurances of the continuity of the initiative.

He mentioned that Mobil has always been interested in developmental projects as these two on Mangrove and Nypa. They were especially interested in the Nypa project. They will like to collaborate with us in this as well as render any assistance they can for the mangrove project.

Mobil has carried out previous projects on mangrove conservation and the information/data on these will be released later.

10.4. TOTAL

The management of Total has already written to BDCP assuring us of their support and willingness to collaborate with us.

10.5 ELF PETROLEUM NIGERIA LIMITED

Contact has since with the above company and a confirmatory letter of collaboration has been received by the contact person:

Ifeoma Yvonne Enwemadu

Planning, Sustainable Development

Elf Petroleum Nig. Ltd.

Tel: 084 266310 ext 2756

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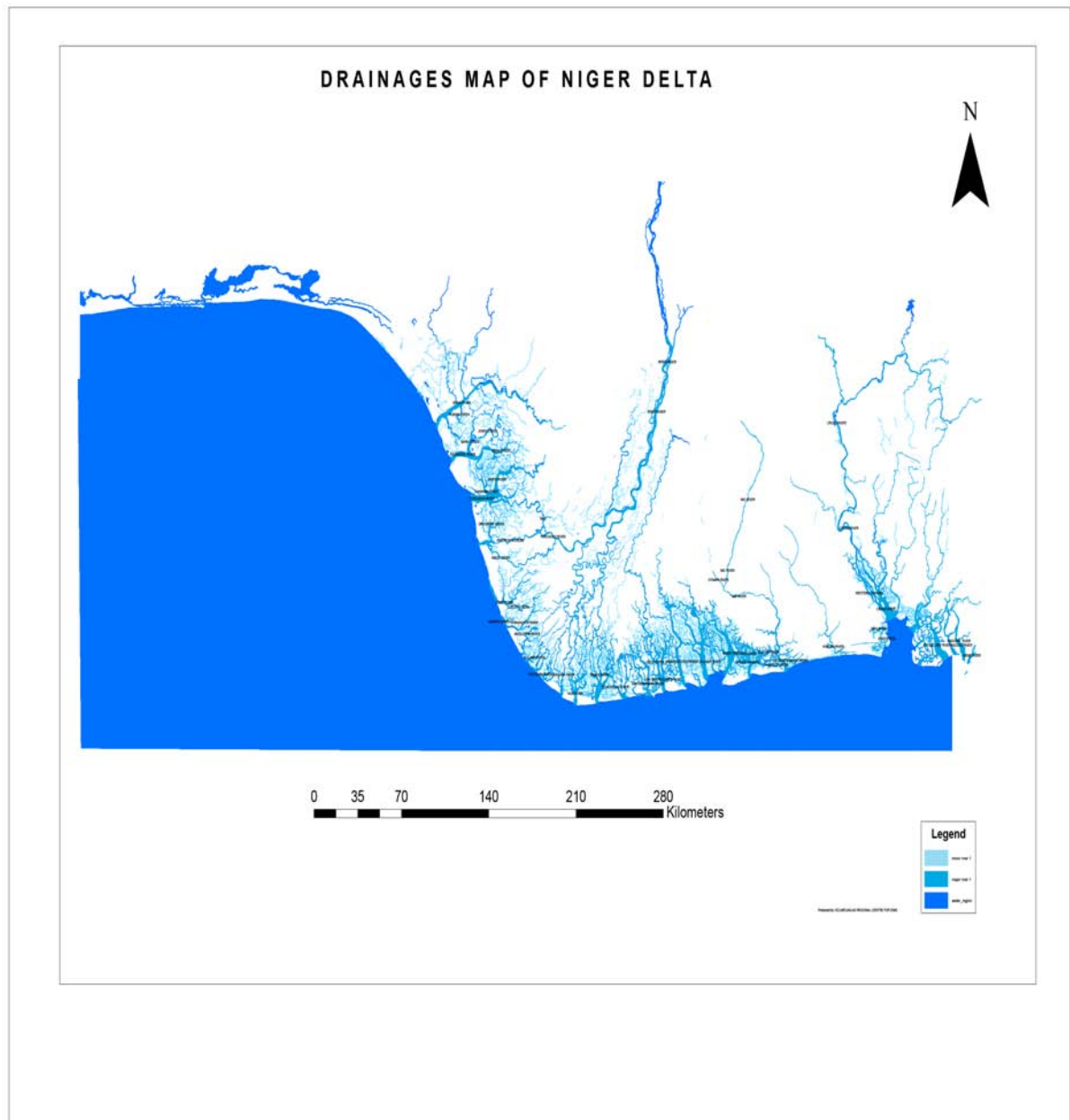
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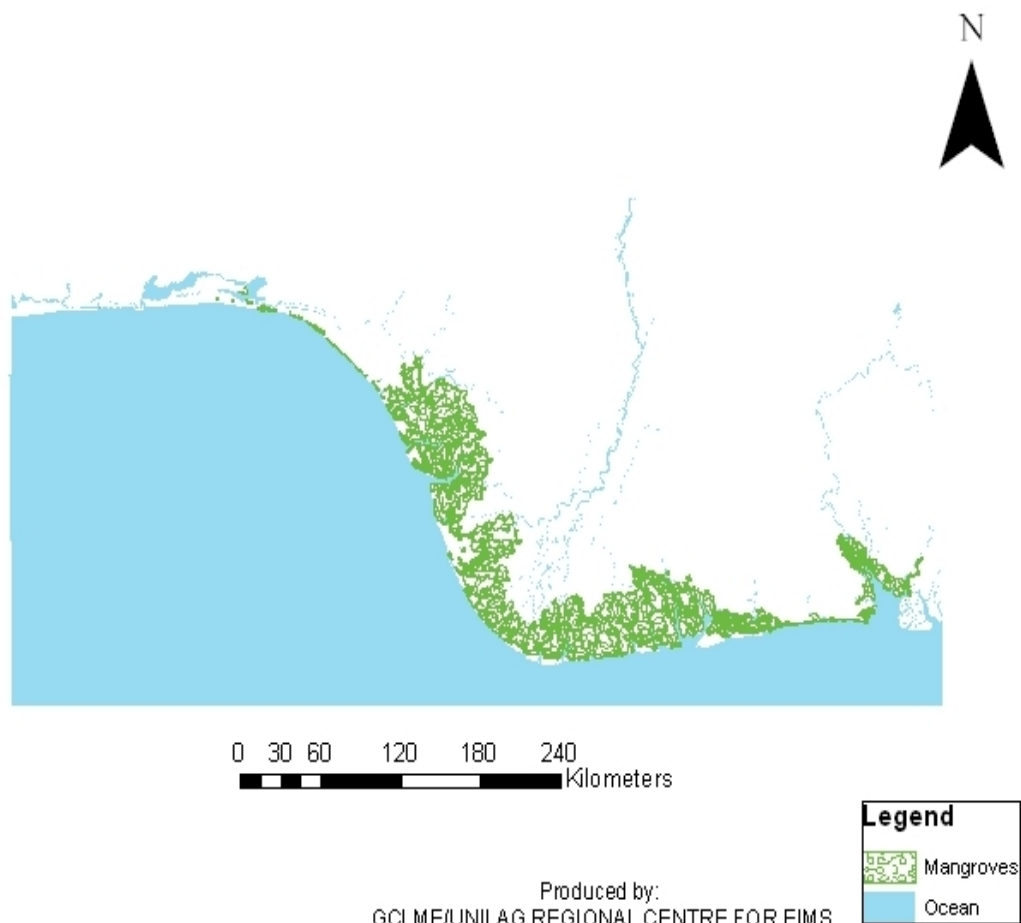
SECTION 3.0

ANNEX 1: NIGER DELTA DRAINAGE SYSTEM



ANNEX 2: MANGROVE FORESTS OF NIGER DELTA

MANGROVES OF THE NIGER DELTA



ANNEX 3: SAMPLE INFORMATION ASSESSMENT QUESTIONNAIRE FOR RESOURCE PERSONS, STAKEHOLDERS, NGOs AND OTHER INSTITUTIONS

Responses to this questionnaire are important for realizing the objectives of this mangrove forests public awareness plan designed to determine: -

- ❖ levels of awareness
- ❖ awareness of existing information
- ❖ priority needs of the generators, collectors and users of relevant information
- ❖ how information is utilized and
- ❖ ease of information accessibility

The analysis of the questionnaire results will be made available in the project report. The responses will also serve as useful indicators for the planned future projects on mangrove forests..

PERSONAL INFORMATION

Name (optional):

Occupation:

Organization:

Address:

Telephone: Fax:

E-mail:

Questions

Please indicate your responses by entering X in the left hand column. Some questions may have more than one response.

Level of Awareness

1. Are you familiar with the status of mangrove forests in Nigeria?

| | |
|--|-----|
| | Yes |
| | No |

2. What are the cusative factors of mangrove alteration in your community/ Nigerian coastal communities?

| | |
|--|------------------------|
| | Over-fishing. |
| | Pollution |
| | Deforestation |
| | Human activities |
| | Other (please specify) |

3. Which single category best describes how your work concerns mangrove forestry?

| | |
|--|---|
| | Field Research |
| | Policy making |
| | Development of regulations/laws |
| | Quarantine |
| | Identification, detection and monitoring of threatened species |
| | Risk assessment/forecasting |
| | Contingency planning |
| | Protection of industries e.g. agriculture, ecotourism, silviculture |
| | Protection of biodiversity/native species |
| | Protection of marine environments |

| | |
|--|---|
| | Protection of freshwater environments |
| | Education/public awareness/dissemination of information |
| | Compilation of data |
| | Other (please specify) |

4. Please indicate how your mangrove information needs are currently being met
Enter X against all relevant categories. Kindly provide brief details of the main resources you use.

| | |
|--|--|
| | Inhabitant |
| | Newsletter |
| | Primary journals – print or electronic |
| | Bibliographic databases |
| | Abstracts |
| | Books |
| | Official guidelines/notices |
| | Grey literature/locally important unpublished data |
| | Internet |
| | In-house databases |
| | Databases compiled outside your own institution |
| | Decision-support systems |
| | Personal contacts or visits |
| | Meetings/Workshops |
| | Other (please specify) |

5. Are the information sources listed above sufficient to meet your needs?

| | |
|--|---------------------|
| | Yes |
| | No (please explain) |

6. What are your constraints in accessing information on mangrove forestry?

| | |
|--|---|
| | Limited resources to purchase materials |
| | Limited (or no) access to Internet |
| | Limited time/staff resources |
| | Geographic isolation |
| | Information found is irrelevant or Information is poorly structured/presented |
| | Lack of adequate documented information |
| | Other (please specify) |

7. For what purposes would you like to use an information network on mangrove resources?
Please indicate H(igh), M(edium), L(ow) priority in the left hand column.

| | |
|--|--|
| | As a source of general information on mangrove resources |
| | As a source of information on the current degradation status of mangrove resources |
| | As a guide to restoring degraded habitats |
| | As an aid to the identification/detection of threatened species |
| | As a source of information on management strategies |
| | As a source of information on policy and legislation |
| | For selecting appropriate risk management options |
| | As a decision-support system for contingency planning |
| | As a decision-support system for environmental impact assessment (EIA) |
| | As an aid for developing policy or regulations |

| | |
|--|---|
| | As an aid for discovering sustainable fishing practices |
| | As an aid for national/local planning |
| | As a training/teaching tool |
| | For producing educational and training material |
| | For producing promotional material |
| | Other (please specify) |

Dependence on Mangrove and its Resources

8. Which groups of mangrove species are you more concerned about

| | |
|--------------------------|--|
| <input type="checkbox"/> | Plants- Non-woody plants, Woody plants |
| <input type="checkbox"/> | Mammals |
| <input type="checkbox"/> | Birds |
| <input type="checkbox"/> | Reptiles and amphibians |
| <input type="checkbox"/> | Fish |
| <input type="checkbox"/> | Crustaceans and molluscs |
| <input type="checkbox"/> | Arthropods |
| <input type="checkbox"/> | Other invertebrates |
| <input type="checkbox"/> | Fungi |
| <input type="checkbox"/> | Microorganisms |
| <input type="checkbox"/> | Genetically modified organisms (GMOs) |
| <input type="checkbox"/> | Other (Please specify) |
| <input type="checkbox"/> | |

9. Which are the most impacted sites or specific regions you believe are most threatened by mangrove loss?

| | |
|--|--|
| | |
| | |

10. What existing sources/organizations dealing with conservation of mangrove forests are you aware of?

.....

11. What efforts have been made by you, your organization or the government to check the present degradation of mangrove in your area?

| |
|--|
| |
| |

12. Does the present information on mangrove help you to make informed decisions? If no- state recommendations

Yes

No

13. Briefly, how would you prioritize the mangrove regions to be covered by this project and the GCLME project at large?

14. What kinds of activities will you like to be seen done in this awareness project?

Please indicate H(igh), M(edium), L(ow) priority in the left hand column of each suggested activity.

15. Please give examples of the types of decisions you would like the project network to assist you with:

- 1.
- 2.
- 3.

16. Would you be willing to supply information mangrove resources? If so, please give brief details of the type(s) you could provide/your area of expertise?

Databases

Full text documents

Data sheets/species descriptions

Illustrations

Maps

References/abstracts

Grey literature/unpublished data

Web resources

Teaching materials

Other (please specify)

17. Are there any proprietary rights/issues on the materials you are willing to provide?

| | |
|--|----------------------|
| | Yes (please specify) |
| | No |

18. Are there other limitations or constraints in supplying or linking your information on the decimation of mangrove forests?

| | |
|--|----------------------|
| | Yes (please explain) |
| | No |

19. What are your expectations for benefits in exchange for participation as an information provider?

20. For which persons/organizations do you think an information network on mangrove resources would be useful in this country?

| | |
|--|--|
| | Policy makers |
| | Local communities / farmers |
| | Quarantine officers |
| | Regulatory staff |
| | Tourists |
| | Research scientists |
| | Farmers/foresters/gardeners/fishermen |
| | Environmentalists/natural history groups |
| | Conservation officers/reserve wardens |
| | Keepers of animal/plant collections |
| | University students |

| | |
|--|---|
| | Lecturers |
| | Public awareness campaigners |
| | Extension workers |
| | International organizations |
| | Regional organizations/networks |
| | NGOs |
| | Donors and development assistance agencies |
| | Commercial organizations/private sector (please specify industries) |
| | Other (please specify) |

21. How many users of an information network on mangrove resources and status would you expect in your community/ organization?

| | |
|--|------|
| | None |
| | One |
| | 2-20 |
| | >20 |

22. What would be the best way of accessing the information on mangrove forests?

| | |
|--|------------------------|
| | Meetings |
| | CD-ROM |
| | Internet |
| | Education |
| | Printed output |
| | Other (please specify) |

23. Are you involved in any regional/international initiatives concerning the conservation of mangrove resources?

| | |
|--|------------------------------------|
| | Yes (please give details) |
| | No |

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE

ANNEX 4: SAMPLE QUESTIONNAIRE FOR COASTAL COMMUNITIES

PERSONAL DATA.

Questions

Please indicate your responses by filling in the blank spaces.

| | |
|--------------------------------------|--|
| 1. What is your name (optional)? | |
| 2. Sex? | |
| 3. Which community do you reside in? | |
| 4. How old are you? | |
| 5. What do you do for a living? | |
| 6. Brief History of your Community | |

PROJECT.

Questions

Please indicate your responses by ticking against your preferred choice(s) or you fill in the dotted lines.

1. Do you understand what the term Mangrove forest means? If Yes, what are these mangrove species?

| | |
|--------------------------|-----|
| <input type="checkbox"/> | Yes |
| <input type="checkbox"/> | No |

2. Are you familiar with the status of mangrove forests in your locality? If Yes, state where they are.

| | |
|--------------------------|-----|
| <input type="checkbox"/> | Yes |
| <input type="checkbox"/> | No |

3. Does the mangrove forest affect your daily existence?

| | |
|--------------------------|-----|
| <input type="checkbox"/> | Yes |
| <input type="checkbox"/> | No |

4. If yes then how does it affect your existence.

| | |
|--|--|
| | |
| | |

5. Which groups of mangrove species affects your existence directly?

6. What are the uses of the Mangrove forest to your community?

| |
|--|
| |
| |
| |

7. Are the Mangrove forests depleted in your community?

| | |
|-----|--|
| Yes | |
| No | |

8. What are the causative factors of mangrove depletion in your community?

| | |
|--|------------------------|
| | Over-fishing. |
| | Pollution |
| | Deforestation |
| | Human activities |
| | Other (please specify) |

8. Which are the most impacted mangrove sites in your locality.

| | |
|--|--|
| | |
| | |

11. What efforts have been made by you and your community to check the present degradation of mangrove in your area?

| |
|--|
| |
| |

12. Would you like the project to enlighten you and your community of the immense benefits in conserving the Mangrove forests?

| | |
|-----|--|
| Yes | |
| No | |

13. If enlightened are you willing to continue with the conservation of the Mangrove forest?

| | |
|-----|--|
| Yes | |
| No | |

12. Please give examples of the types of assistance you would like the project to assist your community with:

| |
|--|
| |
| |
| |

13. Other Flora, Fauna

14. Gender Issues

15. Are you in support of the project and upcoming reforestation exercise?

| | |
|--|-----|
| | Yes |
| | No |

ANNEX 5- WORKSHOP ON INTEGRATED COASTAL AREA MANAGEMENT (ICAM) AND MANGROVE RESTORATION.

This is a meeting held by
BIORESOURCES DEVELOPMENT AND CONSERVATION PROGRAMME (BDCP)
In conjunction with

FEDERAL MINISTRY OF ENVIRONMENT

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

Stakeholders Workshop on
INTEGRATED COASTAL AREA MANAGEMENT (ICAM) AND MANGROVE RESTORATION.

At
VILLA MARINA HOTEL EKET AKWA IBOM STATE
20TH DECEMBER 2006.

PROJECT OBJECTIVES:

The workshop strove to enhance human resource capacity within the Region in the field of integrated coastal area management (ICAM), while providing and facilitating debate on the strengths and constraints in multidisciplinary skills, where coastal environmental management is concerned, with a view to promote networking and specialist cooperation at regional level. The Workshop also endeavored to initiate an understanding between key actors, particularly between environmental planners/resource managers and community leaders, on the approach of how best to utilize and manage available resources (human and logistical) within their remit of responsibility.

Moreover, the Workshop encouraged techniques on the involvement of local stakeholders in protected area planning and forest management in coastal areas through a community-based management approach and explored strategies in which to link conservation of protected area assets in coastal regions and the sustainable development of local communities.

It also tried to teach them how to maximize the benefits of their immediate surroundings by putting it to better use.

PROJECT BRIEF.

Coastal areas are the most densely inhabited and industrialized parts of almost every sub-Saharan country with approximately 50% of the population residing within 100 km of the coastline. The coastal areas are also the location of the main import and export centres and provide food supplies for the landlocked countries of Africa. The coastal area is also an economically important zone where fishery, mineral and oil exploitation and tourism contribute significantly to the financial well-being of the respective coastal regions. At present, issues and constraints that require urgent attention and management are becoming increasingly more common in numerous coastal areas of Africa. The Mangrove and Nypa palms are found only in the coastal zones.

Guinea Current Large marine Ecosystem [GCLME] Project

**National Stakeholders Workshop on
Integrated Coastal Management and Mangroves (ICAM)**

**Villa Marina Hotel, Eket,
Akwa Ibom State, Nigeria**

20-22, December, 2006.

BACKGROUND:

In the GCLME region, about 40% of the 300million of the population live within the coastal areas. Many depend heavily on the water systems such as lagoons, estuaries, creeks and in-shore water for their survival and livelihood. This consequently leading to a myriad of significant transboundary environmental problems in the GCLME region, which include depletion of the living resources, uncertainty in ecosystem status [including climate change effects], deterioration in water quality and loss of habitat [including coastal erosion].

The task before the GCLME countries has been to achieve sustainable development that includes sustainable use of the resources found within this ecosystem. The need for a collaborative and holistic approach has been realized which is encapsulated in the Large Marine Ecosystem [LME] CONCEPT.

The Integrated Coastal Area Management [ICAM] methodology emphasizes the importance of combining the economic, social and environmental dimension for sustainable coastal and marine resources utilization. Hence the ICAM has been adopted by many African coastal nations.

Mangroves are highly productive. They provide valued habitat [for fish, shorebirds, and other wildlife], important to stability of coastal lands and productivity of estuarine ecosystems, source of sustenance for the human population around it, food web for the complex food web marine organisms .

The mangrove of the GCLME region extends from Guinea Bissau to Angola. The total African stock of mangrove is 9,730km² with the largest mangrove block of the GCLME region is found in coastal Niger Delta of Nigeria at 7000km². Important blocks are found in the Cross River Estuary of Nigeria, However, the mangroves of the GCLME region are presently the focus of coastal development such as housing/tourism facilities, fish ponds in addition to the stress of oil exploitation.

Typical mangrove forests are composed of black mangrove [*Avicennia Africana/ Avicennia germinans*], white mangrove [*Laguncularia racemosa*] and red mangrove [*Rhizophora racemosa* and *Rhizophora mangle*] with a variety of palms. In nigeri, the gregarious prostate mangrove palm, *Nypa fruticans*; introduced into West Africa in the early 1900 is invading and displacing the native mangrove.

A large proportion of the world's mangrove resource has been degraded by unsustainable exploitation practices which may include; habitat destruction, changes in hydrology, pollution due to industrial and sewage effluents and chronic and catastrophic oil spills

In Nigeria, the invasion of the *Nypa* palm is threatening the mangrove resulting in the loss of biodiversity and livelihoods of human populations that are dependant on the mangrove.

There is a need to control/efficiently manage *Nypa* palm to ensure that biodiversity of the mangrove ecosystem is preserved and the restore the ecological benefits of the coastal ecosystem to socio-economic development and sustainable livelihood.

Since the GCLME project commencement in December 2004, there has been a regional workshop on Integrated Coastal Area Management [ICAM] in Kribi, Cameroon in April, 2005. The focus of this 1st workshop was to train participants on the fundamentals of ICAM encourage countries to development and implement the ICAM model.

The 2nd ICAM regional workshop was held in December, 2006 in Calabar, Nigeria, this workshop was to enhance the knowledge of participants on advanced technological tools and procedures of coastal management. Also at this workshop, various options both on the short and long term measures for the control of *nypa* palm were proffered. Further, it was proffered that communities should be further educated on the new developments on *nypa* palm utilization.

Justification:

Work on the development of an ICAM plan 4 Nigeria was commenced during the first phase of the GCLME project. So far, Nigeria has prepared its coastal profile where elements of an ICAM plan were identified.

Objectives:

- To review and adopt an ICAM plan for Nigeria
- Developing strategies for establishing alternative means of livelihoods for communities in the mangrove ecosystem
- Evolve strategies towards the development of mangrove national park[s]
- Presentation of *Nypa* palm control options for adoption
- To inaugurate the UNIDO/GEF National Demonstration Project on Mangrove Restoration and *Nypa* Palm Control
- To evolve strategies for the dissemination of information on *nypa* palm control
- To chart means of enhancing community/private sector involvement in mangrove management.

Expected Outputs:

- An ICAM plan for Nigeria adopted
- Alternative livelihood strategies developed
- Strategies for development of mangrove park[s] prepared
- *Nypa* palm control options adopted
- Information dissemination strategies on *Nypa* palm control prepared
- Enhanced community and private sector participation in mangrove conservation and management

Participants

Participants at the workshop will include private sector[oil, maritime, fishing, coastal tourism industry], Bioresources development and Conservation Programme (BDGP), NGOs, Government Ministries/Agencies, Coastal state governments/Local governments, Research institutes, Universities Fed. Min. OF Environment GVLME staff and UNIDO project Assistant. A total of 47 participants are expected as attached.

Tentative Program:**Documents:**

Draft ICAM plan [Nigeria], new strategy on mangroves- the Thailand experience, presentation by Institute of Oceanography, University of Calabar.

Date and Value:

20-22 December, 2006

Villa Marina Hotel, Eket, Akwa Ibom state

5.2 WORKSHOP SUMMARY REPORT AND RECOMMENDATIONS FOR IMPLEMENTING NIGERIA'S ICAM.**PREFACE**

This integrated Coastal Area Management [ICAM] plan was developed to promote rational use of resources of environment of the coastal areas of Nigeria. The plan was developed because of the mounting concerns over the social well-being of the people who live there, the use of the coastal areas and the implications of multiple uses on the fragile environment along the coast. Nigeria coastal line containing some 54,000km² of wetlands, include the third largest mangrove forest in the world. It is indeed among the most sensitive environments in the world. While it supports the vibrant internally and externally focused economics such as fishing, forests utilization, agriculture, oil and gas development and processing, steel, fertilizer glass and textile industries, it has been increasingly apparent that these industrial, social and economic demands have placed the ecosystem at risk. As a result, concern as well as considerable debate about the region has been attracting both national and international attention.

The plan provides opportunity for a comprehensive programme which is focused on the needs of the people of the area and can be used by the government, industry and environmental groups to better region and plan developments to minimize overall environmental impacts. It also provides opportunity for capacity building for resolving the environmental problems of the coastal areas of Nigeria, those problems associated with

socio-economic development, fisheries, biodiversity management, environmental pollution, floods, erosion, physical planning and data management.

The plan will be implemented under the overall supervision of Federal Ministry of Environment [FEPA] and should serve as comprehensive environment management programme for the coastal region of the country.

1.0 INTRODUCTION.

Nigeria has started to order development in the light of environmental issues. Following the establishment of the Gulf of Guinea Large Marine Ecosystem [GOGLME] project funded by the Global Environment Facility [GEF] and implemented by the United Nations Industrial Development Organization [UNIDO] , National Integrated Coastal Areas Management [ICAM] plans have been developed by the countries in the West Africa region.

Nigeria's commitment to ICAM has greatly increased the awareness of the economics cost of unsustainable development. As we begin to understand more fully the broads' linkages between population, resources, environment and development, it has become increasingly clear that good ecology is sound economies the World Commission of Environment and Development known as Brundtland Commission described the link between a healthy environment and a sound economy as the concept of sustainable development. There two interconnected concerns in a secure environment: the long term integrity of natural ecosystem and the economic and social well-being of the people who live within the natural environment.

This is particularly relevant in the coastal areas of the West African region where many of the region's poor are crowded in the areas seeking subsistence, socio-economic activities such as fishing and farming as well as engaging in industrial activities

The term Integrated Coastal Area Management [ICAM] reflects the fact that management of human activities on a sectoral or uncoordinated basis has failed spectacularly to achieve ecologically sustainable development or use. Probably the driving reason for this failure is that the absence of integrated management allows one sector to impose costs on another sector of society or on society as a whole. ICAM aims to adopt an integrated approach to address cross sectoral environmental concerns covering, resources management, environmental protection and strategic planning.

Objectives of ICAM

The overall goal of ICAM is to improve the livelihood of coastal communities and to contribute to the successful management of the GOGLME project. ICAM in Nigeria will aim to achieve these goals by overcoming the following institutional constraints;

- Short term planning horizons and lack of participation to political instability;
- Weak policy and regulatory environment for encouraging rational resources use and checking the impacts of growth
- Administrative weakness and lack of coordination across sectoral agencies limiting opportunities for developing human capacity in the growing population.

Its objectives include:

- Establishing Nigeria's foundation for integrated coastal area management, including policies, legislation and institutions; and
- Providing a forum for:
- Supporting states to promote participatory development;
- Long term planning and implementation processes for achieving sustainable development within the coastal areas as part of the national efforts;
- Addressing major environmental issues affecting the coastal areas especially where there is a high risk of considerable social costs if nothing was done;
- Focusing on priority problems in key areas; pollution problems, coastal erosion, flooding and degradation, biodiversity loss, fisheries depletion, policy issues freshwater depletion, water hyacinth menace and related socio-economics problems;
- Help state and local governments to build their capacity for environmentally, sustainable management of coastal areas;
- Combat fragmentation by focusing on cross-cutting issues e.g. by helping to establish national, state, local government coordination committees.
- Enhancing knowledge, education, training, communication, data management and the introduction of improved technologies and analytical tools, and;
- Supporting the introduction and application of environmental assessment procedures and the development of *information systems*;

2.0 HISTORICAL ACCOUNT OF ICAM IN NIGERIA

IN November 1989, the Federal Government of Nigeria adopted the National Environmental policy. The document describes guidelines and strategies for achieving the goal of sustainable development by;

- Securing for all Nigerians a quality of environment adequate for their health and well-being;
- Conserving and using the natural resources for the benefit of present and future generations;
- Restoring , maintaining, and enhancing the ecosystem and ecological processes essential for preservation of biological diversity;
- Raising of public awareness and promoting understanding of the essential linkages between environment and development ;and
- Co-operation with other countries and international organizations and agencies to achieve the above.

In December 1998, the policy was revised and the number of sectors increased to twenty four Marine and coastal area resources management has always remained as one of the major sectors of the policy. Before then, the Gulf of Guinea Large Marine Ecosystem project [GOGLME] supported by the Global Environmental Facility. [GEF] and executed by UNIDO had adopted Integrated Coastal Area Management [ICAM] as a way to help transition from unsustainable to sustainability in the coastal states of West Africa in the next thirty years or so. A number of workshops were held in different of the region. In the case of Nigeria, the first regional workshop was held with the assistance of the World Bank in 1995. That workshop defined the environmental strategies for the Niger Delta. Another workshop was held 25th -27th August, 1997 at the FEPA Conference Hall. The workshop was attended by more than 100 participants representing government agencies at Federal and State levels, the private sector and non-governmental organizations.

The workshop agreed that the country's ICAM plan would be implemented in the wider context of the national Agenda 21 programme of Action for Nigeria and in concert with Large Marine Ecosystem Project of the Gulf of Guinea.

3.0 DEFINITION OF THE COASTAL ZONE

Nigeria's Coastal Areas for ICAM have been defined as follows;

The coastal of Nigeria from the boarder with republic of Benin to the Bakkassi border with the Cameroon, lies between the Atlantic Ocean [with the continental shelf and Exclusive Economic Zone [EEZ] and the coastal fresh and brackish wetlands ramified by an anatomizing network of the rivers and creeks. These water bodies are characterized by periodic tidal variations and ranges along water channels and the differences depend on the hydrological properties and the slopes of the various channels,

The coastal areas of Nigeria includes the area within the uppermost limit of tidal influence and the continental shelf of the Atlantic Ocean- an area dominated by mangrove vegetation with its characteristic flora and fauna.

With this definition, the Nigeria coastal zone is composed;

- i. The coastal plain lagoons and estuaries in the west and the Niger Delta and the Cross Estuary in the east. These areas contain mangrove forests.
- ii. The continental shelf, and
- iii. The Exclusive Zone [EEZ] which extends beyond the Continental Shelf and extends to 200 nautical miles [320km] offshore.

4.0 PRIORITY ISSUES FOR ICAM IN NIGERIA

The national ICAM plan has been designed to deal with the priority environmental and natural resource problems in the coastal regions of the country. These issues include poverty, deforestation, over-exploitation and destruction of mangrove ecosystem, industrial pollution, fisheries depletion, unsustainable population growth, disruption of existing social structures, lack of basic amenities, waste disposal problems and health impairment for the for communities.

After a thorough review of these problems, it was agreed that plan will deal with the following priority issues:

- Standards and regulations.
- Biodiversity management
- Environmental pollution
- Fisheries improvement
- Flood , erosion and physical planning
- Socio-economic issues
- Data Management.

5.0 RECOMMENDATION POLICY ACTIONS

5.1 Underlying Approaches

Nigeria's ICAM will aim to strengthen the Large Marine Ecosystem project of the Gulf of Guinea and to do so must contain the following essential elements;

- It must be cross-sectoral, embracing all categories of marine ecosystem, all types of human uses and activities and all sources of threats;
- It must adopt holistic so that it can govern action on land in the sea: that is both land based sources and offshore inputs of marine pollution problems should be well understood and controlled;
- It must be capable of decentralization on national, state and local community basis;

- It must have flexibility to address priorities that will inevitably vary from one location to another;
- It must encourage scientific and technological exchanges with other countries in the region;
- It must within the country encourage innovation partnership among groups especially among grassroots population engaged in self help improvement efforts;
- It must give grater attention to adapting and coping with long term and new trends through sustained monitoring efforts.

5.2 Strategies

Marine and Coastal Ares Resources

Marine and coastal areas are important in terms of their ecological and economic significance. In order therefore to maintain and improve the quality of the unique environmental resource endowment and physical characteristics of the coastal areas, the plan will adopt the following strategies:

- The preparation of ecological master plans to guide the use of coastal areas for diverse purposes and limit land use and biodiversity loss;
- The facilitation of management structures for the protection and stabilization of damaged areas by appropriate methods;
- The promotion of sustainable agriculture, soil and water conservation techniques;
- Enforcement of compliance with the National Environmental protection [Effluent Limitation] Regulations [S.18] and the National Environmental protection[pollution Abatement in Industries and Facilities Generating Wastes] Regulation 1991 [S.19]
- Environmental assessment , monitoring and auditing programs will be operated routinely to:
 - a. highlight vulnerable species and ecosystems bearing in mind the limited stocks of living and non-living exploitable resources;
 - b. sustain ecological diversity and productivity;
 - c. provide data and operational standards for project planning and implementation, for example, in fishing dredging and mining;
 - d. identify and map critical and sensitive habitats to enable project designs to take appropriate steps to minimize damage and disturbance to breeding, nesting and feeding areas of all species;
 - e. identify the land form that are indicative of coastline changes over time especially with regard to coastal submerge/emergence, subsidence, sediment balance compaction, tidal and current erosion;

- f. establish coastal protection measures based on careful evaluation of detailed local situation and socio-economic and cultural needs
- g. prepare controls for land –use, coastal and marine –base activities to minimize pollution and protect coastal and marine resources;
- h. encourage the recreational use of coastal and marine areas as basis for the enhancement of tourism;
- i. establish measure against transboundary movement of toxic and hazardous substances within Nigeria’s marine and coastal areas;
- j. create public awareness of the dangers of dumping of toxic and hazardous wastes including domestic wastes in coastal areas
- k. establish national and regional contingency plans for maritime tanker accidents and oil well blow-outs;
- l. establish restoration, rehabilitation and mitigation and or compensation programs for loss of marine and coastal resources;
- m. prepare guidelines in consonance with the environmental implications of the National Environmental policy;
- n. facilitate the role and efforts of NGO,S –proper maintenance and management of the region’s resources;
- o. improve co-ordination and communication among the public and private sector agencies;
- p. discourage upstream water that can negatively impact estuarine and coastal habitats, water quality and quantity and thus endanger aquatic life forms dwelling and/or reproducing in such habitats

6.0 STAKEHOLDERS INVOLVEMENT IN ICAM

In order to achieve the goal of ICAM, there is a need to reinforce environmental monitoring, information exchange and research capabilities for implementation of policy and action plans. A key to this is regular networking among all the stakeholders. As much as possible ICAM will provide for co-operation and collaboration in policy formulation, programme development and project execution among the community, local, state and federal government agencies.

Experience from other parts of the world also supports the view that integrated coastal zone management has a better chance of being successfully implemented when a wide range of stakeholders from the public and private sectors participate in the preparation. Such strategies are likely to be more realistic and to be based on a broader range of knowledge, understanding and commitment on the stakeholders involved.

For ICAM in Nigeria, the key stakeholders include the federal, state and local governments along the coastal states of the country, the individual communities who live there and or are affected by environment problems, all the various small and large industries who cause environmental problems, the scientific community, NGOs and media who have relevant information and expertise and the GOGLME staff through their activities will strengthen regional and sub-regional arrangements for capacity.

Nigeria's ICAM will thus provide excellent opportunities for stakeholder consultation and other forms of stakeholder participation for addressing common issues and building commitment to the ICAM plan.

7. PROPOSED MANAGEMENT STRUCTURE FOR THE COASTAL ZONE

Nigeria has embraced ICAM as an environmental strategy for which this national management plan has been prepared. The plan will require a new kind of institutional capacity particularly for cross-sectoral decision-making, public participation and continuing innovation. Action at the local level will be the key. After a thorough discussion, the structure sketched in fig. 1 for ICAM implementation in Nigeria was agreed upon.

7.1 Coastal Area Management Committee

At the federal level, there will be the National Coastal Area Management Committee [NCAMC] as the Apex body to be chaired by FEPA as the National Focal Agency and to include the National Oceanographic and Marine Research Institution [NIOMR] as the National Focal point Institute

It will also include other stakeholders and should replace current Steering Committee.

Terms of reference

This Committee will be responsible for;

- i. preparing, reviewing and managing the National ICAM Master Plan;
- ii. identify major environmental problems and priorities for each sector
- iii. designating institutions responsible for project implementation, institution building, training and public education;
- iv. selecting priority area for specific projects;
- v. fixing specific environmental objectives to be accomplished by particular target dates;
- vi. proposing policies and measures needed to realize given objectives;
- vii. estimating funding requirements and approving funding sources
- viii. approving focal points for international co-operation

7.1 Technical Subcommittees

Deriving their mandate from the National Committee, will be six Technical Subcommittees as follows:

- Standard and Regulations
- Biodiversity
- Data Management
- Environmental pollution
- Fisheries
- Flood, Erosion and physical planning
- Other socio-economic Issues

Each subcommittee will advise on technical issues that relate to its area of competence. It will also propose and review studies for implementing ICAM programmes as detailed as below;

7.2 Standard and Regulations Subcommittee

Standards and regulations are major components of good environmental planning. In recognizing this ICAM will help provide common environmental standards and regulations in an advisory capacity

Terms of Reference

This Sub- Committee will aim to;

- Assist the enforcement of compliance with the various laws on National Environmental Protection and National Solid Wastes and Hazardous Waste Management
- Prepare control for land –use, coastal and marine based activities to minimize pollution and coastal protect marine resources
- Establish measures against the transboundary movement of toxic and Hazardous substances within Nigeria’s marine and coastal areas
- Create public awareness
- Prepare guidelines in consonance with the environmental implications of the National Environment Policy
- Provide data and operational standards for project planning and implementation for example in fishing, dredging and mining;
- Conduct environmental assessment, monitoring and audit programmes routinely to;
- Highlight vulnerable species and ecosystems;
- Sustain ecological diversity and productivity;
- Identify and map critical and sensitive habitats to enable project designs to take appropriate steps to minimize damage and disturbance to breeding, nesting and feeding areas of all species.

7.4 *Biodiversity Sub-Committee*

This sub-committee will help to conserve and enhance the sustainable use of the biodiversity and biological resources of the coastal zone of Nigeria within the regional Large Marine Ecosystem Project of the Gulf of Guinea.

Terms of Reference

This Sub-Committee will help to:

- building upon the past and ongoing activities e.g. Nigeria Delta Environmental Survey [NDES], National Biodiversity Action Plan [1997], Biological Diversity in Nigeria- A Country Study [1992], Niger Delta Action Plan [1994]
- Pursue more vigorously ongoing national initiatives.
- Inventories identify and rehabilitate all threatened endangered species of flora and fauna.
- Increase the network of protected areas to include all ecosystem types in consonance with the internationally accepted categorization.
- Promote and enhance measure for in-situ and ex-situ conservation through identifications inventories, evaluation, monitoring, research, education, public awareness and training.

7.5 *Environmental Pollution Sub-Committee*

7.6 *Fisheries Management Sub-Committee*

Nigeria has extensive aquatic ecosystems in the coastal region and exclusive economic Zone which under proper management should make the country self sufficient in fish production and exportation. This sub-committee will help to achieve sustainable fisheries resources development in the coastal areas

Term of Reference

The term of reference of this Sub-Committee may be stated as follows:

- The acquisition of background information on artisan, industrial and aquaculture fisheries;
- The resource evaluation of the fish and fisheries of freshwater, rivers, creeks, ponds, burrow pits, lagoons, estuaries, marine coastal waters, deep sea.
- The identification of rare and endangered sp.

- The protection of shell and shell fish stocks through location of breeding and feeding grounds, study of migration patterns of economic species, identification of sensitive areas and community education.
- The development of aquaculture potentials through fish/shell fish development in burrow pits, ponds, lagoons, estuaries, caging and penning culture fisheries in rivers, lagoons and estuaries, mariculture and community integration and empowerment.
- The capacity building through adequate manpower development at all levels, establishment of adequate facilities for harvesting, preservation, processing, distribution and marketing, establishment of at least one National Fisheries University in the coastal zone and strengthening of existing fisheries departments in the Universities.

7.7 Coastal Erosion, Flooding and Land Degradation Sub-Committee

Terms of Reference

This Sub-Committee will help to:

- Adopt modern technology procedures and techniques for survey of the entire Nigeria coastline to identify areas vulnerable to erosion and flooding for physical and urban planning e.g. remote sensing and GSI.
- Carry out regular monitoring of erosion rates at major sites.
- To support research [coastal dynamic monitoring] and oceanographic data gathering.
- Establish a National Oceanographic Data Bank for the components.
- Monitor rate of sand mining within the Nigeria coastal zone [NCZ] and introduction of regulations or limiting the quantity of sand that can be mined.
- Establish tides gauges at strategic locations to monitor tides, sea level fluctuations and predication of storm gauge.
- Build capacity to enhance the ability of local personnel in [a] hydrodynamics and oceanography data gathering techniques [b] physical planning motoring activities.
- Enlighten campaign to sensitize the local communities on the fragility of the coastline and how to protect it.
- Use data and information made available from NDES ongoing programme of hydrological monitoring and surveys, and by some oil companies.
- Categorize all coastal erosion sites into high, medium and low erosion rates.
- Develop erosion hazard guidelines to plan and advice on development activities in the NCZ such activities will include coastal settlement, industrial sites, dredging, sand-mining, canalization and reclamation.
- Establish set-back lines for new town development close to shoreline [e.g. Lekki peninsula]
- Clarify erosion hazard zones as part of flood plain and use zoning covering the whole NCZ and its components.

- Determine sediment transport dynamics and coastal processes causing erosion and flooding along the NCZ, sediment transport dynamics modeling.
- Control of sand mining and dredging activities in the NCZ.
- Develop erosion hazard maps for the NCZ using GIS
- Plan activities so that they are economically self sustaining.

In addition to these strategies and Action Plan, this Sub-Committee will study the lagoon systems in the country. Since lagoons are important to the hydrology of the region.

7.8 Socio-Economic Sub-Committee

This Sub-Committee will aim to improve the social and economic status of the in the coastal area and enhance their ability to sustainable exploit the coastal environment.

The Sub-Committee will bear in mind the constraints to sustainable socio-economic environment in the region which are known to be

- The high population density, poor infrastructure, housing problems, poor state of educational facilities, poor state of health facilities, poor public hygiene, high crime rates.
- The highly industrialized and diversified large markets, high level of unemployment and high level of poverty.

Terms of Reference

This Sub-Committee will aim to:

- Formulate plans for social and economic development of the area;
- Provide special incentives to promote resource based on investments in the coastal areas;
- Provide control for land-use, coastal and marine based activities to minimize pollution and protect coastal and marine resources;
- Improve co-ordination and communication among the public and private organization;
- Support ongoing national initiatives ;
- Proactively encourage of positive change in the ecological and socio-economic environment;
- Undertake baseline studies on the determinants of socio-economic trends in the coastal areas that are not available in existing information services;
- Develop social and economic empowerment programmes for women and other vulnerable groups in coastal areas;
- Develop instrument profiles based on the economic resources of the coastal areas;
- Liaise with the private sector to identify their investment preferences for th coastal areas;

State and Local Government ICAM Committee

There will also be State ICAM Committee to be created at each coastal state. Such committee will be served by the State Environmental Protection agency. Relevant Departments technical experts NGOs, local government representatives and will be comprehensive enough to deal with priority problems.

In a similar manner, local government ICAM Committee will also be created at the Local Government Headquarters to enhance grassroots and community involvement participation in ICAM programs.

Special Area Management Committee

It may also be necessary to set up Special Area Management Committee to resolve resource conflict or to handle special circumstances in areas designated as Special Areas: the term of reference and composition of such Committees will be determined as occasion demands

IMPLEMENTATION STRATEGY

The primary responsibility for the project must rest with government at all levels acting through a broadly participatory process involving NGOs, the private sector, private citizen, and in conjunction with GOGLME project.

This draft plan will establish an umbrella framework to support and reinforce on-going and new initiatives in respect of integrated coastal zone management for achieving sound management of natural resources and sustainable development within the coastal states of Nigeria. The basis concept of the framework is its composite approach to the definition of goals and the provision of broad framework fitting Agenda 21, the aims and objectives of the GOGLME project and the VISION 2010 plan of the Federal Government of Nigeria. It is expected that another workshop will be held soon to refine the plan, determine a time table of events and the funding of projects.

As a national programme, this plan will need to be continuously updated and refined to reflect new information and changing environmental conditions and priorities. In this way, the planning and implementation of key actions can be adopted to address emerging issues before they become too costly.

Thus monitoring and evaluation will play key roles during the implementation of the plan. In this regard, a future workshop will work out performance indicators, for the various Sub-Committees so that progress can be judged in the efforts to improve the efficiency and effectiveness of implementation.

8.1 FEPA's Role

FEPA as the National Focal Agency will maintain the Secretariat for ICAM. It will also set up the various committees, determine their chairpersons, initiate action to implement the plan, source for funds and determine the time table for various activities.

It will also ensure that ICAM will

- Adopt a community oriented and participatory approach in the execution of all ICAM programmes.
- Assist the State and the Local Governments in building their capacity to implement the ICAM plan
- Initiate and strengthen capacity building through international collaborative efforts,
- Harmonize various activities in order to avoid duplication of efforts and dissipation of energy;
- Ensure that ongoing related programmes and initiatives are properly coordinated
- Synthesize information to help development decision making;
- Ensure that government commitment to the ICAM plan is maintained and that the private sector participation is regular,
- Strengthen national institutions and organization their contribution to the successful implementation of the plan,
- Support collaborating institutions, NGOs, and individuals who could serve as resource for capacity building in the country.
- Incorporate biomonitoring into all physiochemical monitoring programmes so that the threats to natural resources from pollution will be understood and controlled;
- Issue an annual ICAM Reports for wide circulation.

8.2 Operation of Cross-sectoral Task forces

- ICAM will set up State Local Government and Communities and the PRA/PLA approach to encourage community identification of problems and solutions, as a well as community participation, facilitation and empowerment indecision making and implementation of programmes
- It will also adopt the above framework to focus efforts on Six Task Forces covering Environmental pollution, biodiversity conservation including mangrove conservation, fish and fisheries, infrastructure and social services, poverty and impacts of industrial development.
- **Operate the Task Force on Environmental Pollution and Enforcement Agencies** to enact goods and services environmental standards not less stringent than the national and international environmental standards in place, harmonize measures for measuring environmental standards, to provides access for information gathered through individual and joint monitoring

monitoring programmes. Also recommend for enactment where appropriate, effective laws and regulations which use economic instrument and establish and strengthen institutional structures and procedures to fully integrate environmental and development issues in all spheres of decision making.

- **Manage the Task Force on Biodiversity Conservation** to ensure the protection, preservation and conservation of biological diversity at the genetic, species and ecosystem levels provide in particular for the protection, preservation , and conservation of those species and their habitat which are listed as rare, indigenous, endangered or threatened with extinction and special protection to unique areas and the representative samples of all of the different types of ecosystem, undertake and support programmes aimed at preventing waste of natural resources, materials and energy are used as sufficiently as possible create and maintain special protected areas with a view to conserving genetic resources in-situ map the risks associated with development use and release and modified organisms resulting from biotechnologies which are likely to have adverse effects on the other organisms or the environment, control promote and establish gene banks and other documented collections of animal and plant genetic resources and recommended in the trade and possession of specimen and product of species.
- **Mangrove the Task Force on Fish and Fisheries** by setting ecological sustainable levels of use, managing ecosystem rather single stock, reduce by-catch and incidental impacts on non-target species, eliminate subsidies that encourage over-fishing, enforce community management measures just as legal recognition and protection of special areas, encourage that mariculture operations are sustainable and prevent introduction and control or eradicate harmful alien species,
- **Operate Task Force on Infrastructural and Social Services** to evaluate and recommend ways to improve in industry government practices, seeking and obtaining open access to industry development plans, for environmental emergencies and disasters, provide safety precautions and contingency plan agreed to prevent accidents and events which cause harm, provide information to be taken to abate the cause of environmental harm, co-operate with other interested and international organization to prevent and to minimize the effects of emergence situations
- **Operates the Task Force on Impact of industrial Development** to recommend improvement in industry government practices, seeking and obtaining→ open access to industry development plans, monitoring industrial practices, securing improvement in operational standards for waste management, community/industry relations and community development efforts seek solutions for transboundary pollution problems based on equitable balance of interests.
- **Operate the Task Force on Poverty** to recommend co-ordination and monitoring actions towards the elimination of poverty through self activities, effective communication between communities, industries and government

agencies, resolving resource use conflicts and providing that trade does not lead to wasteful use of natural resource nor interfere with their conservation Encourage efforts to ensure that prices reflects the full direct and indirect social and environmental cost of their extraction, production, transportation marketing and disposal

8.3 Guiding Principles For Decision Making

The guiding principles for decision making have also been agreed as follows:

- Decision making processes should effectively consider long and short term environmental, economic, social and equity issues;
- Decisions should provide for broad community involvement on those issues which affect them,
- The regional and global implications of actions and policies should always be recognized and considered,
- The precautionary principles shall apply this principle holds that where there are threats or irreversible damage, the lack of full scientific knowledge shall not be used as a reason for postponing cost-effective means to prevent environmental damage;
- The main means to approach environmental sustainability shall be pursued. These are sound economics, environmental accounting, environmental assessment and the use of operational guidelines;
- Develop greater use of modern methods of environmental accounting/economic valuation of natural resources in planning EIA activities etc, leading to improved awareness of resource conservation needs at high levels of government Co-operate regionally on response, contingency and modification procedures;
- Develop greater regional understanding and awareness of improved capability and commitment to the conservation of biodiversity;
- Improve and increase the quantity and quality of training in all aspects of governance and the bottom up participatory approach to decision-making;
- Operate regional workshops for interchange of ideas on all the foregoing.

Sound economics: Get the right to reflect full social marginal opportunity cost;
Use the full cost principle or the cradle to grave approach;
Repeal perverse fiscal incentives;

ANNEX 6- REPORT ON THE TECHNICAL SCIENTIFIC WORKING GROUP AND PROJECT STEERING COMMITTEE MEETING



UNIDO Projects on the: ASSESSMENT OF CONTROL MEASURES FOR NYPA PALM INFESTATION IN NIGERIA & IMPLEMENTATION OF A PUBLIC AWARENESS PROGRAMME IN RELATION TO MANGROVE DEPLETION AND PROPOSED RE-FORESTATION.

Technical Scientific Working Group and Project Steering Committee Meeting

February 8-9, 2007, BDCP Office, Wuse II, Abuja, Nigeria.

DAY I (8TH February, 2007) - TECHNICAL COMMITTEE MEETING

1. Registration
2. Opening Statements by:
Bioresources Development and Conservation Programme (Prof. Elijah Sokomba)
3. Responses from the participants
4. Presentation of the two projects- Ngozi Aligwekwe
5. Comments by the participants
6. Statements by the Consultants- Prof. Ekpere and Prof. Obot
7. Coffee Break
8. Breakout into Groups/Technical Section - Mangrove and Nypa palm
9. Lunch
10. Technical Session Cont'd
11. Coffee/Tea Break
12. Technical Session II Contd

DAY II (9th February, 2007)- MEETING WITH PROJECT CONSULTANTS

Minutes of the Project group on the Implementation of Public Awareness Programme in relation to Mangrove Depletion and Proposed Re-forestation

1.0 GROUP MEMBERS:

- Prof. Ekpere (Consultant)
- Mr. Sam Etatuvie (For: T.F. Okujagu)- Resource Person
- Mrs. Catherine Isebor (Resource Person) Later replaced with Dr. F. M. Nwosu
- Prof. Ogbe
- Prof. Francis Sikoki (Resource Person)
- Mrs. C.O. Oshunsanya (FMEnv)
- Mr. Andrew Iloh (Rapporteur /BDCP)
- Ms. Ngozi Aligwekwe (BDCP)

Absent: Prof. Imevbore; Dr. F. M. Nwosu

| S/NO | MINUTES | ACTION BY |
|------------|---|-----------|
| 2.0 | OPENING REMARKS: This was done by the lead consultant Prof. Johnson Ekpere. | |
| 2.1 | <ul style="list-style-type: none"> • He charged the team to individually make general comments about the project. | |
| 2.2 | <ul style="list-style-type: none"> • He also stressed the need to look critically at the specific objectives of the project and lastly | |
| 2.3 | <ul style="list-style-type: none"> • Divide the tasks among the team so as to speed up the project. | |
| 3.0 | GENERAL COMMENTS: There were remarks made by each of the members and there was | |
| 3.1 | <ul style="list-style-type: none"> • A general acceptance of the project proposal as a good working document. | |
| 3.2 | <ul style="list-style-type: none"> • They also hoped the project components will all be fully implemented. | |
| 4.0 | SPECIFIC OBJECTIVES OF THE PROJECT: The team adopted the project's workplan as guide to help it come-out with a feasible action plan. | |
| 4.1 | Step 1: The team agreed that in identifying mangrove sites, there was a need to look at sites that were feasible and accessible. Thus the backside | |

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| | mangrove for the pilot study was adopted. | |
| 4.1.1 | <p>Following the above decision, the following sites were then suggested by Ms. Catherine Isebor and adopted by the group:-</p> <ol style="list-style-type: none"> Stock Creek (Akwa-Ibom State) Akasa (Bayelsa State) Koko (Delta State) | |
| 4.1.2 | It was agreed that the results gotten from these pilot sites would be applied to other communities located near/ related to the pilot sites. | |
| 4.1.3 | Again it was agreed that letters be written to the State Ministries of Environment and Agriculture. This will aid the group in getting access to/gaining entry to these sites. | |
| 4.1.4 | It was also agreed that the stakeholders should include CBOs, NGOs and Oil Companies. These groups including the communities and BDCP would form the Project Committees mentioned in Step 1. | |
| 4.1.5 | BDCP above includes the project consultants and resource persons. | |
| 4.1.6 | Equally agreed was the fact that funds need to be set aside for the entertainment of the communities during the visits. | |
| 4.1.7 | The team requested the following from BDCP: | |
| 4.1.7.1 | <ol style="list-style-type: none"> List of CBOs and NGOs (contact persons) already contacted especially those who have indicated interest and willingness to collaborate | |
| 4.1.7.2 | <ol style="list-style-type: none"> Immediate contact be made with the relevant Oil Companies | |
| 4.1.7.3 | <ol style="list-style-type: none"> Obtain the document on Texaco Mangrove Study | |
| 4.1.8 | The time and duration of this step was increased from 14 to 21 days. | |
| 4.2 | Step 2: The team agreed on the objectives of this step but suggested that the questionnaires be reviewed in a way to fit into any group (Local communities, NGOs, Oil Companies etc). The group however agreed that the questionnaire will be good for NGOs/CBOs but the information contained in it should be modified to applicable to all stakeholders. | |
| 4.2.1 | <p>The reviewed questionnaire should bear the following subheadings:</p> <ol style="list-style-type: none"> Biodata of the respondent Determination of the level of awareness of the mangrove and its resources./ Level of dependence of the respondent on the mangrove and its resources. Impact of human activities on the Mangrove and its | |

| | | |
|-------|---|--|
| | resources over time. D. Need for reforestation and sustainable forest management programme? | |
| 4.2.2 | The group agreed that BDCP mend the draft questionnaire to include the above stated sub-headings after which it will then be e-mailed to the members for comments and/or amendments. It was noted that the questionnaire should be able to find out what kind of mangrove that is mainly used by the communities and which is/are under major threat. | |
| 4.3 | Step 3: It was suggested that | |
| 4.3.1 | <ul style="list-style-type: none"> • Workshops be held in each zone and these workshops should run concurrently. | |
| 4.3.2 | <ul style="list-style-type: none"> • The reports of these workshops will be forwarded to the lead consultant for assessment. | |
| 4.3.3 | <ul style="list-style-type: none"> • Questionnaires to be given out during the workshop. | |
| 4.3.4 | <ul style="list-style-type: none"> • Stakeholders made to sign an MOU during the workshop. | |
| 4.3.5 | The time allocated for the workshop was certified okay. | |
| 4.4 | Step 4: Here the members agreed that | |
| 4.4.1 | <ul style="list-style-type: none"> • Each will design/draw out general guidelines /information as regards the production of information booklets. | |
| 4.4.2 | <ul style="list-style-type: none"> • Information would be sent to either the media and training experts to develop the information into clear and simple messages for use within the communities. | |
| 4.4.3 | <ul style="list-style-type: none"> • Funding to be budgeted for this aspect of the project; to be used in entertaining the community members. | |
| 4.4.4 | <ul style="list-style-type: none"> • As already stated in the project document, the production of teaching aides/out-reach materials should be done in local languages or atleast pidgin English. | |
| 4.4.5 | <ul style="list-style-type: none"> • The design of the teaching aides/out-reach materials should be taken to step 2 and the time allocated to that step increased from 4days to 14 days. While the duration of step 4 was reduced from 60 days to 50 days. | |
| 4.5 | Step 5: All agreed on the objectives, activities and duration as outlined in the workplan. | |
| 4.6 | Step 6: All agreed on the objectives, activities and duration as outlined in the workplan. | |
| 4.7 | Step 7: As outlined in the workplan but emphasis was placed on the signing of MOU by the stakeholders during the workshops. | |
| 4.8 | Step 8: As stated and outlined in the workplan. | |

| | | |
|------------|--|--------------------|
| 4.9 | Step 9: The group to submit individual reports to the lead consultant and the latter to produce the final report along with BDCP. | |
| 5.0 | SITE VISITS' GROUPING | |
| 5.1 | The sites to be visited /assessed were grouped into four (4) and atleast one member assigned to each sub-group as follows: <ul style="list-style-type: none"> ❖ Edo/Delta- Prof. Ogbe (Replaced with Prof. Imevbore) ❖ Bayelsa/Rivers- Prof. Sikoki ❖ Cross Rivers/ Akwa-Ibom- Mrs. Catherine Isebor ❖ Lagos, Ogun/Ondo- Mr. Etatuvie (T. F. Okujagu) | |
| 5.2 | The lead consultant said he will join Mrs. Catherine in her group. BDCP staff, along with the community contact person(s) will be other members of these sub-groups. | |
| 6.0 | VISIT TO STATE MINISTRIES & OIL COMPANIES | |
| 6.1 | <ul style="list-style-type: none"> • The initial visits to the Sate Ministries are to be carried out within the next two weeks by BDCP. | |
| 6.2 | <ul style="list-style-type: none"> • It was agreed that the two lead consultants be part of these visits. | |
| 6.3 | <ul style="list-style-type: none"> • With regards to the visits to the oil companies-Any of the group members who are resident in these areas to assist in these visits. Prof. Sikoki was asked to assist with the visit to Shell Port-Harcourt while Mr. Etatuvie was asked to assist with the visit to the oil companies in Lagos. Here Prof. Ekpere made a special appeal to Mr. Etatuvie to assist with the provision of a vehicle to be used for the visit to the oil companies and state ministries within his sub-group. | |
| 7.0 | AOB The group was joined by Prof. Sokomba who assured the team that every travel carried out by any one will be financed by the project. Also the issue of Honorarium would be worked out as soon as possible. | |
| | Prof. Johnson Ekpere Chairman | _____ Secretary |

ANNEX 7: WORK PLAN (Mangrove Project)

| PROJECT STEP | OBJECTIVE | SPECIFIC ACTIVITY | RESPONSIBLE PARTIES | TIME DURATION | EXPECTED OUTPUT |
|---|---|--|--|---|---|
| The first step would be IDENTIFYING THE MANGROVE FORESTS IN NIGERIA AND ESTABLISHING NETWORK. | To identify the most impacted sites to be included in the assessment. Establish communication channels with the host communities/NGOs and all stakeholders in the mangrove forest sites. | Site visits. Eliciting the support of the communities. Hold consultative meetings/form network with the village heads and chiefs. Identify Stakeholders Form Project Committees. | Bioresources Development and Conservation Programme (BDCP) with the assistance of our partners in the project sites and also environmental institutions, NGO's and stakeholders. | This stage will take fourteen (14) days. | Project sites are clearly identified. Effective communication channel at all levels are established Project Committees constituted. |
| The Second step will be DEVELOPMENT AND REVIEW OF DATA COLLECTION TOOLS. | Data collection tools will be designed e.g. questionnaires. | Develop data collection tools. | Bioresources Development and Conservation Programme | Four (4) days will be earmarked for this. | All data collection tools developed. |
| The third step will be ASSESSMENT OF THE IDENTIFIED SITES. | To assess information gathered for each site. To Fill data gaps through the questionnaires and workshops held. To analyze the findings. To Identify next steps and priorities. | Hold workshops. Distribute questionnaires. Assess/Analyze data collected from above activities. | BDCP and all Stakeholders. | Fourteen (14) days will be needed. | All project sites assessed. All data relating to sites are validated. |
| The fourth step would be to | To sensitize the coastal | Carry out media | BDCP and the Media. | This will last for | Awareness already |

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| <p>UNDERTAKE OUTREACH PROGRAMMES AIMED AT STOPPING FURTHER DECIMATION OF MANGROVE FORESTS. The Public Awareness Campaign/education will be plan-based: i.e., it must have a vision, mission, phases and objectives.</p> | <p>communities on the status of decimation of the Mangrove Forest and also collect data.</p> | <p>promotion through national radio, television and print.</p> <p>Hold Rallies/Exhibitions and distribute questionnaires.</p> <p>Consultative meetings/fora and distribute questionnaires.</p> <p>Distribute pamphlet/booklets and/or teaching aids that will be translated in local dialects.</p> | | <p>sixty (60) days.</p> | <p>created.</p> <p>Public educated (formally and informally) on the need to conserve the Mangrove forest.</p> |
| <p>The fifth step will be ANALYSIS/ ASSESMENT OF DATA/INFORMATION COLLECTED</p> | <p>To Assess existing information for each site.</p> <p>To analyze the data collected during the outreach programme.</p> | <p>Analyze information gathered from the questionnaires and outreach program.</p> | <p>BDCP.</p> | <p>Eight (8) days.</p> | <p>All data collected are fully analyzed.</p> <p>Level of awareness and public suggestions noted.</p> |
| <p>The sixth step is to SUGGEST PREFERRED SITES WITH DETAILED DESCRIPTION AS NECESSARY FOR THE PLANNED RE-FORESTATION PROGRAMME.</p> | <p>To prioritize the sites according to the level of degradation.</p> <p>To proffer sites for the planned reforestation programme.</p> | <p>Holding a steering committee workshop.</p> | <p>BDCP, Government agencies, Project steering, technical and Scientific advisory committee.</p> | <p>Four (4) days will be used for this stage</p> | <p>Sites for reforestation programme identified.</p> |
| <p>The seventh stage is ENLIST WILLINGNESS OF COASTAL POPULATIONS AND ALL OTHER</p> | <p>To get Commitment letters from all Stakeholders.</p> <p>To draft a</p> | <p>Hold Stakeholders meeting.</p> | <p>BDCP and all Stakeholders.</p> | <p>This will take us two (2) days to accomplish.</p> | <p>Commitment letters obtained from all Stakeholders.</p> |

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| STAKEHOLDERS. | Memorandum of understanding | | | | Memorandum of Understanding signed by all stakeholders. |
| The eighth stage is TO SENSITIZE CONCERNED STATE GOVERNMENTS ON THE BENEFITS OF CREATING FOREST RESERVES AND PROMOTION OF THEIR ESTABLISHMENT. | To sensitize the decision makers in the State governments on the importance of establishing forest reserves. | Produce and distribute sensitization materials to State and Local Governments Hold a central Meeting with the Government Officials from the Mangrove Forest States. | BDCP and the Mangrove forest State Government officials. | This will take four (4) days. | Firm commitment got from the State government Officials from the Mangrove states to create/conserv Mangrove reserves. |
| The ninth and final stage is TO PREPARE AND SUBMIT A REPORT TO THE CONTRACTING ORGANIZATION – UNIDO. | To prepare a final report. | Preparation of final report. | BDCP | This can be done in ten (10) days approximately. | Final report ready for submission to UNIDO. |

ANNEX 8 A: LIST OF OIL COMPANIES

The following Oil Companies were identified, contacted, and visited:

- 1) Texaco Nigeria Plc
8 McCarthy Street
Lagos, Nigeria
Tel.: +234 1 4614500
- 2) Nigerian Agip Oil Company (NAOC)
Agip House,
PC 23 Engineering Close,
Victoria Island,
P O Box 921
Lagos, Nigeria
Tel: +234 1 61-3862; Fax: +234 1 61-4930
- 3) Elf Petroleum Nigeria Ltd
35 Kofo Abayomi Street
Victoria Island, Lagos Nigeria
P.O. Box 927
Lagos, Nigeria
Tel: +234 1 262-3720
- 4) Chevron Nigeria Limited
2, Chevron Drive
Lekki Peninsula,
P.M.B. 12825, Lagos, Nigeria
- 5) Exxon Mobil (Mobil Producing Nigeria Unlimited)
Mobil House
1, Lekki Expressway, Victoria Island
P. M. B. 12054
Lagos, Nigeria
- 6) Pan Ocean Oil Corporation
Ark Towers, Ligali Ayorinde Street,
Victoria Island, Lagos.
- 7) ExxonMobil
Eket, Cross River.

ANNEX 8B: LIST OF NGOs AND INSTITUTIONS

Eco-Outreach

10 Azikiwe Road,

P.O. Box 2875 (Diobu, By Altrix Coy)

Port Harcourt

Environmental Resource Managers Ltd. (ERML), Nigeria

Plot 107A Imam Abibu Adituro Street

P.O. Box 73148, Victoria Island,

Lagos

Mangrove Forest Conservation Society of Nigeria (MFCSN),

22 King Amachren Road Former Club Road),

P.O. Box 8884

Port Harcourt, Rivers State

Environmental Rights Action (ERA)

#214 Uselu- Lagos Road, Ugbowo

P.O.Box 10577, Benin City

OR

#13, Agudama Avenue, D-Line

P.O. Box 13708, Port Harcourt

Pro-Natura International

129 Woji Road, Port Harcourt

River State

MacArthur Foundation

Plot No.2, Ontario Crescent, Off Mississippi Street

Maitama A6, Abuja

Niger Delta Wetlands Centre

P.O.Box 729

Wetlands Road, Ekeki

Yenagoa, Bayelsa State

Centre for Env. Resources and Sust. Ecosystems (CE-RASE)

Victoria Island,

Lagos.

Niger Delta Human and Environmental Rescue Organization (NDHERO)
Block 3B, Road 10,
Federal Low Cost Housing Estate,
Rumueme,
Port-Harcourt.
P.O. Box 13708, Port Harcourt

National Institute of Oceanography
Lagos,
Lagos State

Niger Delta Development Commission (NDDC)

Ondo State Oil Producing Areas Development Commission (OSOPADEC)

GCLME/UNILAG Centre for EIMS
Centre for Information Technology and Systems
University of Lagos, Lagos

It must be mentioned here that contact has been maintained with the NGOs and Oil companies and indeed most have indicated their willingness to participate in the projects.

