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Original English

IMPLEMENTATION OF A PUBLIC AWARENESS PROGRAMME IN RELATION TO MANGROVE DEPLETION AND PROPOSED REFORESTATION

FINAL REPORT

Volume 1

Prepared for the United Nations Industrial Development Organization

Based on the work by

Bioresources Development and Conservation Programme (BDCP)

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United Nations Industrial Development Organization, Vienna.

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Executive Summary

A. Introduction

The mangrove forest of Nigeria is the third largest in the world and the largest in Africa. Over 60% of these mangroves or 6,000 square kilometers is found in the Niger-Delta. The fresh water swamps are 11,700 kilometers in area. Mangrove forest grows along the coast and delta areas of Nigeria. Mangroves are found in all coastal states of Nigeria namely- Akwa-Ibom, Bayelsa, Cross River, Delta, Edo, Lagos, Ogun, Ondo, and River States. The area is generally referred to as the Niger Delta and most of the communities are under-developed making the area generally difficult to assess. The Niger Delta (including two other states were mangroves are not abound) is also the oil-producing area of Nigeria. The Communities which inhabit this area are made of mainly of fishermen and women in the purely riverine areas and farmers, in the drier upper areas. They also had some local industries based on the mangrove and the surrounding swamp waters, e.g. local salt Industry, mat making etc. These edaphic communities are a result of the constantly changing conditions brought about by river deposits, formation of sand bars, lagoons, temporary swamps caused by alterations in river channels, lake borders and drainage patterns, tidal movements of salty and brackish water, in estuaries as well as for considerable distances upstream, and even the effects of wave action along seacoasts on the deposition of silt, mud or sand.

Coastal ridge barriers, mangrove and fresh water swamp forests characterize the ecology of the Niger Delta and lowland rain forest each of which provides habitation for different species of plants, fish, reptiles, mammals and minerals. The two major mangrove species found in the coastal states are the Red mangrove *(Rhizophora racemosa)* and White mangrove *(Avicennia spp.)*.

The mangrove vegetation occupies a key position in the livelihood of the people of coastal Nigeria (especially Niger Delta). About 95% of the total population live along the coast and the majority are involved in the extraction of mangrove wood products and

fishing. Between 80% and 90% of the local fishing is concentrated in waters close to mangrove areas, creeks and bays. The area under mangrove vegetation, albeit expansive, is nevertheless only a percentage of the total land area which necessarily needs to be used in a sustainable way. Recent efforts to link research findings from site survey and past studies of the mangroves of Nigeria and the dependent activities, with public awareness programs designed to educate and sensitize the local community, have generated a lot of interest in participatory management of the mangrove resources. Awareness of the ecological relationship between mangrove ecosystems and resources such as fishes has proven to be key to winning management support. The development of a sense of ownership of the resources by the local population and their legal empowerment so that they are able to institute and execute control measures on their resources were also essential components in the process aimed at achieving full community support for the sustainable utilization and management of their mangrove resources. Local communities, who up until now, were unaware that these resources were under severe threat, are beginning to protect and plan better ways of exploiting their mangrove resources. Based on biological knowledge gained through awareness campaigns, they have resolved to carry out mangrove restoration programs with positive results and with the help of their State Governments and oil commissions.

B. 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 as mentioned above. 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 10,500km^2.

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 m^3 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 (Iseborc end Awosika, 1993).

Mangrove forests are vital for healthy coastal ecosystems. Mangroves help protect coastlines from erosion, storm damage, and wave action. The stability mangroves provide is of immense importance. They prevent shoreline erosion by acting as buffers 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.

A dense vegetation of mangroves in their marine and brackish habitats found along numerous rivers and creeks have become dependable sources of fuel wood for domestic and small-scale food processing as well as income generation. Similarly, the fresh water swamp forest ecosystem occurring around fresh water creeks and lakes support fishing activities, gathering of sea foods, fuel woods, 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 pine (*Pandus candelabrum*), andelabrum), rattan palms and bulrushes respectively. In the mangrove and fresh water swamp systems people engage in farming, mainly for subsistence and depending on the availability of arable farmland. Collection of snails and other non-timber products, weaving, fuel wood gathering, tapping of rubber trees, etc are other sources from which people that dwell in the mangroves generate revenue and derive their livelihood.

Mangrove forests have traditionally served the South-East people of Nigeria as productive, solar-powered, natural factories. Mangrove forests are often seen as useless swamps, yet they actually offer benefits to society that far exceed even the numerous goods they produce. These tropical ecosystems have been of great use, simultaneously supporting some of the Nigeria's highest levels of biodiversity and serving as habitat for numerous endangered plant and animal species. Indeed, it is partly the rich biodiversity of coral and mangrove ecosystems which makes them so useful and attractive to so many people.

Deforestation of tropical rainforests has a global impact through species extinction, the loss of important ecosystem services and renewable resources, and the reduction of carbon sinks. However, this destruction can be slowed, stopped, and in some cases even reversed. Most people agree that the problem must be remedied, but the means are not as simple as fortifying fences around the remaining rainforests or banning the timber trade. Economic, political, and social pressures will not allow rainforests to persist if they are completely closed off from use and development

In recent times, coral reefs and mangrove forests have been required to produce goods and provide environmental maintenance services at rates that even these efficient ecosystems cannot sustain. As a result, they are becoming so degraded that their ability to fulfill their numerous functions is severely threatened. Thus the need for important efforts to be put underway by the Nigerian government, NGOs and community groups to prevent the looming collapse of these precious natural resource systems by promoting management for sustainable use.

C. Rationale

Mangroves are vital to the everyday life of the population of coastal Africa: to build their houses and as a source of charcoal. Unlimited exploitation of mangrove forests leads to desertification in the coastal zone and inevitable salinization of the land, rendering it useless for agricultural purposes. Another negative aspect is the destruction of habitat. Mangrove forests are nursery grounds for many species and their destruction results in a decrease in biodiversity. Poverty is one of the direct results of indiscriminate exploitation of coastal resources such as juvenile shrimps, fish and oysters. Besides the adverse effects of climate change is felt more harshly as well as adverse weather conditions once these mangrove forests are no longer protecting the coastlines.

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 tsunami 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.

As mentioned above, 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 (due to its state and the restiveness caused by feelings of

marginalization) and is thus difficult to develop. The area is inhabited mainly by fishermen/women and small farmers and 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 for these poor people. 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.

The Niger Delta 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.

D. Purpose of the Project:

The project seeks to protect and restore the mangrove depletion through public awareness and reforestation promotion in the Gulf of Guinea Large Marine Ecosystems (GCLME) and its natural resources in coastal Nigeria.

E. Objectives:

To carry out a public awareness and public participation campaign aimed at sensitizing coastal communities and other important stakeholders on the risks associated with the continued destruction of the mangrove forest and the consequent deterioration of the ecosystem and the depletion of associated living resources.

F. Project Description:

To achieve our set objectives the following strategies were employed:-

- Use of questionnaires to gather information;
- organizing and delivering workshops for stakeholders, coastal communities, and concerned government agencies;
- establishing multi-sectoral, provincial advisory committees;
- establishing strong partnerships, coalitions, and community networks;
- designing, identifying and analyzing literature, models, interventions, and initiatives;
- examining barriers to exercise and identifying risks;
- raising awareness amongst all key stakeholders especially Oil companies and State oil commissions;
- developing action plans for prevention of destruction of Nigeria's mangrove forests;
- building capacity of groups and organizations to address issues relating to destruction of Nigeria's mangrove forests;
- developing broad-based, intersectoral partnerships across public, private and voluntary sectors;
- seeking assistance from experts who had worked on the mangroves for collaboration;
- developing strategies and action plans for prevention of decimation of Nigeria's mangrove;
- carrying out public awareness campaigns and outreach programmes;
- Government sensitization and support.

G. Terms of Reference for the project

I. **Identifying the Mangrove Forests In Nigeria And Establishing Network.**

II. **Development and Review Of Data Collection Tools.**

III. **Assessment of the Identified Sites.**

IV. **Undertake Outreach Programmes Aimed At Stopping Further Decimation Of Mangrove Forests.**

V. **Analysis/ Assessment Of Data/Information Collected**

VI. **Suggest Preffered Sites With Detailed Description As Necessary For The Planned Re-Forestation Programme.**

VII. **Enlist Willingness Of Coastal Populations And All Other Stakeholders.**

VIII. **To Sensitize Concerned State Governments On The Benefits Of Creating Forest Reserves And Promotion Of Their Establishment.**

IX. **To Prepare And Submit A Report To The Contracting Organization – UNIDO.**

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.

H. 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). Additional data was collected from interaction and sensitization exercise with the concerned State Governments. The data obtained has been subjected to substantial interpretation and complemented with photographs to give a comprehensive and vivid understanding of the results.

See Annex for the workplan of the project.

I. Detailed Activities:

I.1. Activity: Identify the Mangrove Forests in Nigeria and establish networks.

The site/surveys were carried out to identify the project areas after which a network was formed between the local communities/inhabitants. The sub-activities includes:-

1.1. Visit the Mangrove Forest areas in Nigeria.

1.2. Initiate communication network with the communities through the traditional rulers.

1.3. Gather socio-economic information that reflects the dependence of these communities on the mangrove resources.

1.4. Identify/Establish links with all Stakeholders in the Mangrove areas.

1.5. Identify Technical/research/administrative/community-based persons or organizations that need to be contacted

1.6. Constitute Project Committees (Steering, Advisory and Scientific/Technical).

The data collected through the visits provided information on the communities' perspective and the problems experienced by the host communities. These community profiles were then used in the development of data collection tools.

I.2. Develop and Review data collection tools.

Different models of questionnaires were developed to suite specific respondents:

The questionnaires were designed to determine:

- levels of awareness about impacted mangrove sites and threatened resources
- most impacted sites
- awareness of existing and available information on these species
- priority needs of the generators, collectors and users of relevant information
- how information is utilized and
- ease of information accessibility
- overall management effectiveness issues
- threats and stresses

- recommendations /suggestions.

I.3. Assess the identified sites.

3.1. *Hold workshops with stakeholders and Committee members:* These workshops were attended by representatives from government and non-government organizations, project committee members, field experts and representatives of the local communities. This workshop is a key component to assess and validate data on mangrove forest areas. The major objectives of the Workshop were

- exploring the status of information on mangrove forests in Nigeria
- sharing of some information resources on the mangrove and
- exploring decision-making and research needs.

Working groups were formed and each of them was provided with an actual case study and had to identify:

- Type and authenticity of information available on the Mangrove sites
- What information is/is not easily accessible (within or outside of relevant organizations)

The eventual benefits of the workshop included 1) the identification of new information sources for the GCLME project, both literature as well as resource persons 2) identification of deficiencies in information sharing, ecological information and legislation and 3) the opportunity to promote information networking between providers, users and distributors of information at the government and non-government levels

3.2. *Distribute questionnaires among the participants during the workshop:* The questionnaires helped to prioritize information needs and will serve as useful indicator for future outreach programmes on Mangrove forest status and reforestation campaign in Nigeria.

3.3. *Assess/Analyze data collected from the above activities:* The results were presented in form of bar charts and graphs. Upon deciding the key learning, parameters and illustrations, the next step was to validate these findings by presenting them to the

stakeholders for comment. The findings which were presented in a clear and concise form; wherever possible using the visualization diagrams that the stakeholders have developed during the workshop.

Various forms of validation were carried out by representatives of the key stakeholders and this took place on the last day of this workshop.

Discussions at these validation meetings were recorded and the results incorporated into the final report. The more important thing is for the community members to be more aware of their problems and opportunities, as they relate to the management of their resources. These differences are important and were thus documented. In cases where the stakeholders disagreed with some of the results, the team used its judgment, backed by additional site surveys, to decide whether or not to change their results. Alternatively, additional field data were collected to clarify these discrepancies.

1.4. ***Undertake Outreach Programmes aimed at stopping further decimation of Mangrove forest:***

Various forms and channels of public awareness and education using local dialects, values and culture and partnerships of the community with various stakeholders such as community based organizations, community leaders, local government units, higher level government, NGOs, less vulnerable groups, and donors were employed.

4.1. Media Promotion Programmes were carried out. Jingles were designed and carried on radio and television. Information on the decimation of the Mangrove forests and also the upcoming reforestation programme were also published and disseminated.

4.2. Information boards and posters on the protection of the mangroves and resources at the identified zones were erected at strategic locations.

4.3. Outreach activities were carried out in local schools and community centers. This was effectively done through education tools-handbills/pamphlets, exhibitions and lectures. During the course of the project, basic environmental training were provided to some of the teachers in the villages.

4.4. Environmental awareness was promoted through mangrove-based ecotourism: A programme of on-site public awareness was targeted towards visitors and tourists. This consisted of the following actions:

- Booklets and posters on mangrove conservation were printed and distributed to visitors/tourists.
- A Mangrove Interpretation Centre (MIC) was established within the secretariate. The main aim of the MIC is to disseminate knowledge and information about Mangroves through posters, displays and interactive tools.
- Eye-catching signs and exhibits were erected in the Mangrove and tourist zones.

4.5. Awareness rallies and exhibitions were held where questionnaires were also distributed.

4.6. Consultative meetings where questionnaires were distributed were also held. The meeting involved the general public along with the mangrove site caretakers/managers, local communities, administrators/government officials and stakeholders (e.g. social and conservation NGOs). Full education of the importance to preserve the mangrove forests was done. These consultative meetings were held while the enlightenment campaign was going on.

4.7. Pamphlets/booklets and/or teaching aids that will be translated into local dialects were distributed. These materials bore information about the status of the depleted mangrove forests and the importance to conserve them.

1.5. ***Carry out Analysis/Assessment of data/information collected.***

5.1. Assessment/Analysis of the information gathered from the questionnaires and outreach programme. All available existing information collected earlier and also from the outreach programme were analyzed and assessed. The analysis did include but not restricted to the following:

- Overall effectiveness of the awareness campaign
- Overall effectiveness of inputs, practices, policies
- Extent and severity of existing degradation;
- Extent and severity of potential degradation;
- Vulnerability;

- Conservation urgency;
- Social urgency.

I.6. Suggest preferred sites with detailed description as necessary for the planned reforestation programme.

6.1. Steering committee workshop was held with government agencies, project steering/technical/scientific advisory committees. Out of the knowledge gathered from the sites so far and their expertise/experience the committee members were then able to proffer sites for the coming reforestation project.

6.2. An outline of the committee's suggestions have been included in each state report in hard and electronic copies and have been included in this final report.

I.7. ***Enlist the willingness of Coastal Populations and all other Stakeholders.***

7.1. This was done during the Stakeholders meeting.

7.2. A memorandum of understanding was drafted and signed by all stakeholders. This document showed future plans for the conservation of mangrove forests as well as monitoring and evaluation.

7.3. Firm commitment letters were obtained from the stakeholders especially the State Ministries.

I.8. ***Sensitize concerned State Governments of the benefits of creating forest reserves and promote their establishment.***

8.1. Sensitization materials were produced and distributed within the State and Local government level, where local administrators require resource materials for technical issues of mangrove forest decimation.

8.2. A central meeting was held with the government officials from the mangrove forest states.

The representatives of local communities and State Government relevant departments were involved in this two-day seminar on the benefits of creating forest reserves and promoting their establishment. The seminar enabled representatives from the government to understand better the need of the local communities and the need to provide

sustainable livelihood of the people that come from districts where mangroves are especially important to their lives and where there are conflicts between current use and conservation of the mangroves.

I.9. *Prepare and submit a report to the contracting organization- UNIDO.*

9.1. All reports obtained from all the previous activities were collated.

9.2. These reports and data were harmonized into a final report.

9.3. A database on the status of the mangrove forests in Nigeria has been developed.

7.94. Submit the final report to UNIDO.

J. Data Collection and Analysis

Data presented in this report was obtained from site visits, information collected from data collection tools (questionnaires), interview sessions, workshop presentations and group discussions, as well as existing data.

The answers to the questionnaire were statistically analysed and used to determine stakeholders' overall awareness level, past and ongoing efforts, and perception on the project objectives. Additional information was obtained from the awareness campaign conducted in each state using both public forum and the media.

K. Expected Outcomes:

1. With respect to the questionnaires, it is expected that adequate information on the project sites will be obtained in terms of the site overview and the activities which affect the mangrove forests. The questionnaires together with the workshops and consultative fora will help in estimation of the level of decimation of the mangrove forests in the Niger Delta and subsequent aid in their prioritization.

2. The expected outputs of the outreach programmes will be an expanded awareness of mangrove forest decimation among those who could assist with their conservation, and also the assurance that future generations grow into fuller awareness of the value of mangrove resources. At the end of this project, the public will be made aware of the risks

associated with the continued destruction of the mangrove forest and the consequent deterioration of the ecosystem and the depletion of associated living resources, after which they will be briefed on the upcoming reforestation programme.

3. It is hoped that the government sensitization process will develop the capacity of State Government and local administrations to administer wise use of mangroves, through the creation of forest reserves and the promotion of reforestation, throughout the region. While this is a mammoth task, substantial progress will be achieved by strengthening the capacity of central Government to understand and address the priority problems and issues identified with mangroves, while at the same time providing technical assistance to local communities to improve the use of these resources such that the benefits can be obtained on a sustainable basis.

Such an activity, along with the entire GCLME programme, should ensure the survival of the country's mangroves, their functions and their biota, while encouraging wise use of these resources. At the same time, the programme, in particular through the Inter-Ministerial agencies, will facilitate cross-sectoral linkages, establishment of administrative structures, and public awareness schemes that are necessary for the management of these national resources. In addition, by highlighting the need for research and training of key personnel, this activity hopes to build the capacity to implement action to conserve and sustainably manage mangrove forest.

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LIST OF ABBREVIATIONS

BDCP- Bioresources Development and Conservation Programme

CBO- Community Based Organizations

EIC- Environmental Information Centre

FMEHUD- Federal Ministry of Environment, Housing and Urban Development

FMST- Federal Ministry of science and Technology

GCLME- Guinea Current Large Marine Ecosystem

GEF- Global Environmental Facility

IOC- Institute of Oceanography

LGA- Local Government Area

MFCSN- Mangrove Forest Conservation Society of Nigeria

NCF- Nigeria Conservation Foundation

NDHERO- Niger Delta Human and Environmental Rescue Organization

NGO- Non-Governmental Organization

NNMDA- Nigeria Natural Medicine Development Agency

NIFOR- Nigerian Institute for Oil Palm Research

OSOPADEC- Ondo State Oil Producing Areas Development Commission

OLFR- Ologe Lagoon Forest Reserve

SPDC- Shell Petroleum Development Coorporation

UNEP- United Nations Environmental Programme

UNIDO- United Nations Industrial Development Organization

UNICAL- University of Calabar

SECTION 1.0

Status of Mangrove Forests in Nigeria

1.1 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.

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.

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 leads to decrease in 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 mangrove vegetation in this zone occupies an area of about 7,500km^2 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 I: 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**

1.2. 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):

(i) 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

(ii) 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 adjourning 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 is coupled with industrialization of the Mahin mud coast has exacerbated the erosion problem along the Awoye/Molume 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.

(iii) 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).

1.3. *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 10,500km^2.
Annual rainfall is very high n the delta and rage 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 27^0 C and humidity is generally very high oscillating around 80%.

Table II: 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 t 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). His 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 III: 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.

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

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

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

Table IV: Mangrove types in Nigeria

Common name in Nigeria	Red mangrove	White mangrove	Black mangrove

Genus	Rhizophora	Avicennia	Laguncularia
Species	*R. racemosa*	*A. germinans (Africana)*	*L. racemosa*
	R. mangle		
	R. harsonii		

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, Chrysobalnus spp, Pandanus candelabum* Early in the twentieth century, a mangrove species from Asia, *Nypa fructicans,* 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 5,400km^2 and 6000km^2 (SECAL, *in* Sayer, Harcourt, and Collins, 1992, 231); Adegbehin and Nwaigbo, 13), 9900km^2, 9980km^2, 7422km^2 and the highest being 11,134km^2.

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).

1.4. *Extent of Mangrove Loss in Nigeria*

1.4.1. Introduction:

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 T*Rhizophora spp, , Avicennia spp* T 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 m^3 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 (Isebore end Awosika, 1993).

1.4.2. ***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.

1.4.2.1. Four drivers of mangrove change/loss have been identified in West African mangrove:

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

1.4.2.2. 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.

1.4.2.3. 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

1.4.2.3.1. 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.

1.4.2.3.2. 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.

1.4.2.3.3. 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).

1.4.2.3.4. 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

1.4.2.3.5. Oil Pollution

Oil export takes 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).

1.4.2.3.6. 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.

1.5. *Destruction of Mangrove Forests in Nigeria*

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 fructicans* invade and then displace mangroves. Clearance of lines may reach 5 metres.

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

1.5.1. The Petroleum Industry

1.5.1.1. Impact of the Petroleum Industry on Nigerian Mangroves

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

3.	Funiwa-5 Fishtown blow out revealed that 5 years after the incident the vegetated had just started re-establishing itself.
4.	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
5.	Egwa Field development is associated with the appearance of nypa
6.	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.

1.5.1.2. Oil Industry Stresses

1.5.1.2.1. 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.

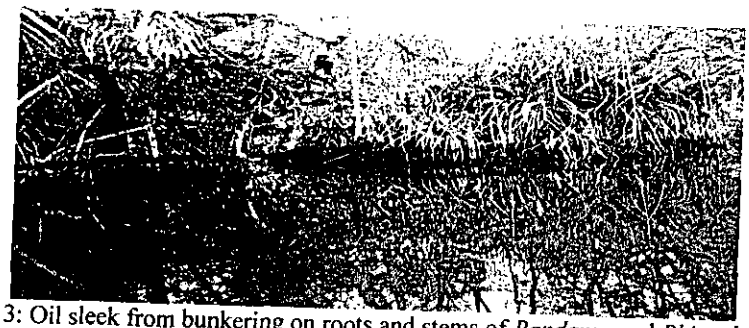


Fig 3: Oil sleek from bunkering on roots and stems of *Pandanus* and *Rhizophora*

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).*T he 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 Baee Strait (Australia) crude oil (2 1/m2) on mangrove seedlings urvival.9 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		

Fig. 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.

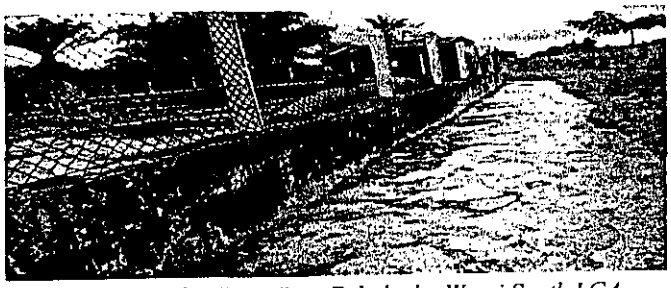


Fig. 5: Section of a "Riser", at Egbokodo, Warri South LGA.

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

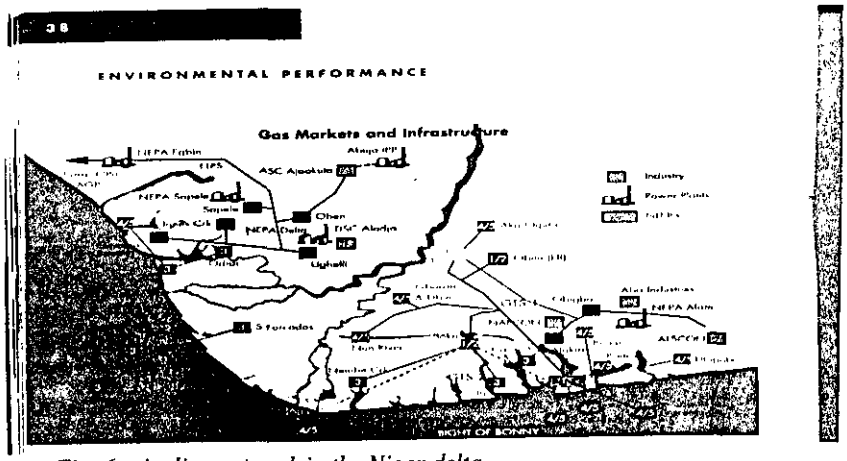


Fig. 6: pipeline network in the Niger delta
Source: SPDC annual publication; People and Environment

1.5.1.2.2. 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 a 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:

i. Dibi
ii. Olero
iii. Opumami
iv. 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.

1.5.2. *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 $4m^3$ 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 V: 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.

However, the results obtained from the project has shown that the above estimates from the World bank have far been exceeded and the percentage loss is at a greater percentage.

1.5.2.1. 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 this to a preference for kerosene even in the remote villages as a major reason which keeps the mangroves from being over-exploited.

Fig. 7: Rural dweller coming home with harvest of firewood, Abe-Ugborodo, WNLG

Table VI: 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
	Irvingia	Men
	Raphia palm	Women, children
	Fish, mollusks	Women
	Native salt	Men, men, Women
	Poles	children
	Sand chalk and clay	

Fig. 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 VII: 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 Wildlife (Periwinkle) Mangrove native salt	6/m^3 5/kg 15/kg	4,289 44,360 48 S/T 48,697
Moist forest	Palm oil Rattan Chewing stick (billets) Palm wine (litres) *Irvingia gabonensis* Wildlife numbers	11 35 56 4 230 250	30,215,626 3,205 5651 658 1,240 S/T 26,682
Southern guinea savanna	Fuel-wood *Parkia* seeds Wildlife numbers Shea butter	20 20 10 65 33	648 1,034 76 315 149 S/T 2,222
Sudan savanna	Fuelwood Vegetables Fodder (*A. albida*) Parkia seeds Gum Arabic	80 10 2 20 1622	1,200 536 193 77,797,320 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

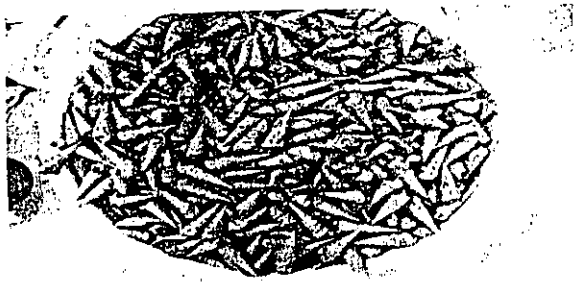


Fig. 9: periwinkles are picked from mud flats on the creeks away from the waterfronts of the mangrove ecosystem

SECTION 2

Outreach Programmes

2.1 AWARENESS CAMPAIGN

2.1.1 Introduction: Public awareness may be defined as the process whereby a set of pertinent information is delivered to a group (family, neighborhood, community, region, society, or nation) for the purpose of bringing about a specific response or change of actions/behaviour in favor of the well being of the individuals or members that make up the group. Thus, in public awareness delivering the right information to the right people is as important as the reactions, which take place once the information has been delivered or provided.

At the community level, existing resource persons or opinion leaders were used for conveying specific messages to the public during the public lectures/rallies. This was especially necessary in communities where there was youth restiveness and where there was general hostility to strangers. The opinion leaders include, but are not limited to, local chiefs, development commissions, fishermen and women, farmers' associations' leaders, youth associations' leaders, women association group leaders, the village school teachers, the village heath care workers, the extension agents, the local NGOs/CBOs representatives, the senior citizens, etc.

The Public enlightenment campaigns were carried out in all the coastal states of Nigeria namely Akwa Ibom, Bayelsa, Cross-River, Delta, Edo, Lagos, Ogun, Ondo and Rivers States. In each state, efforts were made to sensitize them on the conservation of the mangrove forests. Also effective utilization of Nypa was introduced to them. The educational materials used were handbills, posters, leaflets and questionnaires. The experience was worth the campaign and additional informational was collected as well as support obtained. Endorsements were also obtained from each state and each also gave the team maximum support and provided guides.

2.1.2 Objective: The major objective of the public awareness campaign is to undertake/carry out outreach programmes in all coastal states aimed at stopping further decimation of Mangrove forest.

In order to achieve this, various forms and channels of public awareness and education activities using local dialects, values and culture and partnerships of the community with various stakeholders such as community based organizations (CBOs), community leaders, local government units, higher level government, NGOs, and donors were adopted.

2.1.3 Procedure: The awareness campaign /rallies were carried out in such a way that representative communities were visited while a public lecture was held in each state. The lectures featured the Community leaders and relevant State Stakeholders.

The following activities were undertaken:

i. Media Promotion Programmes: Here jingles were designed and carried on radio and television (local and national). Information on the decimation of the Mangrove forests and proposed reforestation programme were also published.

ii. Information boards and posters on the protection of the mangroves and associated resources: These were erected at strategic locations within the identified zones.

iii. Outreach activities in schools and community centers: This was done through education tools-handbills/pamphlets, exhibitions and lectures. During the course of the project, basic environmental training was also provided to some of the teachers in the villages.

iv. Promotion of environmental awareness through mangrove-based ecotourism: A programme of on-site public awareness targeted towards visitors and tourists was undertaken and is still being executed. This consists of the following on-going actions:

   a. Booklets and posters on mangrove conservation were printed and distributed to visitors/tourists.

b. A Mangrove Interpretation Centre (MIC) was established within the secretariat branch at Calabar. The main aim of the MIC is to disseminate knowledge and information about Mangroves through posters, displays and interactive tools.

c. Eye-catching signs and exhibits have been erected in a few Mangrove and tourist zones.

v. Awareness rallies and exhibitions: were held around representative communities, within every state, during which questionnaires were distributed to collect additional information on mangrove ecosystem and its importance as a high support mechanism for the coastal population.

vi. Consultative meetings/fora:. These meetings were held with the full involvement of the general public along with the mangrove site caretakers/managers, local communities, administrators/government officials and stakeholders (e.g. social and conservation NGOs). The importance of preserving the mangrove forests was discussed and these consultative meetings were held as the enlightenment campaigns were going on. Educational materials and questionnaires were also distributed.

vii. Distribution of Pamphlets/booklets and/or teaching aids which were also translated into local dialects: These bore information about the status of the depleted mangrove forests and the importance to conserve them.

2.1.4. Community Participation

The mangrove communities are the key stakeholders who have to be responsible for conserving their mangrove and carrying out reforestation. However, to involve local communities in the reforestation of mangrove areas, the team had to provide them with incentive, knowledge and resources to enable them to undertake mangrove reforestation projects. Such community projects also ensure that the communities involved have the

appropriate knowledge to undertake sustainable management of the rehabilitated mangrove areas.

During the public lectures, the communities were adviced to:
-Seek community participation and cooperation in the protection and management of the mangrove. Whenever possible such programs should be managed by, or in collaboration with, local-based community organizations. These organizations should be given the necessary support such as technical assistance and other needs.
-Encourage communities dependent on mangrove resources to establish people's organizations which can facilitate popular participation in mangrove management plans for their areas in conjunction with relevant government and non-government agencies.

The rallies were mostly used as a means of circulating the fliers and educational materials while the public lectures, which held in selected communities in each state, were used to educate the community members and obtain their comments.

Public Lecture
In addition to the circulated materials, the two projects namely **Mangrove Conservation** and **Effective use of Nypa**.were introduced and the following issues were addressed by the BDCP team:

Mangrove Deforestation: The communities were informed them that Nigeria has the largest Mangrove forest in Africa but it is fast deleting due to the following factors:-

a. Use by the communities.
b. Deforestation by activity of oil companies.

Benefits of the Mangrove: The Mangrove is of benefit to all coastal communities for use in building of houses, boats, paddles etc. Due to the harsh economic situation that plagues the coastal communities they can't be told not to make use of the Mangrove forest for their daily living but to sustainably harvest the Mangrove forest by harvesting one and planting four.

Additional Uses- Mention was also made of the advantages of the Mangrove forests to their daily living such as:-

a. Protection of the shoreline of the seas;

b. Fishes and other water species make use of the forests roots as a safe breeding ground;

c. Birds make us of the Mangrove trees for Nesting.

Effective utilization of Nypa: The invasive nature of the Nypa palm on the Mangrove forest explained. However, the communities were encouraged to control the advent of Nypa invasion through utilization and the economic benefits that can be derived from the Nypa palm were highlighted. Examples were given of countries that have benefited immensely economically from Nypa as well as efforts made by the Nigerian Government. This, along with the fact that cutting or uprooting the Nypa palm is an arduous task, thus formed the basis for the advice to utilize as a means to checkmate the invasion of Nypa.

2.2. STATE REPORTS

Below are some of the excerpts of/issues raised by the communities visited:

2.2.1 DELTA STATE REPORT

Public awareness lectures and discussions were held in two communities both located in Delta North Local Government Area of Delta State. The communities are namely:

(a) Community Development Centre

(b) Orogugbo

(a) Community Development Centre:

-Deforestation due to Ignorance: The youths of the Niger Delta region and particularly Warri, are not fishermen by choice but rather are fishermen out of unemployment. As a result, they do not know much about these mangroves and the need for their conservation. Therefore a major part of the problems associated with lack of the conservation of the mangrove forests in the area will be solved by detailed education of the youths on the importance of the mangrove forests and associated resources.

Figs 10 (a) and (b)- Mangrove Forest of Warri North

-Economic Benefits to the Communities: The project has to be seen as being economically benefiting the communities involved in order to get their full supports.

-Enlightenment of the Fishermen: The fishermen all need to be further enlightened since they are mainly the ones who actually make use of these mangrove and cut them down.

(b)Orogugbo

-Sustainability: The community is aware of the project that was carried out by the Federal Government in 2004 on Nypa palm eradication and reforestation of the Mangrove. The communities had expected that the project will be followed up with immediate activities.

They therefore encouraged BDCP along with the Federal Government and UNIDO and hoped that this project will be sustained.

-Invasive Species: The Nypa palm (known locally by the Itsekiris' as "abeje") is not the most threatening invasive specie as far as the communities are concerned. While agreeing that the Nypa palm is gradually getting more rampant, they commented that it only grows in places where the mangrove is absent unlike other species (particularly the water hyacinth) which causes obstruction to movement in water and do not provide breeding grounds for marine species since they are unpalatable to the fish.

-How does the Government plan to control Nypa palm? They would like the Federal Government to embark on a mass uprooting of Nypa and employ the community members thereby creating employment and revenue for the poor masses.

-Proposed Project- In Delta, the accompanying Ministry representative gave us details on a project proposal on the revitalization of *abura* and mangrove forests in the Warri South senatorial district of Delta State: through communal partnership participation, in collaboration with the ministry of environment, using the national conservation strategy as a tool for poverty alleviation and rural youth empowerment. The project will aim at providing jobs to the rural youths, thus reducing youth restiveness. It will enable the State to sustain exploitation of mangrove trees and Raphia palm. To organize production of tannin for which mangrove is a rich source of supply. This will also facilitate socio-economic development of the area and preserve it as a shelterbelt against the south west winds and tornados to the hinter-land. This will thus ameliorate the global effect of climate change, providing healthy air quality and therefore reducing acid rain.

Pictures Taken During the Lecture

Figs 11 (a) and (b)

2.2.2 LAGOS STATE REPORT

The awareness lecture was held at Majidun Community, Ikorodu West LGA and the meeting witnessed a huge turn out of community elders and leaders from Majidun and all surrounding communities. The meeting which held at the town meeting ground was very educative and the following issues were discussed:

-Advantages of the Projects to the Communities.

-Prosecution of Offenders /Penalties for Misuse: Will the government enact a rule or put measures in place for the prosecution of those who are destroying the mangrove.

-Alternative sources of fuel: The villagers also wanted to know if the Government will provide other sources of fuel (e.g. kerosene) to substitute the use of the mangrove for firewood.

-Mangrove in exchange for Fish Pond: It was learnt that there had been proposals by certain companies/persons to use a portion of the mangrove forest as fish pond. Since this will lead to clearing of some of these mangrove species, the communities wanted all stakeholders to know about this common practice and understand the reason why such

requests are usually granted. Considering the level of poverty in these communities, it is difficult for them to resist granting such requests due to the compensations.

-Difficulty in securing loan facilities: It has been noticed that the local women find it easier to obtain loan facilities (and other forms of assistance) more than the men in the community. Even thus who have finished learning all forms of handiwork find it difficult to obtain any form of assistance from the Government or Non-Government bodies.

-Gender Issues: Most of the women engage in business activities and are indeed responsible for the livelihood of their family. Most of the petty trading involves the use of firewood and it will be difficult for these women to reduce the cutting of the trees.

-Unemployment: Most of the youths have graduated and have no jobs. The only option is for them to utilize what is available to them and become self-employed. As they live near the water, the most common practice is to become fishermen or engage in the sale of wood or edible water animals.

-Small Scale Industries in place of Dredging: Most of the communities have been approached and told of the intension of the oil ompanies to start dreding activities near or within the communities. The communities are aware of the danger of oil to their mangrove forests as well as sea incusion. They therefore expressed their preference of having small scale industries which will engage the community members and serve as a continuous source of income as opposed to the compensation to be received by the oil companies.

-Youth Restivenes: The younger ones have been encouraged to come back to the communities to develop their father-land. However, when they come back home and do not find most of the amenities in place, it leads to youth restiveness as mpst of their aggression is then directed to the Government. Therefore, it becomes difficult to get the youths to welcome any initiatives by the Government. The youths are the next generation of people to use and conserve the mangrove and so there is a need for them to be carried

along. The Government must thus be seen as carrying them along (granting them assistance and employment).

Fig 12- Baale of Majidun in Red cap with other Community leader and oldest man in next village

Fig 13- Cross-Section of Elders

Fig. 14 a,b,c- Cross Section of those in attendance (Elders, Youth Leaders, Fishermen etc)

2.2.3 OGUN STATE REPORT

The public lecture was held at Ode-omi of Ogun Waterside Local Government Area. Below are some of the comments/questions raised by the community leaders/members.

-Project Sustainability/ Continuous Visits: The communities attached to Ode-omi and which have these mangrove species in abundance are many and it is not everyone that will be reached by the few visits. It is therefore necessary for the team to embark on more visits long after the project period has elapsed.

-Newly Commissioned Ogun Liquified Natural gas Project: The newly commissioned OKLNG Project will soon kick off and once this happens, the villagers will no longer be interested in knowing about our project and as such there is a need to speed up any

activities including the planned re-forestation exercise before the OKLNG project starts in order to get maximum assistance/cooperation of the communities.

-Youth Restiveness/Education: The project was seen as very timely due to the resent protest by the youths on the need for compensation of the coastal communities by the OKLNG. The villagers recognized the fact that there will be a need to organize a small retreat for the youths and educate them on such important issue as conservation.

-Land Reclamation: The government has large portions of land reclaimed by them and the community members wanted the team to impress on the Government of the need not to reclaim any land or start up any projects in these mangrove-rich communities, especially Ilete.

-Information Dissemination: The traditional ruler (baale) assured the team of their continuous support and assured us of further dissemination of the information to areas where we could not cover during this visit. He understood the difficulty of the terrain during this rainy season and as such adviced the team not to try to access all areas to avoid a repeat of the trapping of our vehicle, but instead urged us to leave the educational materials with the community spokesperson for future distribution.

Pictures of Public Lecture

Fig 15-Village spokesman & Women Leaders

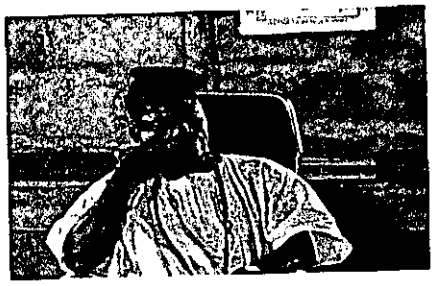


Fig 16- Baale of Ode-Omi

Fig 17 (a) & (b)- Lecture with the people of Ilete

2.2.4 ONDO STATE REPORT

The public lecture was held at Igbokoda in Ilaje Local Government Area. The meeting was hosted by Ondo State Oil Producing Area Development Commission (OSOPADEC) (the video coverage has been submitted along with the report). The meeting had community leaders, local government representatives, teachers and other stakeholders (NGOs, CBOs etc) in attendance. The excerpts of the meeting along with some of the issues raised by the attendants, all of which were addressed by BDCP representatives are enumerated below.

Comments by OSOPADEC Chairman (Represented by his Deputy)

-Preservation of the Mangrove: He expressed concern that these valuable trees are found mostly in Ilaje land amidst other communities in Ondo State. As an indigene of Ilaje, he recalled that these mangrove trees were formerly in abundance but that is not so now. There is therefore a need to preserve these mangrove forests due to the irreplaceable uses they serve to the communities.

-Uses: He highlighted such uses as follows

Firewood

Construction

Protection of the environment- Sea surge; Wind breakers

Medicinal purposes

- Displacement of the Mangrove by Nypa palm: He also explained the dangers inherent in allowing the Nypa palm to displace their mangrove. The major threat to the coastal communities is sea incursion. The Nypa palm does not protect the coast from sea incursion but rather displaces the mangrove which does the protection. He therefore encouraged the community members to control the spread of this Nypa palm.

Comments by the Ilaje Local Government Chairman Representative

- Expressed happiness to BDCP and her collaborators for these projects aimed at conservation of their environment especially in view of the fact that there was a recent sea surge in Ayetoro (one of the identified sites for planned reforestation).
- Urged all stakeholders to undertake research on the projects and device ways of promoting the concept.
- Also requested that all in attendance should help in information dissemination.

Comments by Ese-odo Local Government Chairman Representative

-Acknowledged that the Local Governments are key stakeholders in the projects.
-Accepted it as part of their responsibility to promote the objectives of the two projects.
-The major threat to their mangrove is pollution from oil companies and the Local Governments will try to intervene on the behalf of the communities.
-Appealed to the community members to overlook the above fact and stop expressing their grievances but rather to do the much they can to conserve their environment and reforest their mangrove forests.
-Also urged the villagers not to wait for the reforestation by the government but rather when they see the young mangrove plants floating along the banks of the river, they should pick them up and replant them along the river banks.

Responses/Questions from the community members/representatives

Mangrove Reforestation: How are these mangrove trees best replanted?

Alternative sources of income: Will the government provide alternative sources of livelihood for these coastal communities since the mangrove serves as the major source of income to the members?

Threat by Cattle: How will the communities stop the cow from feeding on the mangroves? Some of the villagers rear cattle albeit on a small scale and these cattle feed on the young mangrove.

Threat by Oil Companies: The representative of an NGO working in the area expressed concern about the absence of oil companies' representatives in the meeting since the latter are the major cause of destruction of their otherwise abundant mangrove species. He believed the mangrove species are able to reestablish themselves as they are usually washed in by the water and are often seen floating into the community coastlines. However, the real damage is caused by the oil pollution and gas flaring of oil companies and as such they have to be seen as participating actively in such important meetings. He therefore appealed to OSOPADEC to invite the oil companies in any such meetings to be held in the future.

Training of women on use of Nypa to make jewelries: The women wanted to be trained on how to use the Nypa palm in the production of jewelries. This will serve as a source of income to them as well as put the Nypa into use.

These questions were responded to by the BDCP spokesperson. A brief meeting was then held with the CBOs present.

Pictures of the Public lecture

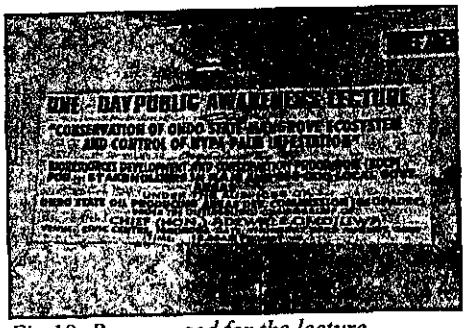


Fig 18- Banner used for the lecture

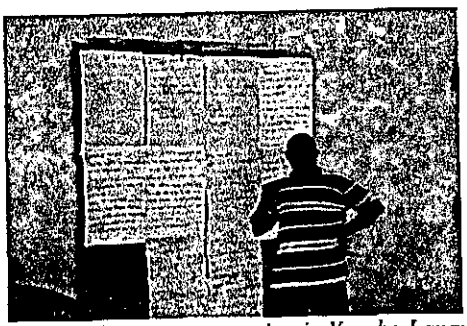


Fig 19- Poster presentation in Yoruba Language

Fig20-Coastal communities' kings(Baales)

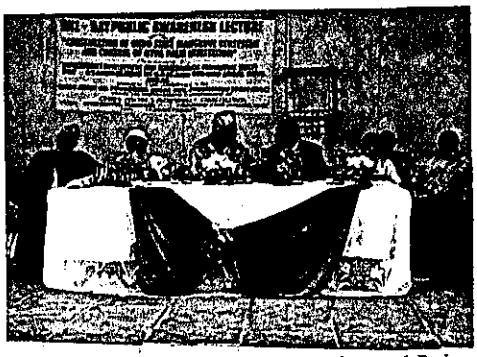


Fig 21-High table showing the Traditional Rulers, OSOPADEC Chairman and Local Government Chairmen (represented)

Figs 22 a,b,c-Cross-Section of Attendants (Community Leaders, Elders, Teachers, CBO/NGOs, Community member

Fig 23- Picture of Traditional Rulers, OSOPADEC Executives and BDCP Representatives

2.2.5 EDO STATE REPORT

The public awareness campaign on Mangrove re-forestation in Edo State was carried out at Gelegele forest reserve. The team comprised of BDCP representatives and a representative of the Edo State Ministry of Environment (biodiversity conservation). The team embarked on the public awareness campaign to Gelegele through Ogbede, Ugbede, Ikoro, Igbosi, Oduna and Eghudu.

The lecture which took place at the the palace of the Amakosue of Gelegele had the elders and youth representatives in attendance.

Gelegele is a small community of Ijaws, situated on the boundary between Edo and Delta States along the Osiomo River. The Osiomo River joins the Benin River at Ologbo junction. The salt water tide from the Benin River flows into the Osiomo River at this junction. This area happens to be the only area surveyed in Edo state to have mangrove.

The community members acknowledged the various uses of mangrove and the presence of Nypa palm which is also known as '' Ber'' in their ethnic dialect. The Amakosue however, regretted his absence at the stakeholders meeting in Calabar, which he explained was due to poor information/communication link with the Ministry.

Comments from the Community Leader

Most of the comments were made by their king/community leader-the Amakosue of Gelegele who expressed interest in the awareness campaign. He however explained that, the excessive use of the mangrove was due mainly to the low level of livelihood (poverty) in the community. According to him, the community members were poverty driven and would appreciate any assistance in the areas of employment, cottage industries establishment and allocation from the 13% oil derivation. These he believes would reduce over-dependence on the environment.

Comments from the Ministry Representative

The Ministry representative (Forestry officer in charge of the coastal communities around Gelegele) supported what the community leader said and appealed to the team to intercede on behalf of his people in obtaining funds for the community since the dependence on mangrove is only as a result of lack of funds. The community members thus have to utilize the available mangrove to construct canoe and for firewood.

Fig 24- Community members going through enlightenment materials

1.2.7 CROSS RIVER STATE

The public lecture was held in the community known as San San 1 in Bakkasi LGA. The meeting had community leaders, women, and youths in attendance.

Existing Laws: After the lecture, it was generally gathered that there are no past laws or regulations for protection or efforts made in the past to conserve the forest.

Additional uses of mangrove for medicinal purposes- It was discovered that mangrove leaves were used medicinally to treat measles in infants. The fresh Mangrove leaves are harvested/plucked and squeezed to express the liquid from them. This is then mixed with detergent water and then used to bath the kids afflicted with measles. This application is repeated twice a day and it has proved to be a very potent cure for measles.

Use as salt-They also use the roots for salt. Cut roots of the mangrove are burnt and the resulting ashes is then used for salt.

Local names for different mangrove species- The native names for mangrove forest and Nypa palm include:-

Mangrove forest – Angala

Nypa palm – Calabar bia

Fig 25 a and b: Cross section of community people listening to the enlightenment campaign

2.2.7 AKWA IBOM STATE REPORT

The public lectures in Akwa-Ibom State took place in two Local Government Areas and communities in the state namely Oron Nation and Eastern Obollo LGAs. The names of the two communities are Mbo Community (Oron LGA) and Iko Community (Eastern Obollo). The red mangroves were more dominant than the white mangroves in the state. The reception was very good from the communities and those in attendance promised to continue and extend the campaign to other neighboring communities who may not have been represented. Endorsement was also obtained from the state government as was the case in each state. Additional support was also obtained from the NGO's and CBO's based in the state (e.g. Nigeria Conservation Foundation (NCF) an NGO and Eastern Obollo Development Foundation a CBO based in Eastern Obollo). The Enlightenment campaign was a success because they accepted the message and promised to practice what they have learnt and also pass it on.

Akwa Ibom state Mangrove Forest is disappearing at an alarming rate due to the following:-

1. Activities of the Oil Companies.
2. Increasing rate of Mangrove trees logging.
3. Fast Invasion of Nypa Palm
4. Local Usage.

The government has been urged to quickly intervene in the high rate of logging in the state by creating forest reserves and also promulgating laws to prosecute any person found logging Mangrove trees in the state. Also forest guards should be employed to check the menace.

The state communities were re-assured that in the next stage of the project, which is reforestation, verbal consent of the multinational oil companies have been obtained to assure their participation, thereby reforesting the areas where they have deforested due to their activities. Further assurances were obtained from the Ministry of Environment (through the Permanent Secretary) that the State Government will take the projects further to the best of their capacity.

(A) Mangrove public enlightenment in oron nation

The journey was taken through Ituk Mbang and Okobo LGA's. The meeting took place at the Chief's palace located at No. 22 Oron road, Mbo community. The meeting was guided by a community leader in Oron and the state representative at the stakeholders meeting.

The following issues were discussed:

Nypa Displacement: The threat posed by Nypa on the Mangrove forest can be seen in Oron where the Nypa is effectively replacing the Mangrove forest.

We learnt that the local name of Nypa is **Iyambaka.**

Comments from Government Representative

Government / Community Involvement: The willingness of the communities to participate-in and implement the two projects was reassuring, as well as their happiness at the assurances from the government that the latter is fully involved in its implementation. There were further assurances that the government will pursue follow-up community based activities to further compliment the efforts of the Consultants.

Conservation of the mangrove forests: The communities were urged to conserve the mangrove forests within the state because the mangroves are disappearing at an alarming rate in Akwa Ibom state. The government is worried but is helpless on how to stop this because the onus of preserving the declining rate of the Mangroves rest with the local communities. They were also encouraged to convert the Nypa to good economic uses in order to stem the tide of it's displacement of the Mangrove forest.

Information Dissemination: The community representatives/leaders were urged to spread this message to not only other members of their community but also to members of other neighboring communities that reside on the coast.

Future Consultations: The Government representative promised to answer any questions that border on governments involvement and participation in the two projects whenever such information is required in the future.

Comments from Representative of the Nigeria Conservation Foundation (NCF)-

-This essentially consisted of a lecture on the various uses to which Nypa can be put into, like brooms, bangles, rings, necklaces, fishing baskets etc. If they learn how to produce most of those things it could become a great source of livelihood for the youths thereby gainfully employing them. The villagers were encouraged to visit their craft centre in Oron to freely learn the technology but they should first organise themselves into groups so that they can be taught in groups.

- He suggested that they should endeavor to help in spreading the message of conservation of the Mangrove to all nook and corners of Oron nation and beyond.
- He also was of the opinion that if they fully imbibe and implement the technology of effective utilization of Nypa it will help to reduce drastically the Nypa invasion of the Mangrove forest.
- While harvesting the Nypa for conversion to other products however, they should first of all be fully cleared by uprooting it. It will sprout again but they should clear it twice again making it thrice to fully kill the plant.

- Lastly, the community members need to know that to save their lives, there is every need to conserve the Mangrove forests.

Questions and Comments from the Communities

1. How do they go about planting Mangroves?
2. The government was implored to come and practically show them how to convert Nypa to economic uses?
3. The two projects are to be commended, however but what will be the use to the communities financially?
4. How will they get the Mangrove seedling, also how do they go about encouraging people about it?

Answers

The questions were then addressed by the BDCP representative:-

1. The Mangroves have seeds. The seeds of the red Mangrove are cylindrical while that of the whit Mangrove is pear shaped. The planting is done through the seeds and the Mangroves take some time to grow.
2. On the second question they were reminded them that the NCF representative had offered to teach them freely how to make use of Nypa for economic benefit. They were also assured that NCF had the governments backing to do that.
3. Financially there is no direct benefit from the Mangrove restoration project. Since fishing is the greatest source of livelihood for their community, preservation of the Mangrove forest will increase their fishing yield. One of the other benefits is protection of their heritage and also saving of lives through environmental protection.
4. Mangrove seedlings are gotten from mature mangrove trees. Direct discussion about the benefit of the Mangrove forest and also the lack of it is the best way of encouraging people about the project.

Concluding Remarks

BDCP- The people were then thanked for their cooperation and urged not to relent in implementing what they had learnt today. The communities were also promised to be remembered in further projects especially the host community.

Community Representative/Chief- BDCP was thanked by Oron and all coastal communities in the state for their development effort. He appealed to BDCP to always remember Oron nation in any other project that will be of benefit to them.

The traditional ruler- Thanked BDCP for coming and offered prayers for the representatives present for journey mercies and progress for the organization

Fig 26-Cross section of chiefs Prince Asuquo I.D (in blue), Chief Jimmy Ebito(black cap).

Fig 27- Offong Ekeng.

Fig 28-Chief Bassey Udonta

Fig.29-H.R.M. Ahta I.E. Nyong (Traditional Ruler of the Oron Nation).

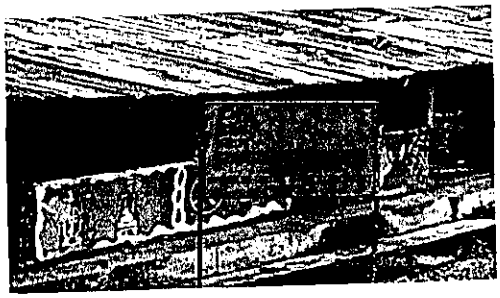


Fig 30- Nigeria Conservation Centre (NCF) Craft Centre Oron.

Fig 31- *Patches of Red Mangrove noticed around Ituk Mbang on the way to Oron.*

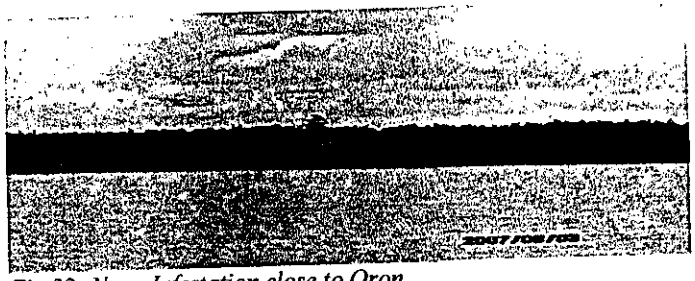


Fig 32- Nypa Infestation close to Oron

(B) Mangrove public enlightenment in Eastern obollo LGA (Iko community)

At Eastern Obollo, the team was received by the executive Secretary of Eastern Obollo Development Foundation and the meeting with the community members took place at the former's office complex. Two members of the traditional council of the community were present along with other important elders and representative groups.

After thanks and due introductions, the BDCP representative gave a short lecture on the use and need for conservation of the mangrove forests in the state. The latter enumerated to them the fast depletion of the Mangrove forest in Nigeria and in particular Akwa Ibom state. He availed them of available statistics which showed that it is only in their Local Government in the state that thick mangrove forests can be found. Other places have either been extensively cut down for use by the local communities or have been fully displaced by Nypa. They were taught how to sustainably harvest the Mangrove forest. Due to the harsh economic situation that plagues the coastal communities they were assured that the project did not advocate the non-usage of the mangroves but rather the sustainable usage which entails the planting of the trees once they are harvested. Mention was also made of the advantages of the Mangrove forests to their daily living like protection of the shoreline of the seas and also harbor to fishes who make use of the

forests roots as a safe breeding ground. The aspect of "effective utilization of Nypa" was also introduced and the economic benefits of the Nypa palm were highlighted.

Commendations/Charges from the NCF representative

-The host community was commended for having been able to maintain the only thick mangrove forest in the state but were informed that the mangrove forest in their state is fast depleting and as such efforts should be made to conserve it.

-The youths were asked to form groups that will carry on the awareness programme to other communities and their community members that were not present.

-The advent of Nypa palm displacement and their inherent threat to their mangrove was addressed. They were however adviced to put cut-Nypa into better economic uses instead of thinking of outright clearance. They were informed of their ongoing project and craft centre in Oron where items such as bangles, rings, necklaces, brooms, fishing baskets and other items were produced from Nypa; and were encouraged to come for further training.

Comments from the representative of the State Ministry of Environment

He commended the efforts of the foundation in the community and in the state at large and promised to alert the state government of the good work of the foundation. The community members were assured of the involvement of the state government in the two projects and reiterated the need to effectively conserve their Mangrove forests. He ended by assuring them of cooperation at all times.

Comments from the Community Members

Uses of the Mangrove- They explained that they make use of the Mangrove forest the following ways:-

1. The trunks and branches of mangrove are used as pillars for building of structures.
2. The barks are used as dyes for their raffia palms.
3. They also use the Mangrove stems to make rackets for fishing.

4. Also the bark is used for Malaria treatment. The bark is scraped and boiled with water. The patient now cloaks himself/herself over the boiled water with the mangrove bark for ten minutes. This is repeated twice a day for one week.

Local names for mangrove species- The team learnt that Nypa is known locally as Dr. Mo after the name of the man who brought it to Calabar, while the Mangrove is known as Angala.

Questions from the Community Members

1. The community had a major destroyer of the Mangrove forest that has contributed greatly in the depletion of the forest and that destroyer has been plaguing them since 1947. That destroyer is Shell Petroleum and Development Corporation (SPDC). They have greatly deforested the Mangrove forest by their activities. They thus wanted to know how BDCP and their collaborators could help appeal to them to stop destroying the mangrove forest?
2. Another said that "according to our explanation, our concentration has been the mangrove forest and also reforestation, how then will the ministry of environment in the state going to assist them in the reforestation exercise? Also what is the benefit/economic importance to the people of the Niger delta from the mangrove".
3. The representative of Ikonta community in eastern obollo LGA expressed "their worry about the menace of Nypa over the mangrove forest; but also explained that the endocarp of the Nypa seed is edible. He however wanted to know how the community members can learn the uses of Nypa so that it can be of benefit to them economically? He also ascribed the cutting down of the mangrove to poverty level in these communities (indeed some even go to get timber loggers to come and cut down the big red mangrove trees and pay them for it) and thus wanted to know what will be done to sustain those involved to stop them from depleting the forest?

Responses

1. They were intimated that contact had been made with the multinational oil companies - SPDC inclusive and that they have accepted in principle to be involved in the reforestation project which is a follow up of this public enlightenment project. The communities were thus urged to please be receptive to the multinational oil companies when the reforestation programme starts.

2. In answer to the second question, the community was assured that the ministry of environment in the state are partners in the reforestation programme and also that the benefit of the Mangrove forests to the coastal communities are many- namely but not limited to the following :-

1. Protection of their shorelines from erosion.
2. Increase fish yield for them since they are predominantly fishermen
3. Increase in yield in other sea mammals e.g. prawns, periwinkles, oysters etc.

3. With respect to the issues and questions raised by the third person he expressed his surprise about the extent of logging of the red mangrove forest and notified them that logging decimates the Mangrove forests faster than even the activities of the oil companies. They were thus urged to quickly stop this trend before the heritage of their unborn children are finished. The excuse of poverty is not tenable because if they finish the mangrove forests, they stand the risk of erosion which might wipe away their communities.

Comments from the CBO representative (Eastern Obollo Devpt Foundation-Mr. S. Agba)

The CBO representative shed more light on the efforts of the community to stem the tide of logging the mangrove forest. We were informed of a group of youths that sometime ago arrested some loggers from Ibino community who came to log their mangrove forests and they were handed over to the police. The advent of logging in Ibino community has left no more mature mangrove trees standing. An appeal was thus sent to the state ministry of environment through their representative to put measures in place aimed at stopping members of the Ibino community from continuous logging of their mangrove forests. He intimated us that at Utayiwa community the chiefs made a law which

prohibits the locals from making use of the mangrove as firewood and for all purposes. This has reduced the advent of mangrove logging there.

Pictures of the public lecture

Fig 33- Mr. Samson Agba
Coordinator of Eastern Obollo Foundation

Fig 34- Chief Venerable Allison F. Aboho (standing) with H.R.H Chief Elder Anthony Jerry Anantia

Figs 35 a,b,c,d- Cross Section of Community members at the Enlightenment campaign.

Figs 36 a, b- Thick Red Mangrove with sparse Nypa at Eastern Obollo

Fig 37- Thick red Mangrove Tree

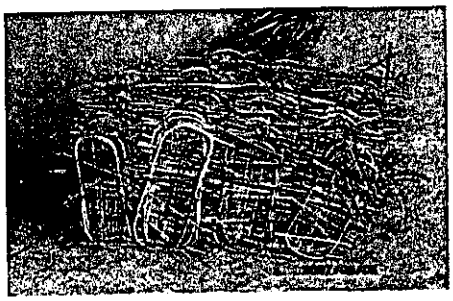


Fig 38- Rackets for drying fish produced from Nypa

2.2.8 RIVERS STATE REPORT

The current situation in Rivers State did not create an enabling environment for meeting with the communities or carrying out an enlightenment campaign within the state. However, the team held a successful meeting with the Ministry of Environment after which they promised to carry out the campaign after the situation improves and the curfew is lifted. The questionnaires, fliers and educational materials were handed over to them for distribution at a latter date. The media was also used to ensure that the message atleast gets to them during this period and the jingles were arranged to run for a longer time at their local radio station.

Proceedings of the meeting at the Ministry of Environment

A meeting was held at the Ministry of Environment between the BDCP Representative, the Director Environment Assessment and the Deputy Director Environment Assessment. The Director expressed his apologies for the inability of the team to carry out a proper enlightenment campaign due to the bad security situation in the state which made the

coastal communities very unsafe for visitors but promised that the campaign will be held at a latter date.

Next was a detailed description of this phase of the project by the BDCP representative followed by enlightenment on the contents of the education materials he came with i.e. pamphlets, questionnaires and handbills. The recommendations during the meeting were also discussed and the planned reforestation sites for Rivers State were confirmed by them. He also requested that additional information be furnished pertaining the coverage of the Mangrove forest and Nypa palm in the state.

Responses

It was regrettable that the enlightenment campaign could not be undertaken in the State. However, the Ministry gave their assurances resolve to carry out the campaign later and also ensure that the educational materials get to the desired communities. They also resolved to invite community leaders to the Ministry to further inform them of the need to conserve their mangrove (considering that they had been briefed during the first phase of the project). The educational materials will be given to them for future distribution in their communities. They also rendered apologies for their absence at the Calabar workshop which was due to changes made at the Ministry but agreed with the recommendations of the meeting.

Mangrove Sites- The Ministry representatives confirmed that the most impacted sites Rivers state are Bonny, Andoni and Opobo. The following sites were listed as having a good concentration of Mangrove:

a. Bonny
b. Kala – Ibiama
c. Cawthorn Channel
d. Andoni.
e. Ogu – bolo
f. Febiere.
g. Opobo.
h. Okirika
i. Andoni
j. Finima.

Predominant Species- The state has both the white Mangroves and the red Mangroves though the red Mangroves are more predominant. The bonny Opobo axis has the greatest concentration of the White Mangroves while the other areas have predominantly Red Mangroves and a few White Mangroves.
The Nypa invasion is present in Rivers state but it has not reached an alarming rate. Nypa has taken over Cawthorn Channel fully. Nypa is also present in Elem Sangana, Kala – Ibiama, Alakiri and Finima. It's presence in other places is minimal.

Project Support- The two projects were tagged as being very timely in Rivers state in order to help them conserve their Mangrove forests.

The meeting ended with the handing over of the materials for onward delivery to the communities as promised.

2.2.9 BAYELSA STATE REPORT

The Bayelsa experience was good with respect to their willingness to execute what they learnt. However, the tight security in the state due to the recent incidence of kidnappings by the militants almost marred the campaign. After due consultation with the Ministry of Environment, Ekeremor LGA was chosen for venue of the public lecture and Alaibiri community was selected. The community was chosen due to its diverse composition that has both natives that migrated from Cross-river state, Rivers state and Akwa Ibom states; as well as security assurance. The red Mangroves were found to be more than the white Mangroves in the state. The state government promised to take the message to other areas that could not be reached due to the security situation on ground when conditions improved. They also promised to assist the local communities to carry out the control of Nypa Infestation after the project must have ended. The Alaibiri community promised to implement the projects to the letter. The invasion of Nypa palm was still very low in the state so they were advised to stem it now by effectively using the Nypa as a means of control.

Excerpts of the Public Lecture held at Ekeremor Local Government Area- Alaibiri Community

Members of the team consisted of BDCP representative, representative of Bayelsa State Ministry of Environment, Coordinator and members of Akassa Development Foundation (ADF) and the Director of forestry.

The meeting took place at the traditional ruler's palace where the presence of a member of the traditional council of the community who represented the traditional ruler and other notable community representatives were in attendance.

The Alabiri community is predominantly a fishing community that comprises of people from Akwa Ibom, Rivers, Cross River and Bayelsa who migrated to Alaibiri solely for fishing and have remained there, intermarried and procreated over time.

The BDCP representataive thanked the communities represented for their support and warm reception after which a detailed lecture of the decimation of the mangrove forests and the need for conservation was given. The advent of Nypa was also addressed.

Responses from Community Members

Uses of mangrove-

1. It is used as main source of fuel i.e. firewood.
2. Charcoal is produced from Mangrove which they use for blacksmithing and fish drying.
3. From the bark of the felled tree, tan is got which is used for dye production for dying their nets and clothes.
4. The trunks of mangrove trees are used for scaffolding, pillars and planks for building.
5. The trunks are also used as transmission poles to support overhead cables and wires.
6. The roots are used for racket making for fish drying.
7. The trunks are also carved, sharpened and dried for chewing sticks.

8. Young stems are sharpened and made to whistles to locate fishing mates.

Uses Of Nypa Palm-

1. Used for thatches for roofs.
2. Used as wedge poles to set the thatches. These poles last longer when they are first dried.

Questions- The community members wanted the following issues clarified

1. Since the Mangrove forest is of immense benefit to the community and the Nypa is also useful which of them are they to eradicate?
2. What can be done to help the community curtail the destruction of the Mangrove forest by Agip Oil Company in their community?
3. What can de done to improve the livelihood of the members of the community so that they will stop cutting down Mangrove trees e.g. providing them cheaper source of energy.

Answers- The questions posed were answered by the BDCP representative as follows:

1. In answer to the first question since Nypa occurrence is still small in their community it is advisable to eradicate it first before it kills the Mangrove trees. The form of eradication proffered is effective economical use of Nypa.
2. To the second question discussions and meetings are ongoing with the multinational oil companies towards reforestation of the mangroves and the responses have been positive. Nigerian Agip Oil Company is one of them and they have agreed to participate.
3. The answer to the third question was that there is no alternative means of improving their livelihood but that their decimation of the forests for personal use does not in any way affect the forests once they plant as they cut.

The meeting ended with assurance from the community members to continue to spread the message to other neighboring communities.

Pictures taken at the lecture hall

Figs 39 a-f: Cross section of community leaders, youth leaders, community members and ADF members.

Fig 40- Red Mangrove trees with sparse scattering of Nypa Palm.

Fig 41- Typical red mangrove forest in Ekeremor

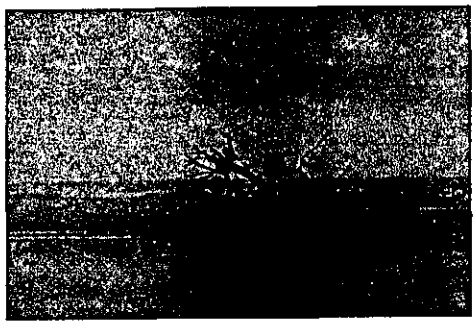


Fig 42- This tree covered with water used to be at the centre of Alaibiri village before flood from the ocean displaced the villagers and made them to relocate to their present position. This situation arose due to the fact that they had deforested the Mangrove trees at their shoreline.

2.2.10 IMO STATE REPORT

At Imo State, a brief meeting was held with the Director of Environmental Conservation who explained that their lack of participation stemed from the fact that the conservation of the Mangrove forests fall under the jurisdiction of the Forestry department which is under the Ministry of Agriculture and the latter has not established the advent of Mangrove forests or Nypa in the State.

An additional meeting held with the Deputy Director Forestry, Ministry of Agriculture, who confirmed that the Forestry department has not confirmed any occurrence of the Mangrove forest or the Nypa palm. The reason for this being the fact that the main River in the state i.e. Imo River is fresh water.

SECTION 3

Suggested preferred sites with detailed description for the proposed reforestation programme

The following steps were taken in obtaining a final list of sites for proposed reforestation programme:

1. A steering committee workshop was held with government agencies, community members, project committees including the oil companies. The committee members then proffered sites for the coming reforestation project based on the information provided (through site visits) and decisions taken on the advice of experts at the meeting.

2. An outline of the committee's suggestions was produced in hard and electronic copies and been included in the final report.

MANGROVE WORKING GROUP EXPECTED OUTPUTS.

- All project sites assessed. All data relating to sites are validated.
- Awareness already created on the need to conserve the Mangrove forest.
- Data collected by completion of questionnaires and information fully analyzed.
- Level of awareness and public suggestions noted.
- Sites for reforestation Programme identified with detailed description.
- Commitment letters obtained from all stakeholders especially the oil companies.
- Memorandum of Understanding signed by all stakeholders.
- Firm commitment obtained from the State government officials of the coastal states to create/conserve Mangrove reserves.

RECOMMENDATIONS

Subject to the resolve of the mangrove working group, below are the suggested mangrove sites in the coastal states and are the most impacted sites.

3.1 AKWA IBOM

The mangrove forests in Akwa-Ibom are thick and rich in biodiversity and the advent of Nypa palm is also on the increase. The following sites are where the mangrove forests in Akwa-Ibom can be found:

- Oron
- Udunguko
- Mbo
- Urue Effiong/Oruko
- Opobo
- Uruan
- Ikot Abasi
- Essien Eket
- Ibeno
- Eastern Obollo
- Parrot Island

However, after the site visit and following the decision of the stakeholders after the meeting, the following sites were suggested for the upcoming reforestation programme:

Most Impacted Sites

1. Oron
2. Udunguko
3. Mbo
4. Ikot Abasi

(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 whose members are essentially fishers, high fish and shrimp production most of which require drying, and booming fish and shellfish markets.

Fig 43- 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.

(2) *Oron*

This LGA shares much in common with Mbo even as they are neighbouring LGAs. The mangroves in this are have been greatly depleted.

Because this 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 44-Young Mangroves along the Oron Beach.

Fig 45- Young Mangrove side by side with Nypa palm

(3) *Ikot Abasi*

The dominant mangrove species in this area is *Avicennia africana* (black mangrove).

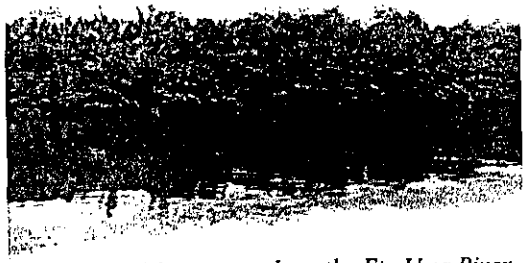


Fig 46-Young Mangroves along the Eta Uwa River

Fig 47-Young Mangroves along the Eta Uwa River Showing Nypa displacement

Fig 48- Nypa palm with White Mangrove along the Eta Uwa River

This species has characteristic aerial roots known as pneumatophores, an adaptation to the characteristic anoxic sediments of the swamp. However, the species has been over-exploited, due 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) Udunguko

Mangroves in this area have been seriously depleted. Two main responsible factors are: 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 49- Mangrove depleted area by the Oil Company.

Eastern Obolo- Proposed Forest Reserve

This area is the **richest in mangrove forests and thus is recommended for establishment of Forest Reserve and not as a site for reforestation.** 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 50- Mangrove forests in Eastern Obolo

Fig 51- Mangrove forests in Eastern Obolo

Fig 52- 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.

3.2 CROSS RIVER STATE

The mangrove forests in Cross-River are found in the following communities:

- Akpabuyo
- Calabar South
- Odukpani
- Bakassi
- Calabar Municipality

Site Most Impacted

1. Calabar South
2. Bakassi
3. Akpabuyo

(1) *Bakassi*

The mangroves in this area are 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 53-Mangrove forests along the river bank of the Bakassi River.

Fig 54. 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 of 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 nypa in our selected community here (San San 1).

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 reserve 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 55-Mangrove trees cut for fire woods at Edibe Edibe beach for commercial uses.

Fig 56-Edibe Edibe Beach heavily infested with Nypa.

With the dense human concentration/population 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 57- 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.

(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.

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 58- 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.

Table VIII: FIELD STUDY METHODOLOGY AND LOCATIONS

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

State	LGA	Name of village	Geo-coordinates
Cross River	Bakassi	San San 1 Fishing Port	04°47.196N 008°33.711E
”	Akpabuyo	Idundu	05°00.968N 008°23.394E
”	Calabar South	Edibe Edibe beach	04°56.185N 008°18.523E
”	”	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
Akwa Ibom	Mbo	Ata Akpa Ebughu	04°42.873N 008°18.648E
”	Oron	Esuk Mma	04°48.416N 008°15.581E
”	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
"	"	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
"	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

3.3 LAGOS STATE

Executive summary

Lagos State is the commercial city of the nation and is considered the most fast-growing 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. There was no Nypa palm noticed.

Lagos state survey revealed that most mangrove forests are found within 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 on 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. It was observed that when reserves are small, their managers are often tempted to indulge in intensive 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 the 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 catered for.

Preferred sites for Reforestation

1. Ikorodu (Majidun-Awori)
2. Epe
3. Ibeju-Lekki (Ise)
4. Badagry

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

A. Introduction

The name of the mangrove site is MAJIDUN AWORI. Majidun is situated on 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.

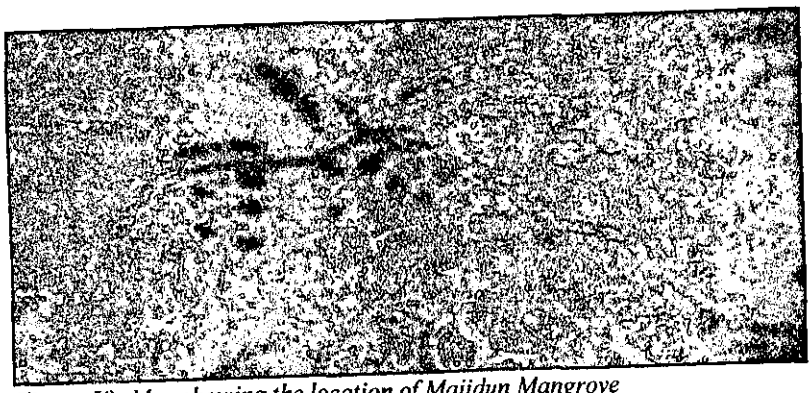


Figure 59- Map showing the location of Majidun Mangrove

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).

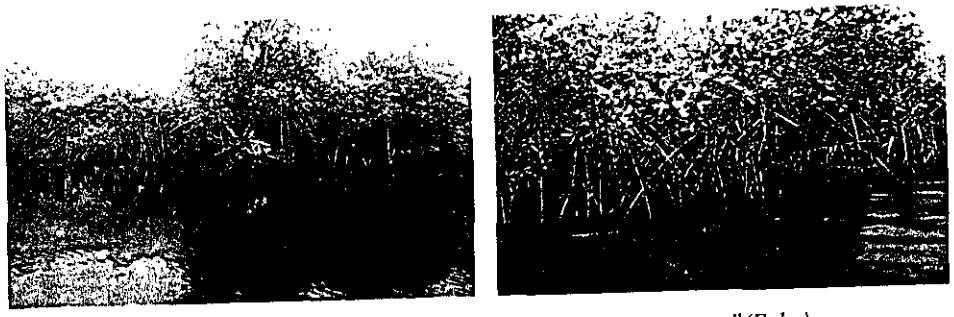


Figure 60 a, b-Predominant Mangrove Specie- "Rhizophora racemosa"(Egba)

B. 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.

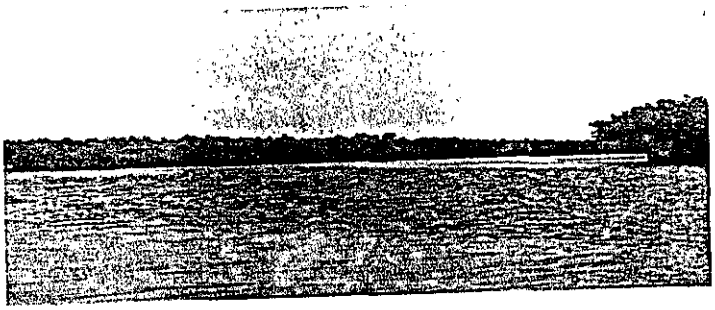


Figure 61- A satellite picture of Majidun Awori River showing the predominant mangrove

Majidun mangrove seperates Lagos from Ogun and the area where it terminates is to the West .

C. 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.

D. 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.

E. Use of the mangrove by 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.

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.

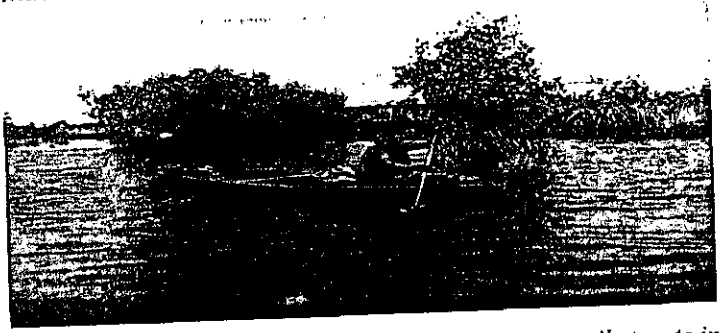


Fig.62 - The women are good fishers and are major contributors to income-earning

The red mangrove is thus mostly utilised as firewood used in drying the fishes for sale. Another major form of deforestation being the cutting of the mangrove to create passages to enhance access to the deeper parts of the forests where it is assumed that the fishes are more abound.

F. Description of the Majidun Mangrove Forest

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 seperates 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 Megalophyla and Mitrigina Ciliata were also encountered. Palm were also seen occasionally.

Fig.63 - Major flora of the Majidun River

-Fauna Types

The inventory (direct and indirect method) of Mammalian, Fauna and avifauna resources of Majidun showed that the bushduck (Tragelaphus Scriptus) were most abundant followed by the 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), and the little sparrow Hawle (Accipiter evgythropus).

Mangrove species found in the river

The mangrove specie found in the river is the red mangrove- *Rhizophora racemosa*. It is the predominat specie found along the entire expanse of the river and is called 'Egba".

G. Current Status /Threat to the Mangrove

The mangrove species are not under much pressure because the activities of the inhabitants there is minimal. The major activities are 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 poverty and the eagerness of the villagers to sell land and even the swampy part of the area for sand filling.

Also, observed unchecked activities of the settlers who live on the opposite side of the river, remain a source of concern. 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.

H. Causes of Mangrove Loss

i. Wood Felling

Fig.64 - The mangrove drawing back further inside due to felling

Fig 65- Some of the community members about to carry out the wood

ii. Use of mangrove tree roots as base of houses

Fig.66- A man seen transporting the roots of mangrove to a building site

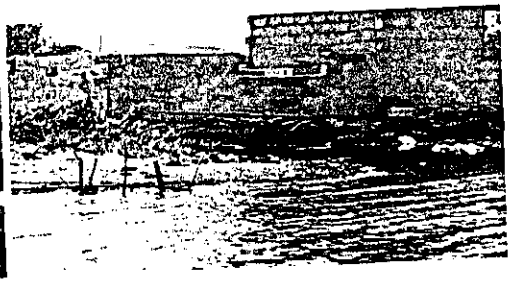


Fig 67 - Roots of the Rhizophora used as base to check against tides

iii. Over-Fishing

Fig.68 - Fisherwoman holding one of the fishes up

iv. Oil Pollution

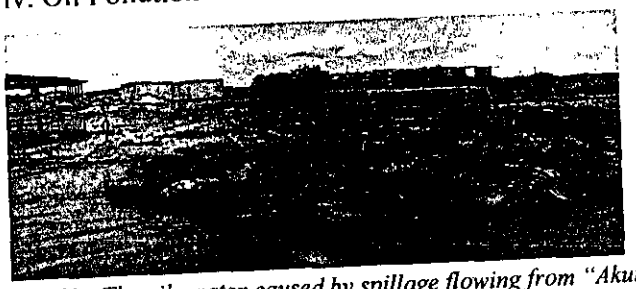


Fig.69 - The oily water caused by spillage flowing from "Akute"

v. Cutting of the trees to create passages

Fig.70 - Artificial passage created by the villagers for easy navigation

vi. Dumping of refuse by settlers cross the community

Fig 71- 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.72 - Secluded area being reclaimed for extension of the local church

I. 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.

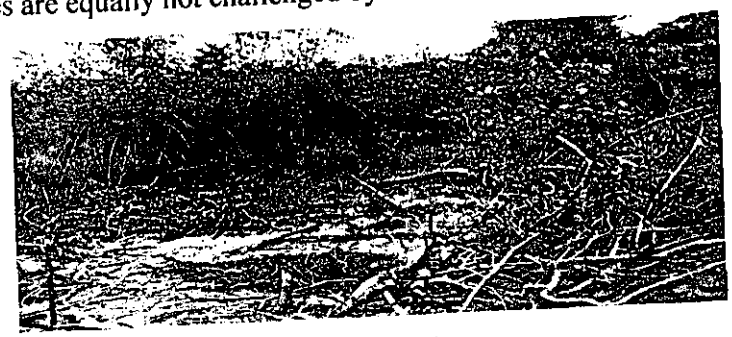


Fig.73 - Heavily deforested mangrove site

J. Conservation measures taken

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 rare its head in this beautiful phenomenon.

Fig.74 - The team with some villagers at a deforested site

2. BADAGRY

The community members of the villages under Badagry are mostly sand diggers/sellers and fishermen. 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 predominantly 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.

The red mangrove specie *"Rhizophora racemosa"* is found in the deeper parts of the villages towards the lagoon.

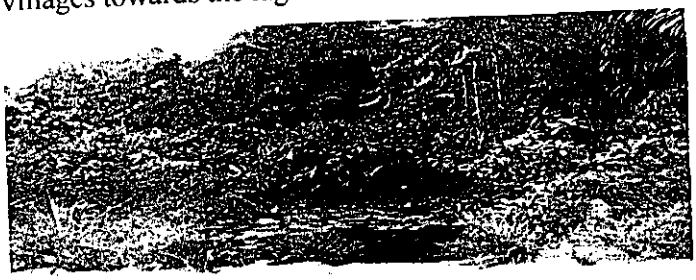


Fig.75 - Major flora of the communities

A. 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. The mangrove is mostly used for: Firewood, building houses and building small rafts. Rhizophora is also being used for medicinal purposes.

B. 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.76- 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 dumped to cover the water until the land is solid enough to build their homes.

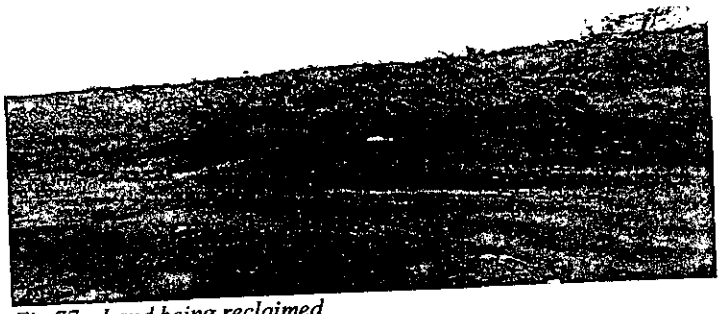


Fig.77 - Land being reclaimed

-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.78 - Stubs of cut mangrove trees

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

Fig.79 - The villagers are predominantly sand fillers-seen here at Badagry lagoon

C. *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.

D. *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. Below is a brief description of the lagoon.

BADAGRY CASE STUDY- OLOGE LAGOON

1. *Background information*- Ologe Lagoon is situated in the Badadgry 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. *Physical characteristics*

2.1. 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.

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

2.2 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.

2.3 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.

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

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, Rhizophora racemosa, Napoleona vogelii, and Nymphae lotus.

Fig 80: Mangrove forest of Ologe Lagoon

2.5 Fauna- About 12 mammalian species are usually found in the reserve. 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 stripped ground squirrel [Xerus erythropus].

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-spured francolin [francolinus bicalcaratus], the plantain eaters [the musophadae], swallows and swift, the hornbills and the finches which are very abundant.

2.6 Communities- The Asepe, mushin and Obele people are of the Awuri tribe while the Ibiye people originated from Lagos and Abeokuta. It is estimated that about three thousand, three hundred and fifty people live within the OLFR and they all speak the Yoruba language.
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 Garri from cassava.

The main crops grown by the farmers are cassava, maize, yam, plantain, sugar-cane, and coconut. The villagers hardly considered the mangrove of much interest and did not appreciate the functions of mangrove to their environment protection. The mangrove is thus cut at random by the villagers as firewood.

2.7 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. *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 within 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.

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 animals, especially the aquatic ones. The fenced botanical garden also contained both native and introduced tree species as well as captive.

Pictures from Ologe Lagoon

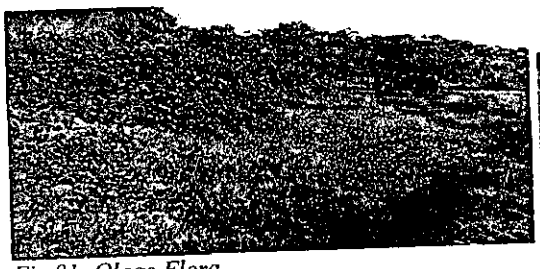


Fig 81- Ologe Flora

Fig.82- Ologe Mangrove from a distance

Fig.83- Ologe Mangrove at a closer distance with few palms resembling Nypa

3). and (4). LEKKI / EPE

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 reside.

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

Fig.84. "Rhizophora racemosa"

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

Fig.85- Rhizophora racemosa found at the back of the palm trees

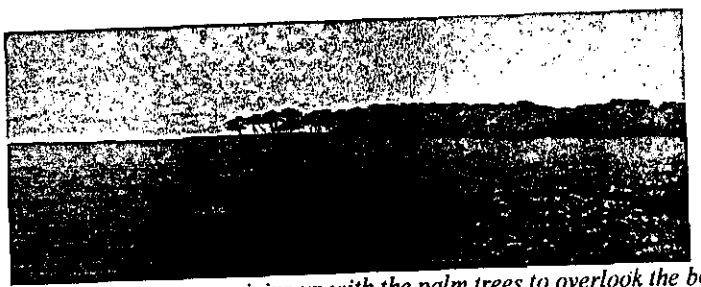


Fig.86- The mangrove joins up with the palm trees to overlook the beach

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

Fig.87- 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. 88- 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.89- Rhizophora is cut and used as firewood (covered against rain with white sac)

MANGROVE SPECIES

The predominant mangrove species in Lekki and Epe is the red mangrove- "*Rhizophora racemosa*".

Fig 90- Rhizophora racemosa seen on all sides

The mangrove is quite abundant as seen above and the rate of decimation is not much in the Government owned sites. However the destruction of the mangrove is high when one considers their destruction for developmental/urbanization purposes.

The mangrove sites in Lekki/Epe expressway are already located in Government Reserves and the aesthetic appearance of surrounding areas is a site to behold, as seen below.

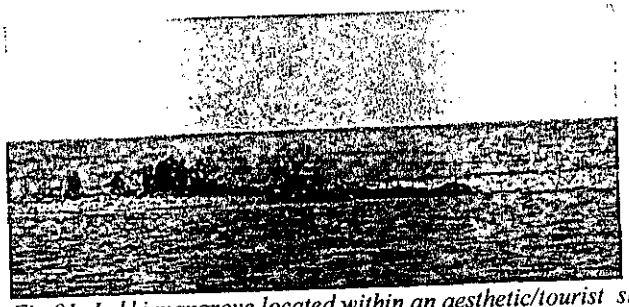


Fig 91- Lekki mangrove located within an aesthetic/tourist site

3.4 DELTA STATE

After the meeting, the following sites were suggested for reforestation:

1. Warri South (Warri)
2. Warri North (Abe Igborodo)
3. Warri Marina

DESCRIPTION OF THE PROJECT SITES

Most of the sites in Delta state are in the creeks and a brief description follows below:

1. Orugbene Creek Areas

At present, the area may be conveniently subdivided into two zones: Orugbene Creek North Area and Orugbene Creek South Area.

a) Orugbene Creek Northern Area

The boundaries are Escarvos river on the north, Obotobe Creek on the East, Orugbene Creek on the South and Akassa on the West. Forcados Island is grouped in this area but it should be realized that the main Orugbene Creek Area is separated from Forcados Island by the Muri Creek.

Observation on the Northern Area

Burutu is on an Island and the Creek South of Burutu opens into the Escarvos Estuary on the East and West of Burutu mainland. The purpose boundaries will bye-pass Burutu Island by this Creek, which is winding and is approximately 8km.

Apart from Burutu which is thriving and growing, it is also the local Government Headquarter responsible for the area under reconnaissance.

b) Orugbene Creek Southern Area

Orugbene Creek on the North Nikroragha Creek on the East and South East and Ramos River on the west form the natural boundaries. Principal settlements are Orugbene, Ekogbene, Grangbene, and Dilobarugbene.

Observation on the Southern Area

The presence of four native settlements in the area, apart from fishing and tapping, camps should be considered at this stage. The native women produce salt from roots of mangrove trees.

2. NDORO FOREST AREA

The original plan was to cut a line southwards from Ndoro market for approximately 25km to a point west of Ojovbo. This cut would then form part of the Eastern Boundary of the area.

These are also water boundaries. It is bounded on the North by Nikkroagha Creek, on the east by series of Creeks liking Ndoro market to Ndoro Town, on the South and South East by Brass Creek and on the West by Gbetobo Creek (see map)

Observation

The Creek between Ndoro market and Ndoro town is thickly lined by fishing settlements- about 160 in number. Ojovbo which is far outside the proposed project limits is a thriving farming community.

General

Vegetation: Swamp forest vegetation predominate: ***Avicennia nitida*** and ***Rhizophora racemosa*** occur abundantly, with Avicennia in areas with tidal flooding and Rhizophora further inland. Raphia palms are found mainly in marshy areas of the swamp forest. These fairly sheltered areas a have been seriously depleted as a result of oil and gas exploration. **Elaeis guinensis** (oil palm) occupy the firm lands at the centre on the raised area. Generally, pockets of Raphia palm and ''Sisal'' plant communities occurs along the Creeks and in the Mnagrove Swamps. Other forms of vegetation include Mitragyna Spp, (occasional) Cleistopholis patens and Lophira

Soils: The visible parent material of the soils profile is black or dark grey silt or alluvial deposits. This is overlain with sand which varies in colors from light brown to grey in

color. Vegetation and debris accumulate on top of this sand and generally rot under anacrobic conditions to give rise to '' peat'' which is fibrous, tough and dark brown in color. This top layer or peaty material occurs extensively in both mangrove and Raphia plant communities. But the essential feature is that whenever the soils are exposed by waves and tidal currents, it is the peat profile that is exposed. ''Peat materials on top is succeeded by layers of sand deposits followed deeper down by alluvial deposits''.

Description of the mangrove forests in these creeks

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

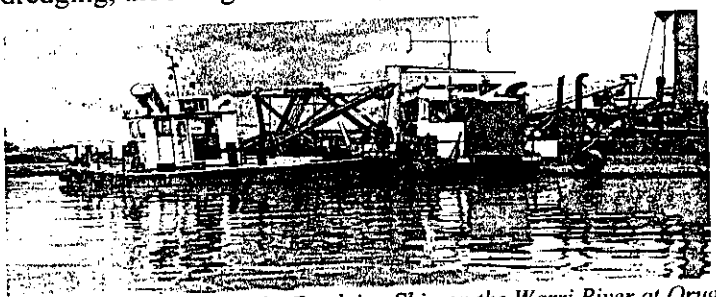
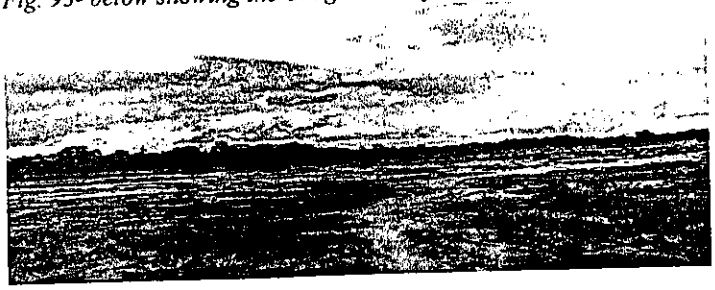


Fig. 92- above showing the Dredging Ship on the Warri River at Orugbu Creek.

Fig. 93- below showing the Orugbu Sand fills (N 05.30.018 E 005.42.590)



Sand gotten from dredging of the Warri River from the Orugbo Creek was used for the sand filling as shown in figure above.

At the Odogene Creek N 0.5.30.118 and E 005.42.734, the mangrove was not affected by any form of human activity. When the reason for this was inquired, it was discovered that this was as a result of religious beliefs attributed to the trees. The site had being abandoned over many years due to human migration.

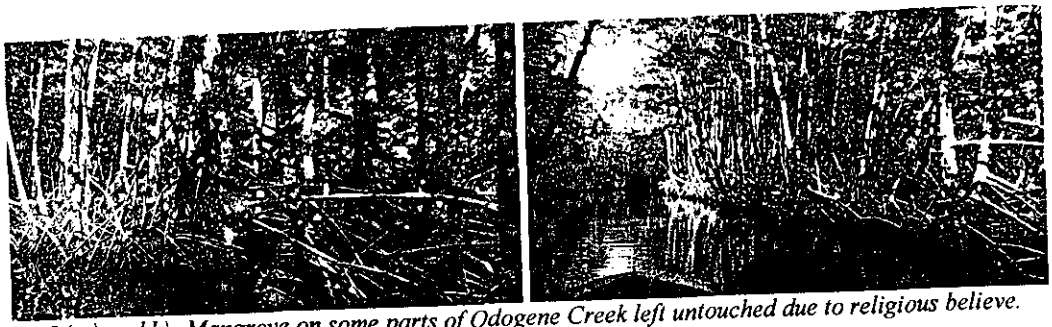
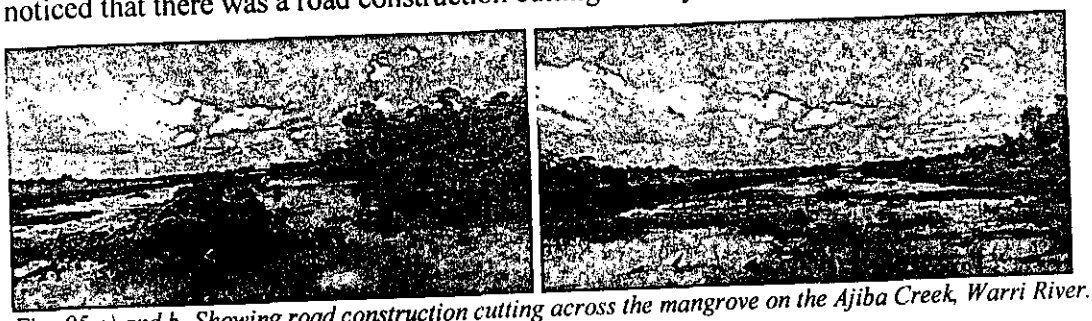


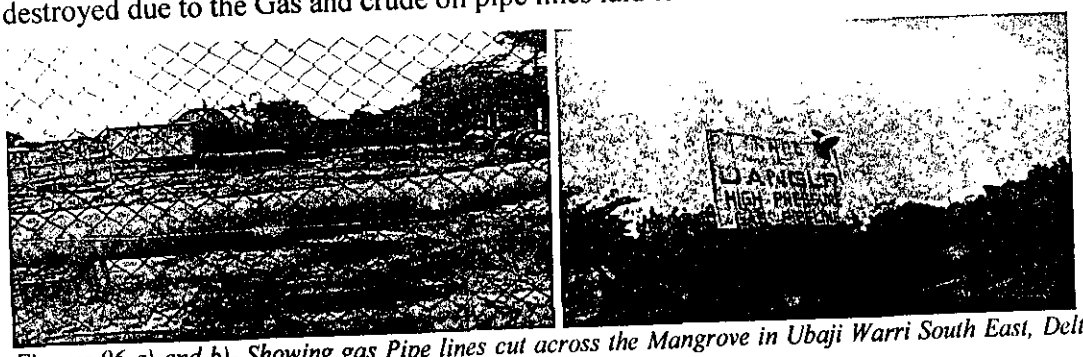
Fig 94 a) and b)- Mangrove on some parts of Odogene Creek left untouched due to religious believe.

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.



Figs 95 a) and b- 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.



Figures 96 a) and b)- 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.

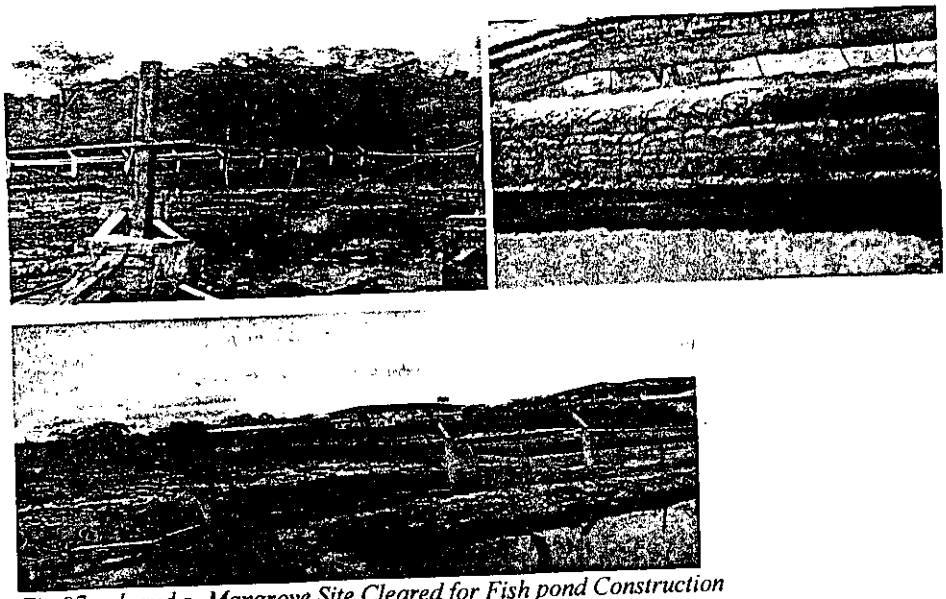


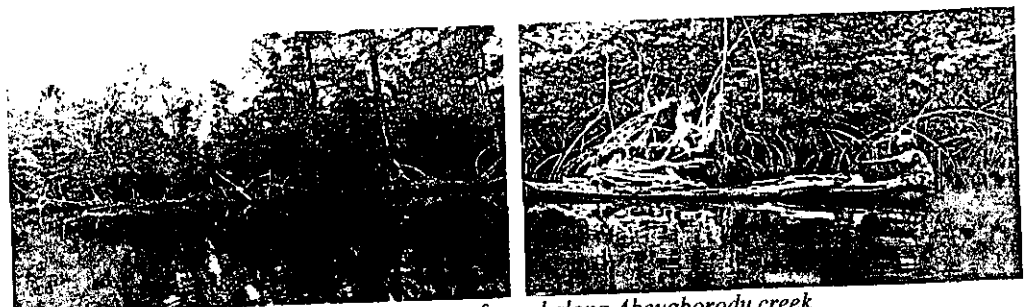
Fig 97 a, b and c- Mangrove Site Cleared for Fish pond Construction

Bini River I (From the Sapele End).

The Benin River had mangrove along its course, from the Sapele End, Sapele LGA, Delta State. The Starting point was at Ugbekoko N 10.00000 and E.005.34.486; heading towards Abeugborodu town in Warri South East LGA.

Fig 98- Abeugborodu Town.

Along the Abeugborodu creek, the mangrove vegetation was noticeably flourishing even though felling of the trees by natives continued.



Figs 99 a) and b)- showing felled mangrove of wood along Abeugborodu creek

Fig 100- Abeugborodu Salt Making Camp (N 0.5.56.436 and E 005.31.633.

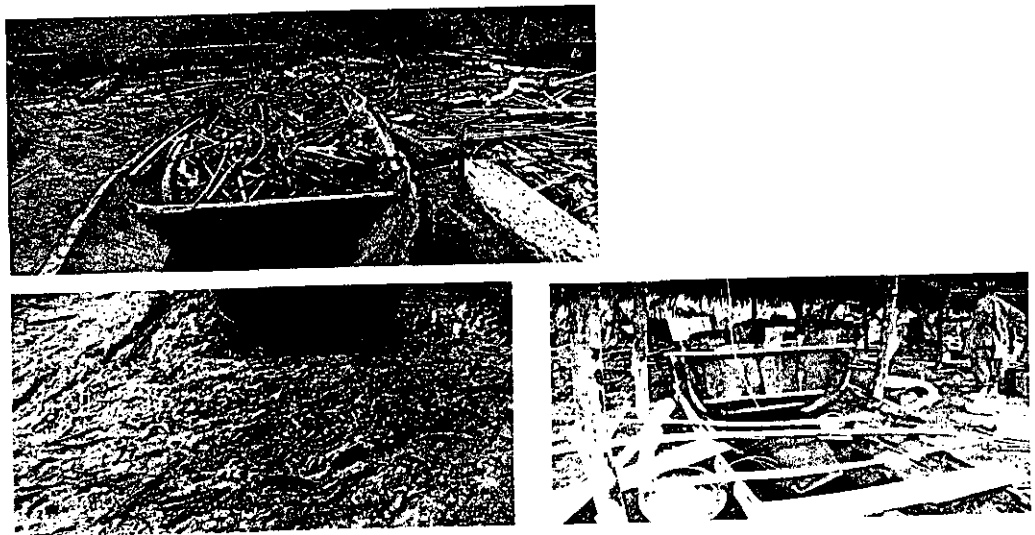
One of the uses of the mangrove prop roots in Abeugborodu is in the making of native salt; the process of Salt making using the prop roots of mangrove is as follows.

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 dry and resulting salt is sun dried.

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



Figs 101 a-c Native Salt process

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

Fig 102- 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 103- 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 conflict which sent the Dudu people away from the area were some of the possible reasons.

Fig 104 a-c Mangrove reserve in Dudu village off the Gwato Creek (Bini River) N0.5.56.412 and E005.15.317

Status of the Mangrove in the State

i. 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 Benin rivers. Dredging actively imperils stability of

the edge of river channels thereby weakening the base of mangroves which eventually fall 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.

Fig 105: Dredging of the Ugbuwangue creek leading into the main channel of the Warri River

Fig 106: removal of dredge spoil from Gere, Orugbo opposite the Port of Warri.

Fig 107: Physical and chemical changes attend dredging of river channels. This plate shows turbidity along the Orugbo-Ode-Itsekiri creek during this survey.

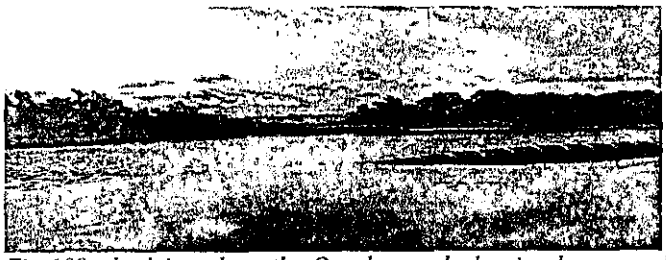


Fig 108: dredging along the Orugbo creek showing booms and destroyed mangrove, mainly Rhizophora along the banks and sand-filled area.

ii. *Road construction in 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.

Fig 109: construction of new road network through mangrove swamp in WSLGA

iii. *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 a Kaduna. In places such as Warri, terminals are also provided for the receipt of imported heavy crude oil from Venezuela which is hen pumped to designated refineries.

Fig 110: Gas pipeline from Delta state to Kaduna at a point near Egbokodo, WSLG.

iv. *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 areas 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 office buildings (Texaco and Chevron offices), moorings (B+B; Beger+ Bilfinger) in Warri.

Fig 111: Portion of Market Road showing mangrove poles and sawdust on sale along the Warri marina. The Warri marina was a mangrove shoreline.

Box 3: The 'Warri marina'; over a century of mangrove removal

The case of the Warri Marina: Mangrove loss due to Uurbanization, Pollution

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.

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 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.

Fig 112: 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.

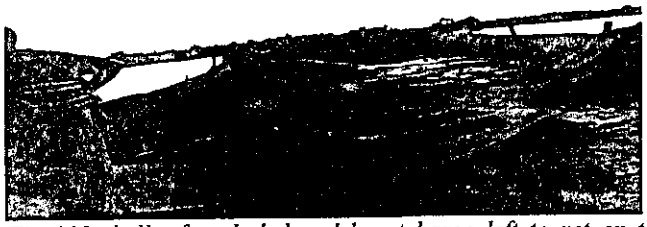


Fig 113: hulk of exploded and burnt barge left to rot on the Warri marina the barge was originally carrying petroleum product. Such items litter the marina and serve as a constant of pollution I the mangrove ecosystem.

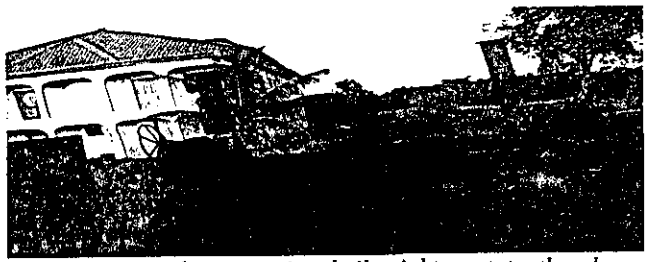


Fig 114: a modern mansion built right next to the shore along the warri marina. Notice imperiled mangrove vegetation along a creek in the background.

v. *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.

Figures 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.

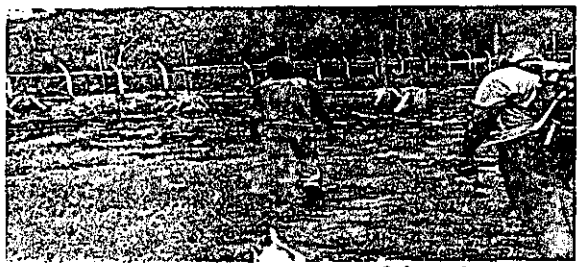


Fig 115: conversion of mangrove to fishpond

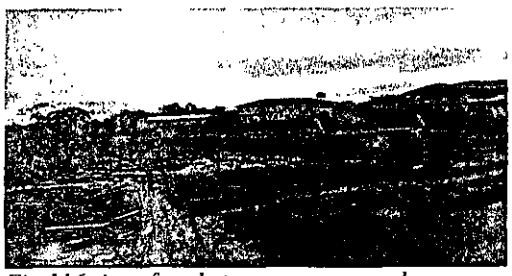


Fig 116: interface between mangrove, human habitation and fishponds

Fig 117: detail of chikoko use in fishpond construction

Level of Dependence on the Mangrove by Delta 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 traditional 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").

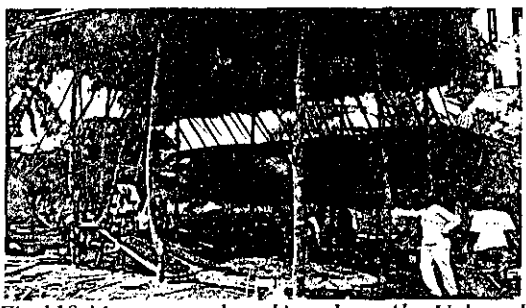


Fig 118:Mangrove salt making plant, Abe-Ugborodo WNLGA Fig 119: Timber size mangrove trees

Mangroves 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.

3.5 EDO STATE

During the meeting, it was suggested that no reforestation needs take place in Edo State as the mangrove forests (across Benin River) is more encompassed in Delta State and as such needs more of conservation. However a visit to Gelegele suggests that such area needs reforestation as the mangrove is being utilized daily by the community members.

Description

The level 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 narrow strips 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.

Status of Edo state mangrove

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 River 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.

While advancing towards the Gelegele creek Ovia North East, Edo state there was no visible sign of mangrove. Further investigations revealed that this is due to the prevalence of fresh water.

On the Ossiomo River N 06.13.260 and E005.27.794, there was also no sign of mangrove but towards the Atlantic by the boundary between Edo and Delta State, the first Mangrove vegetation occurs. Further into the Atlantic however, mangrove could be visibly observed N 05.58.797 and E005.19.656

Fig 120- Continuous Mangrove at the Boundary between Edo and Delta State in the Ossiomo River.

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 due to oil pollution and tree and root harvesting for a variety of local uses by the community members.

The most impacted sites are those due 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 in Edo State. Even among oil industry operators, there is evidence of agreement 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.

Fig 121: First lone stand of Rhizophora on Ossiomo River, Edo state few nautical miles to the exit into Benin River

Level of Dependence on the Mangrove by the Edo People

Like the people of Delta State, the different species provide goods and services such 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").

However, their level of dependence is not as high as that of Delta State.

Fig 122: Fruit of Raphia used as attractant/bait for shrimp in shallow mangrove creeks.

3.6 RIVERS STATE

Rivers and Bayelsa are the two States with the highest production of crude oil in Nigeria. Consequently, the mangroves in both states have suffered the highest depletion rates as a result of their daily activities. Due to the siting of most of the oil companies' operational head-quarters in this state, there is massive movement of people and urbanization in the state with most of the mangrove species now found in the interior parts of the state. These mangrove species are found abundantly in many communities as listed below:

- Bonny (Cawthorn Channel, Kala- Ibiama)
- Febiere
- Finima
- Okirika
- Ogu-bolo
- Opolo
- Andoni
- Port Harcourt

Sites Most Impacted

1. Andoni
2. Bonny
3. Opobo

Mangrove Conversion by Oil Companies

Most of the mangrove in this state is destroyed to enable the laying of pipelines. 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 IX: Mangrove Conversion in Rivers* State by Shell Petroleum

Seismic operations	56,400km of seismic lines	56.4km^2
Drilling	349 sites	4.5km^2 1
Production	70mk of flow lines	0.5km^2
	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

MANGROVE SITES IN RIVER STATE

1. <u>Alakiri or Gold coast</u>

Alakiri is a community rich in mangrove. The site needs urgent reforestation because the mangrove forests have fully been decimated by:

- Nypa Palm
- Activities of oil companies
- 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 123: Picture showing how the mangrove forests are being displaced by Nypa palm at gold coast.

Fig 124: Site showing mangrove deforestation

Fig 125: Mangrove site coimpletely displaced by the Nypa palm

2) <u>Cawthorn channel; Opobo; Andoni</u>

The mangrove forests in these areas are thicker and the forests have some Nypa species. Some mangrove marine species like crabs and shrimps were seen on the mud banks. The white mangroves were more dominant here than the red mangroves.

Fig 126: Mangrove forests that can be seen on the way to Cawthorn channel.

Fig 127: white mangrove forests on the way to cawthorne channel depicting the fast eroding mud banks.

3) Bonny

The mangrove forests in Elem Sangana were dominated by Red mangroves. The mangrove trees has been heavily depleted due to activities of oil companies (pipelines, frequent dredging etc.).

Fig 128: Dredging activity by the oil companies

Fig 129: Red mangrove forests along sangana route.

3.7 BAYELSA STATE

The mangrove forests of Bayelsa state are mostly thick and dense with sparse mangrove seen in a few locations.

Mangrove Communities- There are three islands in Bayelsa where the mangrove abound and the largest is Kongho. However there are about 120 fishing settlements asides from the three islands.

Suggested Sites

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

1) AKASSA

The mangrove is found mostly in the Northern part of the community which is fully covered by mangrove forests.

Past Projects- There were attempts by the Federal Ministry of Environment in 2003 to identify RAMSAR sites but this project is yet to be given full attention. The NCF also has a project in Akassa.

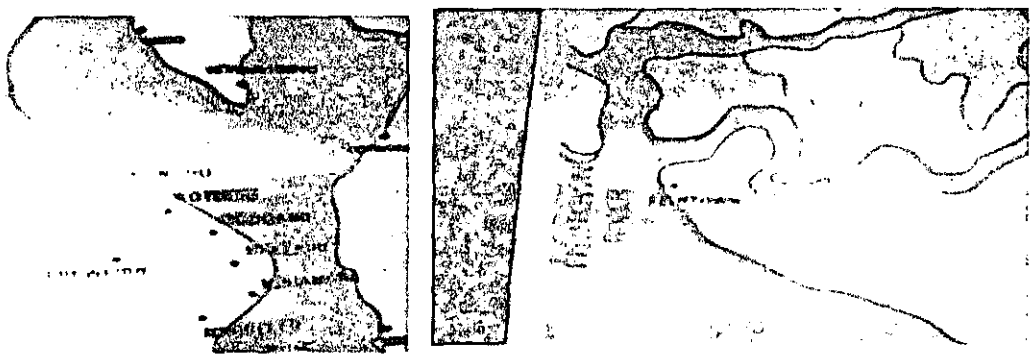


Fig 130: Map of Akassa

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. It is interesting to note 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.

Causes of Deforestation- Despite the use of the mangrove as fuel by this community, there is no doubt that the 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. In that year there was an area in Akassa which 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.

Need for Reforestation- The perception of the villagers concerning the oil spillage and consequent decimation of their mangrove forests and associated species needs urgent attention. They expressed concern 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.

KONGHO

The mangrove forests are sparse and interspersed with date palms and other non-mangrove species. Desecration was noticed with some felled trees clearly evident. A pipeline laid by Nigerian Agip Oil Company (NAOC) 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.

Status of the mangrove forests

The white mangroves are more dominant than the red mangroves here. Fresh and saltwater clams are seen clearly living in the mangrove ecosystem as well as a variety of birds. The chikoko mud which forms the base of the mangrove forests were in well formed layers and the estuary where the sea opens up to the ocean is also visible.

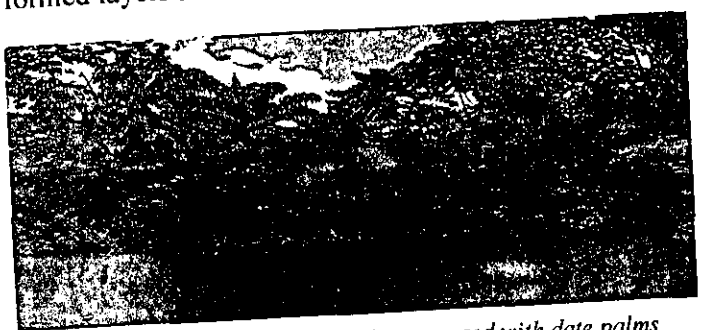


Fig 131: Sparse mangrove forests interspersed with date palms

Fig 132 a, b: Thick vegetation of white mangrove trees on the akassa route

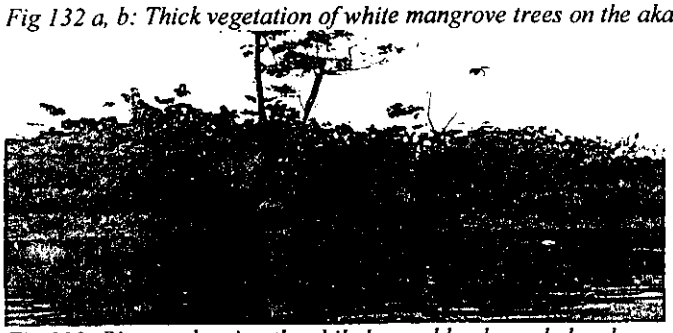


Fig 133: Picture showing the chikoko mud banks and also desecration by spillage

2) <u>NEMBE</u>

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- Small patches of Nypa palm are seen very near Nembe. It was later learnt from the villagers that Nypa just started to appear recently and is displacing their mangrove gradually.

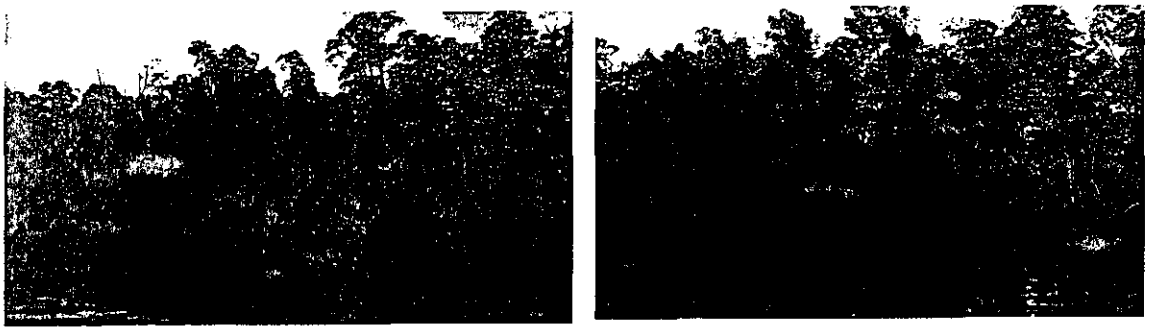


Fig 134 a ,and b: Pictures of very thick red and white mangrove forests along the way to Nembe.

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

Medicines (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 matter always came up during the visits.

Economic and Cultural Values- The mangrove trees are being only consumed locally by the community members to take care of their local needs. 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.

3) TWON BRASS

Brass is the largest and most developed of all the islands visited in Bayelsa. The red and white mangroves are found in almost equal proportion on both sides of the waterways from Nembe to Brass and the mangrove forests are very thick. Small patches of the forest were seen to be destroyed due to oil spillage.

Fig 135: Thick mangrove forests found from Nembe to Twon brass

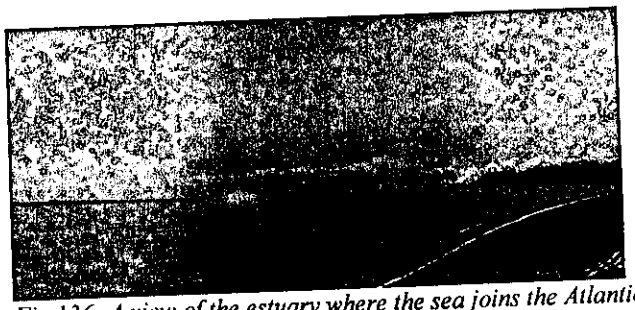


Fig 136: A view of the estuary where the sea joins the Atlantic Ocean

4) OPOBO

During visits made to the mangrove swamp of Opobo community, it was noticed that the occurence of Nypa was more in this community. An attempt was made to delineate the extent of Nypa palm invasion and preliminary results indicated that nipa palm have taken over most of the mangrove along the water front. However, it cannot be said that the mangroves, which are still found in abundance, have been completely displaced by the Nypa palm.

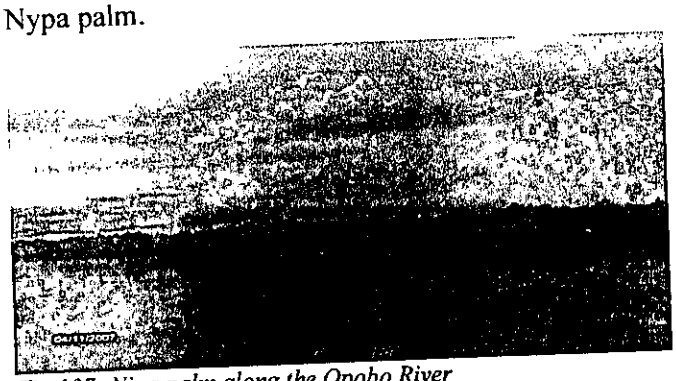


Fig 137- Nipa palm along the Opobo River

3.8 OGUN STATE

Executive Summary

Ogun State is one of the Coastal states of the Western part of Nigeria. The headquater is in Abeokuta. The state is endowed with mangrove forests which are only found in the river-rine areas, a long distance from the city. 75%-80% of the Mangrove is found in the Ogun Water Side Local Government Area (LGA), but there are patches in the following areas-Ipokia LGA and banks of Ogun River.

It was discovered that the mangrove predominantly seen in Ogun State is the Red Mangrove- *Rhizophora racemosa* (known as *"Egba"* in Yoruba land). 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 properties of the roots as silt builder and conservation of the soil in order to prevent flooding and lagoon surge is well known, 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.

There has been no media publicity about the conservation of the mangrove in the LGA, and the villagers have little regard for the mangroves because it is not considered one of the economic trees in the LGA.

The mangroves in Ogun State are found in the following areas:

- Water Side LGA (Makun, Odeomi)
- Upokia LGA (Tony Island)
- Ogun River (Baals)

Sites Most Impacted

1. Ode-Omi
2. Makun-Omi
3. Tongeji Island

Below is a general description of Ogun Waterside Local Government.

Ogun Waterside Local Government Area

The red and white mangrove are not readily seen on the journey from the mainland to the waterside. Below are pictures of the common vegetation seen:

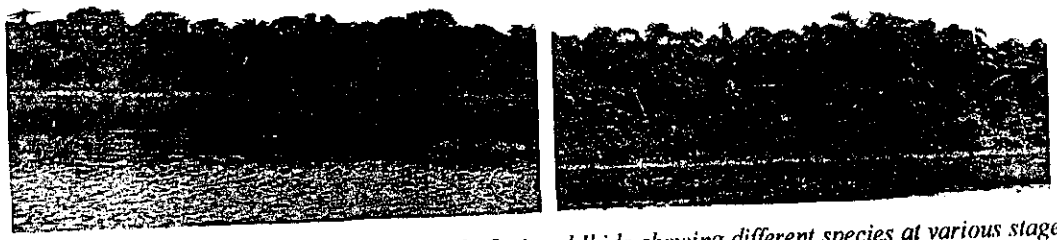


Fig.138 (a) & (b) Diversified wetland of Ode Omi and Ibido showing different species at various stages of development - Fern, ficus, Costus afer,Palisota, Rhizophora spp.

However, several mangrove trees can be seen along the villages. These were the red mangrove and they were still young. However, there 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 139 (a) and (b)- Young Mangrove forests in Makun omi

I. ODE-OMI VILLAGE / MAKUN COMMUNITY

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

Fig 140 (a) & (b)- Ode-omi Community

Although the mangrove is not easily found in the centre of Ode-omi, these mangrove species are found in Osho water in the interior part of the village and communities surrounding it.

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 stands on its own.

Major Occupation: The people of Ode-omi are mainly Rice-farmers, Fishers, Cassava farmers, Vegetable sellers, Banana sellers, and Coconut farmers. The women are very enterprising and collaborate with the men to carry out most of their work. Most of the women are petty traders. Others are fish farmers and sellers (who catch the fish themselves) and palm-oil producers/sellers.

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"*, also known as "egba" by the community.

Uses of the mangrove: The mangrove is predominantly used for building of houses and firewood; the latter being the most prevalent use. The reason for the few uses is perhaps due to difficulty in transporting mature mangrove as the latter is found in abundance only within the inner part of Ode-omi; such as at Ilete which is only assessed by range-rovers

or days of trekking. In the latter place, more uses are seen some of these uses are given below:

- Building of canoes
- Building houses
- Firewood
- Timber for sale- some of the mature trees are cut into logs and shipped to nearby Lagos for sale.
- Smoking of fish
- Roofing of houses
- Medicinal uses- The detailed use of the leaves of the red mangrove for new born babies and their mothers were given during our previous visit to the community.

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; Flora: The fauna of the community comprises mostly of fish, crabs and reptiles. Fish is the major fauna found in the community and constitutes the livelihood of a major part of the population. The flora consists of the above mentioned trees along with mangrove species and associated flora.

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.

II. 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 141(a) & (b)- Ibudo village

The mangrove was only seen in an area just before the entrance of the village.

Fig 142 (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.

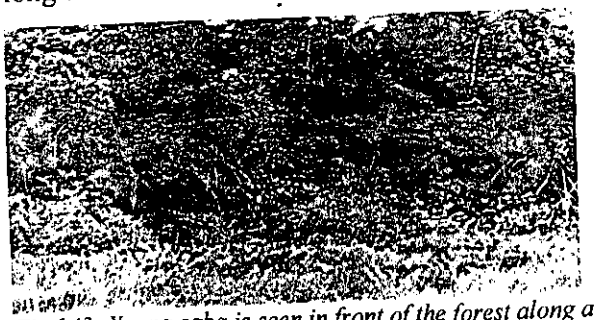


Fig 143- Young egba is seen in front of the forest along a short stretch

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

Liquified Natural Gas" Project (OLNG) found within the free trade zone of Ogun State was just commissioned recently by the former President (Olusegun Obasanjo).

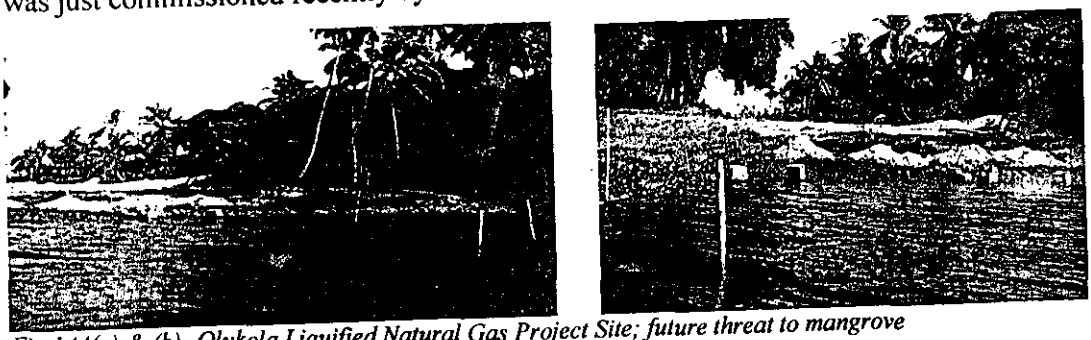


Fig 144(a) & (b)- Olukola Liquified Natural Gas Project Site; future threat to mangrove

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

III. 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 starts from Lekki (Lagos State) from where you proceed to Etiosa. Then we passed through Eleko junction and on to Magbon. 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. On arrival at Ode-omi, it takes another hour to get to Ilete village

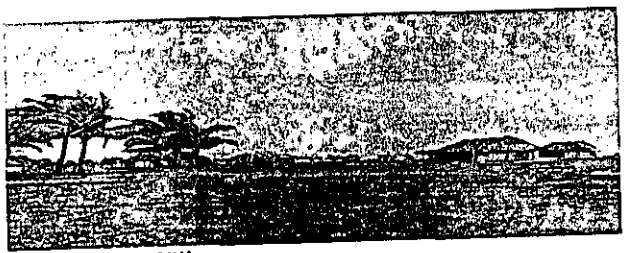


Fig 145- Ilete Village

Land Ownership- The Ilete community owns their land and even the forests are owned by them. 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, the villagers 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.146- 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 147- Young shoots of Red mangrove (Rhizophora racemosa)

And as mature mangrove:

Fig 148- Mature Red mangrove

Perception of the mangrove- The "egba" is usually allowed to grow 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 these mangroves 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 as most villagers who are not strong enough to cut the mature trees prefer to cut and use other less energy-demanding trees.

Fig 149- Red Mangrove is the predominant flora of the community

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

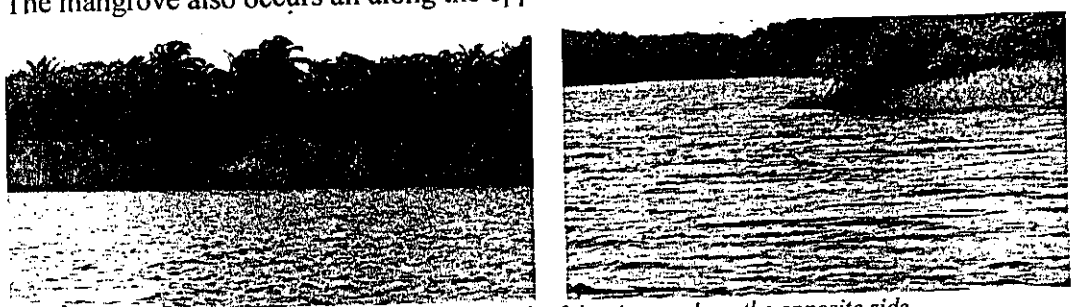


Fig 150 a & b- Egba is seen along the entire stretch of the river and on the opposite side

Uses of the Mangrove- The red mangrove is used for

- Building of houses
- Bait for catching of prawns, and crayfish
- 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 151- 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 council. 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 species 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. The fish had some traditional beliefs attached to it- the mentally deranged people are not allowed to eat the fish.

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 fish is 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 152- 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.

Pictures of the Mangrove Forest

Figs 153(a), (b), (c)- Ilete mangrove forest

Fig 154: Deforested Site

3.9 ONDO STATE

Most of the Mangroves in Ondo State are concentrated in Ilaje Local Government Area. There are also patches of mangroves in Ese-Odo LGA. At Awoye community where we have sea incursion which led to high level of siltation, it is the presence of the white mangroves at right side of the community that offered high resistance to the sea up-surge thereby preventing the coastline from being further eroded. Frequency occurrence of siltation had made the Awoye people to relocate about six (6) times.

Ondo State is one of the oil producing states of Nigeria and comprise of people of rich culture and heritage. The mangrove forests of the State are found in the oil producing areas of mostly 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 locally as "Egba"-Red mangrove, "Sekele"-White Mangrove, and "Opejaja"- Nypa palm. Below is a comparative picture of the red and white mangrove:

Fig 155- Comparative picture of the White (left) and Red (right) mangrove

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 purposes and in some cases, medicinally in the cure of the malaria, which is the most common ailment in the coastal areas and indeed Africa as a whole.

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 resources over which they have control i.e. fish, crabs periwinkle etc, as well as the mangrove trees they are blessed with.

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 incusion makes it a top priority that action is taken soon to prevent the total loss of the 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)".

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]

The neighbours are the ikate; ijaw; itsekiri.; bini; and ijebu.

The white mangrove (sekele) were the predominant species seen in one of the nominated sites Awoye, with the 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.

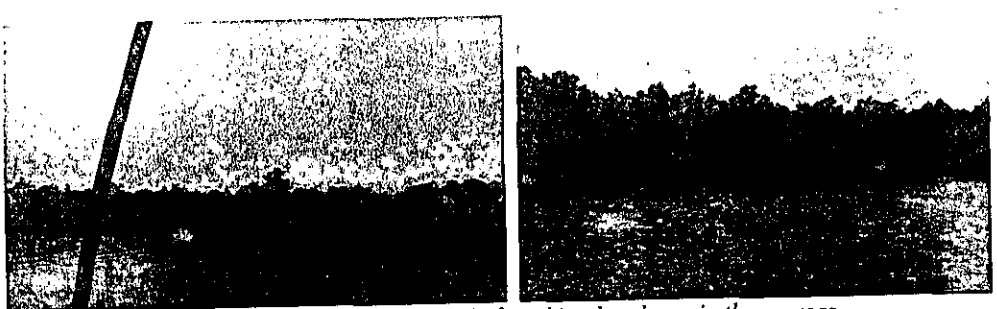


Fig 156 (a) & (b): White mangrove ("sekele"); found in abundance in these areas

However in yet another part of Ilaje, the red mangrove are the predominant species found; for example in the second and third nominated sites Ipepe and Ayetoro.

The sites suggested for the planned re-forestation programme fall into the above LGAs.

(1) Ilaje LGA

Ayetoro

Awoye

Ipepe

(2) Ese-Odo LGA

Gbekebo

Apata

Arogbo

(1) Ilaje Local Government Area

(i) AWOYE COMMUNITY

This is by far the most populous community in Ilaje. Awoye was seriously threatened with sea incursion. This has made the people relocate from their original settlements 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 157- 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.

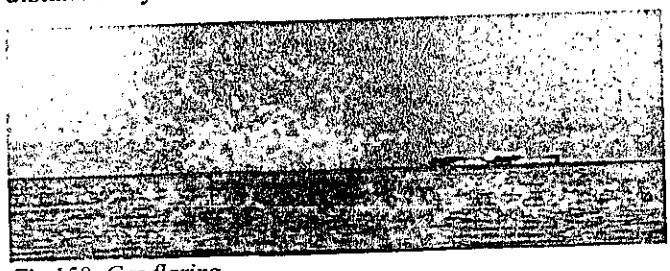


Fig 158- Gas flaring

Initially the villages under Awoye were not all in this concentrated 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 159-Oil spillage seen in water;

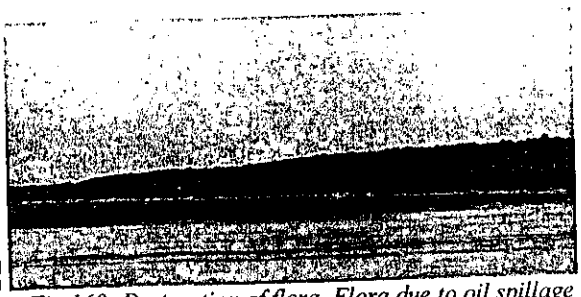


Fig 160- Destruction of flora, Flora due to oil spillage

The oil is seen in the water and is quite close to the mangrove forests of the community. The marine life of these communities were also affected and since fishing is clearly the major occupation of the area, the villagers were forced to keep moving. However if nothing is done about the situation in the next few years, then the biodiversity of these communities will be lost.

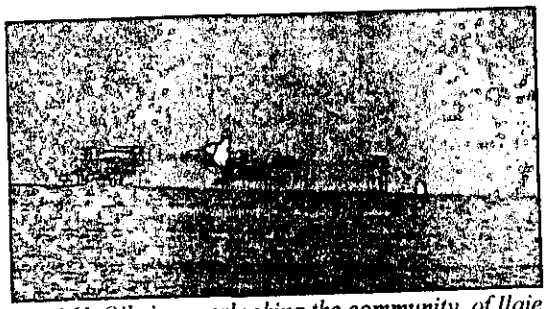


Fig.161-Oil rigs overlooking the community of Ilaje.

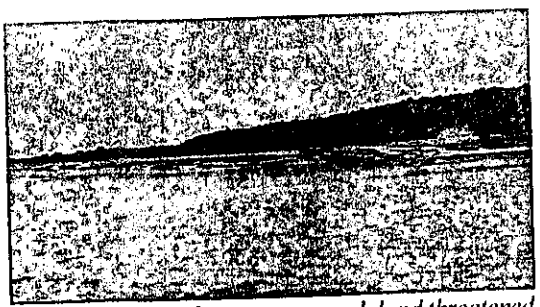


Fig.162-Expanse of mangrove marsh land threatened by constant oil pollution and ocean surge

When questioned, the villagers said at the rate their water was being gradually "poisoned", they may not be found at their current location when reforestation stage comes as they may be forced to relocate again.

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 has, however, affected this mass settlement and will eventually decrease their already poor living standards.

(ii) IPEPE COMMUNITY

In this area, both red and white mangrove co-exist on opposite sides of the village. 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 163- Red Mangrove and White Mangrove seen as if dividing the village into two. Periwinkles are clearly seen in the shallow waters.

The community uses both the white mangrove and red mangrove in most of their building. Below is a typical house built with mangrove:

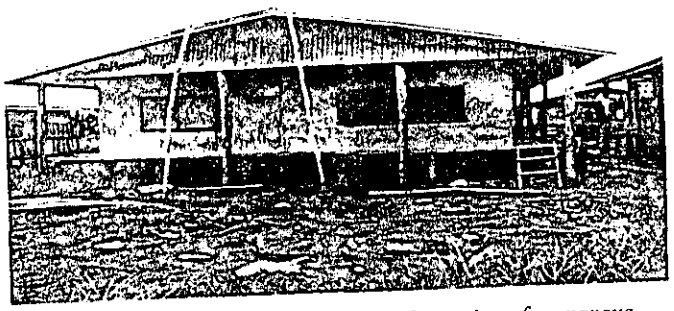


Fig 164- A typical house built with both species of mangrove

-Predominant mangroves species-

I Egba (Red mangrove)

II Sekele (White mangrove)

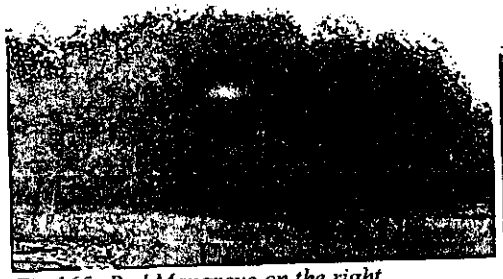


Fig 165- Red Mangrove on the right

Fig 166- White mangrove on the sea side

-Uses of the mangrove:

i. Traditionally for firewood

ii. Building

(a) Flooring of houses -Sekele

(b) Pillar of houses- Egba

iii. Medicinally used for malaria ="sekele": You harvest the leaves and rub together/squeeze 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 ("Sekele")

Fig 167 (a) & (b) - White mangrove used for the flooring and construction of houses

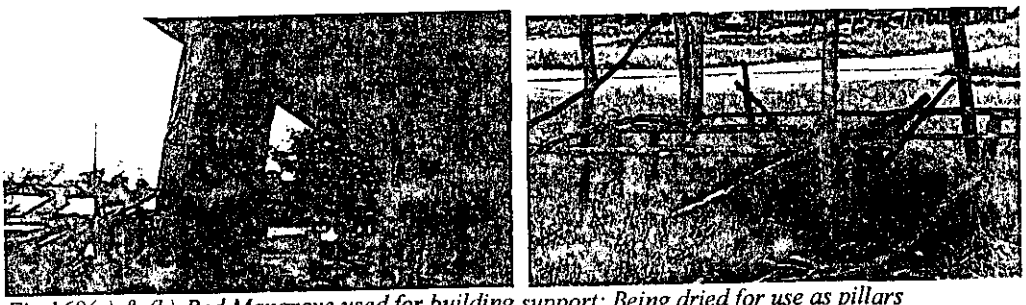


Fig 168(a) & (b)-Red Mangrove used for building support; Being dried for use as pillars

Perception of the Mangrove: The mangrove is considered as an economical tree 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 indegenous 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 (see fig. 163).

Major Occupation- Periwinkle and fish selling is the major occupation of the women while the men are mostly fishermen.

(iii) AJETORO.

This area has been developed into a 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.169- Other flora of Ajetoro

Ayetoro is a more developed community and appeared quite bustling with activities compared to the other communities visited. The people were very receptive and like the people of Zion Ikarrigho, appeared to be well-educated. The white mangrove was the predominant mangrove specie in this community.

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.

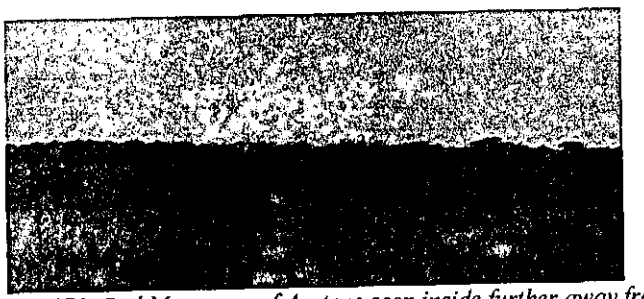


Fig 170- Red Mangrove of Ayetoro seen inside further away from the city

Uses of the Mangrove- The white mangrove is used for Building houses (Flooring and Roofing)

The red mangrove is used as firewood and women cut it and sell so it is sources of income. It is also used as bait for crayfish [used to create artificial habitat to attract the fishes].

Major Occupation- The major occupation of the people is fishing, petty trading and wood selling. The white mangrove serves as their major occupation here as a source of income. However development has turned most of them into petty traders.

Other Areas under consideration:

- ZION IKORIGHO

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

Fig 171: The entrance of Zion Ikorigho.

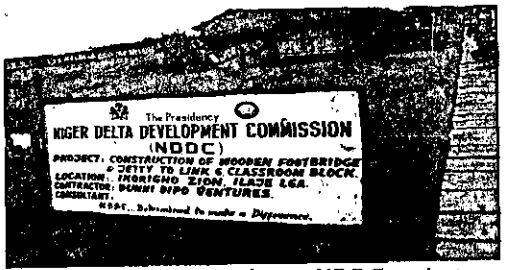


Fig. 172-Entrance bridge an NDDC project

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

Mangrove Species

Apejaja (Nypa Palm)

Egba (Red Mangrove)

Sekele (White mangrove)

Fig 173: White mangrove (Sekele)

Fig 174: Red Mangrove ("Egba")

Fig 175(a) & (b): Nypa palm (Locally known as "Apejaja" or "Opejaja")

Uses of Mangrove:

Firewood

Building

Used as silt for base of houses

Fig 176: Used as Firewood

Fig 176- Root of the red mangrove used on the base of houses as barrier to sea upsurge

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.

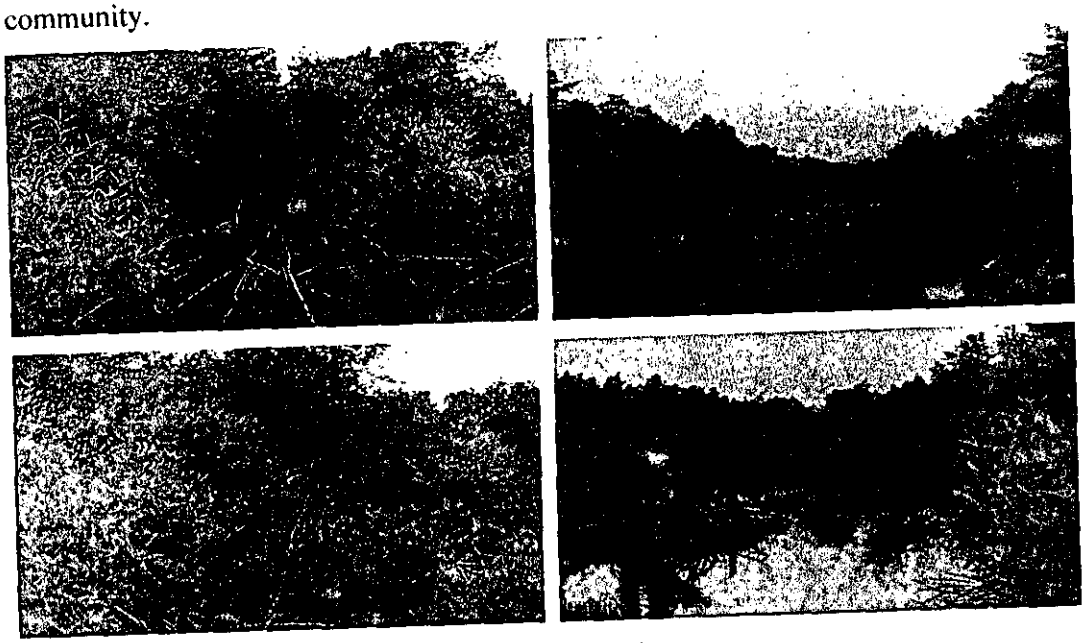


Fig 178(a),(b), (c) & (d)- Sites showing Mangrove deforestation

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.

- AJEGUNLE

Ajegunle was a more populated community with the leadership also seen to be older than that of Zion Ikorrigho. 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 sustenance of these mangrove species.

Fig 179-Ajegunle community

Mangrove Species- The Red and White Mangrove are the predominant mangrove 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

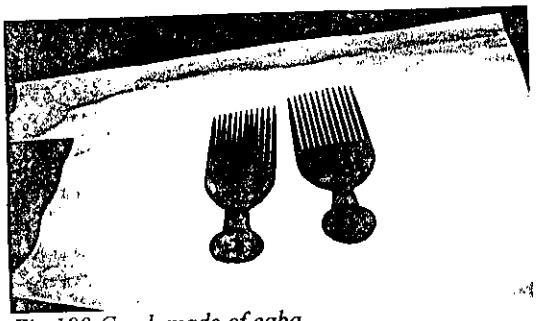


Fig 180-Comb made of egba

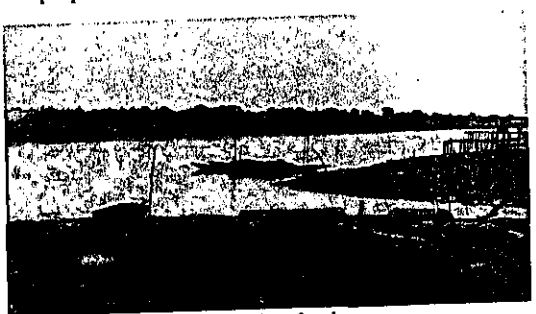


Fig 181-Local boat made of egba

Fig 182-Floor of a house made of sekele

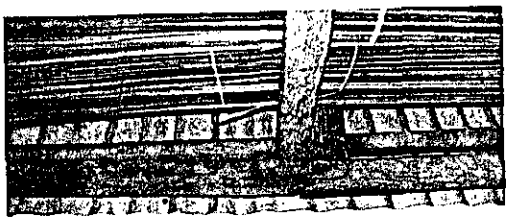


Fig 183- Roofing of a house made of egba

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.

- 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 of the community while the opposite side is a dense forest.

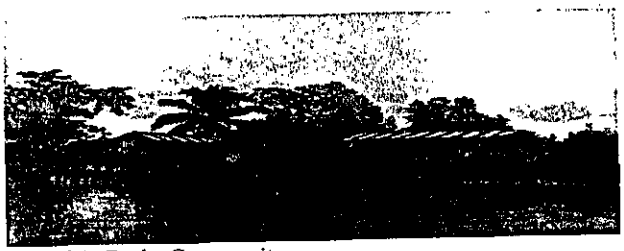


Fig 184- Ereke Community

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 the white mangrove is in a symmetrical form as compared to that of the red mangrove which is horizontal in nature. This system is very resistant to sea incusion, hence the need for aforestation to help the town check erosion and sea incusion.

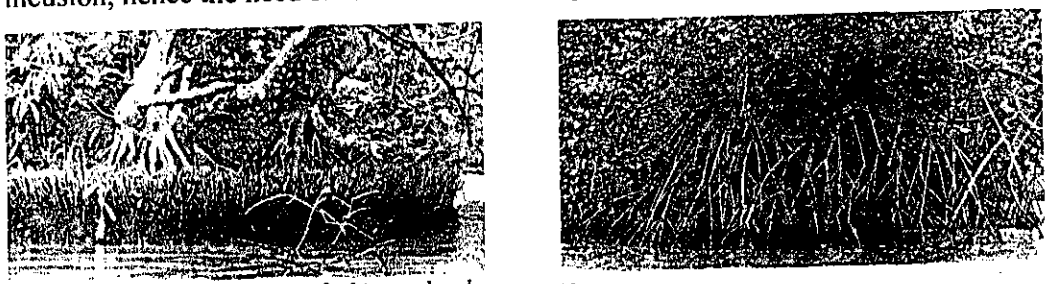


Fig.185 a & b- Root systems of white and red mangrove.

(2) Ese-Odo Local Government Area- Gbekebo, Apata and Arogbo

These communities are not as populated as those under Ilaje and there appears to be fewer communities under this LGA. The mangrove specie most predominant in these communities is the 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 186- Woman cutting the red mangrove- egba

In some areas, 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.187- Re-colonization of Abaala/ Motoro marsh land
Natural habitat - new 'Egba' mangrove taking over from the dying ones

The mangrove trees in the above areas are not as readily seen, but can be seen at a distance. As is the case in most Ilaje communities, the White mangrove and the red mangroves are found on opposite sides of each other.

Deforestation rate- 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. Oil spillage is also a threat to Ese-odo communities and oil can be seen in some of the water.

Fig 188- Deforestation site showing cut mangrove

Fig. 189- Oil seen in water and threatening flora

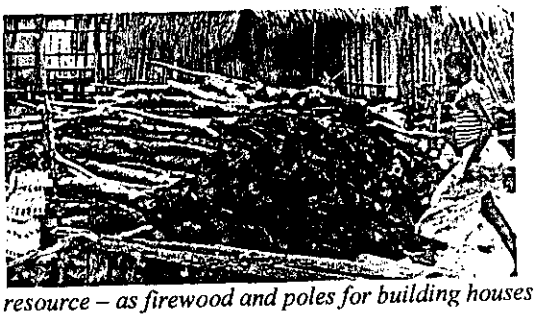


Fig 190 a and b-mangrove trees used as an economic resource – as firewood and poles for building houses

SECTION 4:

Findings and Data Analysis

4.1 Preliminary Findings

Preliminary findings indicate that there is substantial mangrove in all the coastal 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.

The awareness campaign, which was carried out by the BDCP between July 2007 and August 2007, aimed at stopping further deforestation/decimation of mangrove forests through outreach programmes, workshops and public lectures. The media (print and electronic) was also used in enlightening the local people and the general public and stakeholders. This was achieved through the following activities:

- Survey of mangrove sites in coastal Nigerian states;
- An analysis of existing data to determine level of deforestation;
- A survey of the sites where massive deforestation had taken place in the coastal states of Nigeria;
- Interview with communities; and representative groups
- Data collection (questionnaires) and analysis;
- Determination of the level of decimation of the forests and awareness level of the affected communities;
- Distribution of fliers and educational materials;
- Implementation of a public enlightenment campaign through media and public forum;
- Submission of findings and recommendations to government;

4.2 Result Analysis Aims, Activities and Objectives

4.2.1. Aim: *The aim of this section is to undertake Analysis/Assessment of data/information collected.*

4.2.2. Activities- Assess/Analyze the information gathered from the questionnaires and outreach programme. All available existing information collected earlier and also from the outreach programme will be analyzed and assessed. The analyses will include but not restricted to the following:

- Overall effectiveness of the awareness campaign
- Overall effectiveness of inputs, practices, policies
- Extent and severity of existing degradation;
- Extent and severity of potential degradation;
- Vulnerability;
- Conservation urgency;
- Social urgency;
- State Government Input

The project was aimed at realizing the set objectives which are:

(I) To carry out a public awareness and a public participation campaign aimed at sanitizing coastal communities and;

(II) Stakeholder's participation on the risks associated with the continued destruction.

It is on these basis that the questionnaire was designed to determine the following:

1. Level of awareness about the impacted Mangrove sites and threatened resources.
2. Awareness of existing and available information on these Mangrove species.
3. Priority needs of the generators, collectors and users of relevant information (i.e. priority needs of stakeholders)
4. How information is utilized
5. Ease of information accessibility
6. Overall management effectiveness and conservation measures
7. Threats and stresses
8. Perception of upcoming reforestation exercise
9. Recommendation/most impacted sites.

In order to achieve these objectives five hypotheses were formulated through which questionnaires were administered so as to test the hypotheses. At the end of test some conclusions were drawn and some recommendations were made bases on the result of the test.

4.3. Data Presentation And Analysis

4.3.1. Introduction:

The purpose of this stage is to analyze the data collected through the questionnaire with a view to finding answers to the research questions raised on the study. These analyses are based on the responses offered by respondents to the various questions on the questionnaires to determine whether to accept or reject the null hypothesis.

The main objectives upon which the five (5) research hypotheses were formulated are:

(I) To carry out a public awareness and a public participation campaign aimed at sensitizing coastal communities and ;

(II) Stakeholders /Community participation on the risks associated with the continued destruction.

In order to achieve a proper research methodology employed in this study, five operational hypotheses were formulated. These are:

1.Ho: Poor legal structures are not the main problems leading to Mangrove depletion in the coastal areas of Nigeria.

Ha: Poor legal structures are the main problems leading to Mangrove depletion in the coastal areas of Nigeria.

2. Ho: The inability of state government authorities /important stakeholders to properly carry out awareness campaign is not one factor behind Mangrove depletion in the coastal areas of Nigeria.

Ha: The inability of state government authorities /important stakeholders to properly carry out awareness campaign is one factor behind Mangrove depletion in the coastal areas of Nigeria.

3. Ho: Insufficient personnel to reach the coastal communities on a public awareness campaign on Mangrove depletion and proposed reforestation does not contribute to Mangrove depletion.

Ha: Insufficient personnel to reach the coastal communities on a public awareness campaign on Mangrove depletion and proposed reforestation did contribute to Mangrove depletion.

4. Ho: The absences of social and economic infrastructure as well as the underdevelopment of the coastal areas among other things do not contribute to Mangrove depletion.

Ha: The absences of social and economic infrastructure as well as the underdevelopment of the coastal areas among other things contribute to Mangrove depletion.

5. Ho: Failure to use appropriate criteria in assessment of the extent of Mangrove depletion is not one of the causes of Mangrove depletion in the coastal areas of Nigeria.

Ha: Failure to use appropriate criteria in assessment of the extent of Mangrove depletion is one of the causes of Mangrove depletion in the coastal areas of Nigeria.

4.3.2. Presentation of Questionnaire Results

A total of 60 questionnaires were distributed and all were collected, but only 50 were returned in their useable form. The percentage response, therefore were 83.3 percent.

Table X. Number of Questionnaires

No. of Questionnaire	No. Returned	No. Not Returned.	% Returned	%Not Returned.
60	50	10	83.3	16.7

Source: BDCP Field survey. August 2007.

4.3.3. Analysis of the response to the research Questions

Table XI. Summary of Research Questions

S/No	Research Question	Yes (%)	No. (%)
1.	Are you familiar with the status of mangrove forests in Nigeria?	80	20
2.	Which single category best describes how your work concerns mangrove forestry?	53 (Field Research)	47 (Other)
3.	For what purposes would you like to use an information network on mangrove resources?	65 (As a source of general information on mangrove resources)	25 (Other)
4	In which communities would you use the information network on mangrove forestry?	67 (Costal communities in their areas)	33 (Other)
5.	Please indicate how your mangrove information needs are currently being met	80 (Meetings/Workshops)	20 (Other)
6.	Are the information sources listed above sufficient to meet your needs?	60 (Yes)	40 (Other)
7	What are your constraints in accessing information on mangrove forestry?	80 (Lack of adequate documented information)	20 (Other)
8.	Does the present information on mangrove help you to make informed decisions?	80 (Yes)	20 (Other)
9.	Would you be willing to supply information on mangrove resources?	90 (Yes)	10 (Other)
10.	If so, please give brief details of the type(s) information you could provide in your area of expertise?	70 (Illustrations)	30 (Other)
11.	Are there any proprietary rights/issues on the materials you are willing to provide?	10 (Other)	90 (No)
12.	Are there other limitations or constraints in supplying or linking your information on the decimation of mangrove forests?	50 (Yes)	50 (No)
13.	What are the causative factors of mangrove alteration in your community/ Nigerian coastal communities?	80 (Deforestation caused by Human activities)	20 (Other)

14.	Which groups of mangrove biodiversity are you more concerned about?	73 (Plants- Non-woody plants, Woody plants)	27 (Other)
15.	What functions do the mangrove forests serve to you or your neighbours?	70 (Feul wood, Timber, coastal shoreline protection, spawning ground fish and Eco tourism)	30 (Other)
16	Are there alternative resources which serve similar functions to those performed by mangrove forest?	60 (Yes)	40 (Other)
17	Would you please suggest such alternative resources and their products	65 (Rainforest – wood and non wood products, Fresh water swamps- wood non wood products)	35 (Other)
18	Have you or your neighbours observed any decrease in mangrove species availability?	55 (Yes)	45 (Other)
19	If yes, what actions did you or your neighbours take?	55 (Awareness drive)	45 (Other)
20	Which are the most impacted sites or specific regions you believe are most threatened by mangrove loss?	70 (Oil Mining sites)	30 (Other)
21	Briefly describe your observations in places where mangrove losses have occurred	80 (Nypa infestation)	20 (Other)
22	Do you have any suggestions on how mangrove losses can be combated?	75 (Enlightenment on sustainable use of the mangrove).	25 (Other)
23	Are there any customary laws and regulations guiding mangrove use in your area?	40 (Other)	60 (No)
24	Are the existing customary laws and regulations guiding mangrove use in your area adequate?	40 (Other)	60 (No)
25	If no, could you please explain	20 (Other)	80 (No Laws enacted)
26	Would you personally abide by such customary laws and regulations?	90 (Yes)	10 (Other)

27	Who are those in charge of enforcing such customary laws and regulations?	75 Ministry of Environment through the Local community leaders)	25 (Other)
28	Which groups of mangrove species are under major threat?	82 (Plants- Non-woody plants, Woody plants)	18 (Other)
29	Do you have any protected forest area in your community?	25 (Yes)	75 (No)
30	If no, would you welcome the idea of a protected forest area?	80 (Yes)	20 (No)
31.	If yes, where would you prefer a protected forest area sited in your community?	90 (Costal Communities)	10 (Other)
32.	What existing sources/organizations dealing with conservation of mangrove forests are you aware of?	85 (Community Based organization)	15 (Other)
33	What efforts have been made by you, your organization or the government to check the present degradation of mangrove in your area?	70 (Enlightenment Campaign)	30 (Other)
34	Would you say these efforts are enough?	30 (Yes)	70 (No)
35	If no, what further efforts do you think are required?	87 (Increase funding, and training of the local people for capacity building.)	13 (Other)
36	Briefly, how would you prioritize the mangrove regions to be covered by this project and the GCLME project at large?	60 (Niger Delta Region, especially where Nypa is minimal)	40 (Other)
37.	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.	70 High Filed survey and enlightenment campaign, High (Capacity building and training and High provision of alternative fuel wood.)	30 (Other)
38	Please give examples of the types of decisions you would like the project network to assist you with:	85 (Inventory of the mangrove, Ethnobotanic survey	25 (Other)

		and Establishment of nurseries.)	
39	What special training needs would you require to help you better manage mangrove?	90 (Enlightenment of the local communities on the management development)	10 (Other)
40	What are your expectations for benefits in exchange for participation as an information provider?	82 (Capacity building, networking and collaboration)	18 (Other)
41	For which persons/organizations do you think an information network on mangrove resources would be useful in this country?	92 Policy makers, Local communities/farmers, NGOs, Environmentalist, University Students, etc	8 (Other)
42	How many users of an information network on mangrove resources and status would you expect in your community/ organization?	50 (>20)	50 (Other)
43	What would be the best way of accessing the information on mangrove forests?	60 (Meeting and Education)	40 (Other)
44	Are you involved in any regional/international initiatives concerning the conservation of mangrove resources?	30 (Yes)	70 (No)

In order to enhance easy understanding of this research study and presentation of the questionnaire results, Chi-square statistical technique was adopted.

Chi-square (x^2) distribution, this method is a non parametric statistical technique of testing the difference between two or more variables. The values of the observed frequencies are compared with the theoretically determined frequencies of the variables. A large (x^2) value indicates much difference between the observed frequencies (fo) and the expected (fe). Conversely a small (x^2) value means that there were not much difference between the observed (fo) and the expected frequencies (fe). A situation where there was no difference between the observed frequency and the expected frequencies the (x^2) value was zero.

This statistical technique according to Koutsoyiannis, A. is mathematically stated as:

$$(x^2) = \sum \frac{(fo - fe)}{fe}$$

Where:

(x^2) = Chi square

Fo = Observed frequency

Fe = Expected frequency

$\sum$ = Summation.

The decision to either accept or reject the null hypothesis depends on the resultant of computed (x^2) value is compared with the tabulated value obtained from the (x^2) table based on the number of degree of freedom of the sample. The decision rate were as follows:

1. If the computed Chi square (x^2) value from the observed frequencies were greater than the table value at the stated level of (5%) significance, the null hypothesis is rejected and alternative is accepted.

2. If the computed Chi square (x^2) value from the observed frequencies were less than the table value at the stated level of (5%) significance, the null hypothesis is accepted and alternative is rejected.

4.3.3.1. Test of Hypothesis

Below is the table that shows the test of each hypothesis.

Table XII: The Test of Each Hypothesis

Hypothesis	Question No.
1	1
2	6
3	7
4	12
5.	15

Source: BDCP Survey, August 2007.

4.3.3.1.1. Hypothesis 1

Ho: Poor legal structures are not the main problems leading to Mangrove depletion in the coastal areas of Nigeria.

H1: Poor legal structures are the main problems leading to Mangrove depletion in the coastal areas of Nigeria.

Table XIII: Hypothesis 1 tested

Category	Fo	Fe	Fo – Fe	(Fo – Fe)2	(fo – fe)2 / fe
Yes	80	50	30	900	18
No	20	50	-30	-900	18
Total.	100	100			36

Source: BDCP Survey, August 2007.

Degrees of Freedom (d.f) 2 -1 = 1

Calculated value 18 + 18 = 36

Tabulated value at 0.05 = 3.84

Decision:

Since the calculated value is (36) is greater than the tabulated value (3.84), the null hypothesis (Ho) is rejected, and will accept the alternative hypothesis (Ha). So this test concludes that poor legal structures are the main problems leading to Mangrove depletion in the coastal areas of Nigeria.

4.3.3.1.2. Hypothesis 2.

2. Ho: The inability of state government authorities /important stakeholders to properly carry out awareness campaign is not one factor behind Mangrove depletion in the coastal areas of Nigeria.

Ha: The inability of state government authorities /important stakeholders to properly carry out awareness campaign is one factor behind Mangrove depletion in the coastal areas of Nigeria.

Table XIV: Hypothesis 2 tested

Category	Fo	Fe	Fo – Fe	(Fo – Fe)2	(fo – fe)2 / fe
Yes	60	50	10	100	2
No	40	50	-10	-100	2
Total.	100	100			4

Source: BDCP Survey, August 2007.

Degrees of Freedom (d.f) 2 -1 = 1

Calculated value 2 + 2 = 4

Tabulated value at 0.05 = 3.84

Decision:

Since the calculated value (4) is greater than the tabulated value (3.84) we reject the null hypothesis (Ho) and accept the alternative hypothesis (Ha). So this test concludes that the inability of state government authorities /important stakeholders to properly carry out awareness campaign is not one factor behind Mangrove depletion in the coastal areas of Nigeria.

4.3.3.1.3. Hypothesis 3

Ho: Insufficient personnel to reach the coastal communities on a public awareness campaign on Mangrove depletion and proposed reforestation does not contribute to Mangrove depletion.

Ha: Insufficient personnel to reach the coastal communities on a public awareness campaign on Mangrove depletion and proposed reforestation did contribute to Mangrove depletion.

Table XV: Hypothesis 3 tested

Category	Fo	Fe	Fo – Fe	(Fo – Fe)2	(fo – fe)2 / fe

Yes	56	50	6	36	0.72
No	44	50	-6	-36	0.72
Total.	100	100			1.44

Source: BDCP Survey, August 2007.

Degrees of Freedom (d.f) 2 -1 = 1

Calculated value 0.72 + 0.72 = 1.44

Tabulated value at 0.05 = 3.84

Decision:

Since the calculated value (1.44) is less than the tabulated value (3.84). We accept the null hypothesis (Ho) and reject the alternative hypothesis (Ha). So, this test concludes that insufficient personnel to reach the coastal communities on a public awareness campaign on Mangrove depletion and proposed reforestation does not contribute to Mangrove depletion in coastal Nigeria.

4.3.3.1.4. Hypothesis 4.

Ho: The absences of social and economic infrastructure as well as the underdevelopment of the coastal areas among other things do not contribute to Mangrove depletion.

Ha: The absences of social and economic infrastructure as well as the underdevelopment of the coastal areas among other things contribute to Mangrove depletion.

Table XVI: Hypothesis 4 tested

Category	Fo	Fe	Fo – Fe	(Fo – Fe)2	$\frac{(fo - fe)2}{fe}$
Yes	90	50	40	1600	32
No	10	50	-40	-1600	32
Total.	100	100			64

Source: BDCP Survey, August 2007.

Degrees of Freedom (d.f) 2 -1 = 1

Calculated value 32 + 3 2 = 64

Tabulated value at 0.05 = 3.84

Since the calculated value (64) is greater than the tabulated value (3.84), We reject the null hypothesis (Ho) and accept the alternative hypothesis. So this test concludes that the absences of social and economic infrastructure as well as the underdevelopment of the coastal areas among other things contribute to Mangrove depletion.

4.3.3.1.5. Hypothesis 5

Ho: Failure to use appropriate criteria in assessment of the extent of Mangrove depletion is not one of the causes of Mangrove depletion in the coastal areas of Nigeria.

Ha: Failure to use appropriate criteria in assessment of the extent of Mangrove depletion is one of the causes of Mangrove depletion in the coastal areas of Nigeria.

Table XVII: Hypothesis 5 tested

Category	Fo	Fe	Fo – Fe	(Fo – Fe)2	(fo – fe)2 / fe
Yes	76	50	26	676	13.51
No	24	50	-26	-676	13.52
Total.	100	100			27.04

Source: BDCP Survey, August 2007.

Degrees of Freedom (d.f) 2 -1 = 1

Calculated value 13.52 + 13 .52 = 27.04

Tabulated value at 0.05 = 3.84

Decision:

Since the calculated value (27.04) is greater than the tabulated value (3.84). We reject the null hypothesis (Ho) and accept the alternative hypothesis (Ha). So, this test concludes that failure to use appropriate criteria in assessment of the extent of Mangrove depletion is one of the causes of Mangrove depletion in the coastal areas of Nigeria.

4.4. Summary of Major Findings

4.4.1. Analysis of the sites revealed several problems namely that the threat to Nigerian Mangrove ecosystems includes:

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

4.4.2. Analysis of the questionnaire showed that few people were well informed on the mangrove species and their functions to the environment. It was also discovered that the community members were less interested in the uses of these mangrove forests and the need for their conservation, but rather are more interested in knowing the economic values of the project/use of the mangrove species.

4.4.3. The result of the workshop conducted from the 14^{th}-15^{th} of August 2007 was a successful circulation and accumulation of data from participants representing the communities, State ministries, several government agencies, NGOs/CBOs, educational sector, oil companies, print media, radio and television stations and all other stakeholders.

4.4.4. The special session with the state governments also led to their firm commitment in the conservation of the mangrove forests and subsequent establishment of forest reserves in their states.

4.4.5. At the end of the working group meeting, sites for the proposed reforestation exercise were suggested. A copy of the working group resolutions is attached below as Annex.

Section 5

Stakeholders Enlistment; State Governments' Sensitization On The Benefits Of Creating Forest Reserves And Promotion Of Their Establishment.

5.1 What are forest reserves?

Forest reserves are portions of state lands where commercial harvesting of wood products is excluded in order to capture elements of biodiversity that can be missing from sustainably harvested sites. Small (patch) reserves will conserve sensitive, localized resources such as steep slopes, fragile soils, and habitat for certain rare species that benefit from intact forest canopies. Large (matrix) reserves will represent the diversity of relatively un-fragmented forest landscapes in an area.

During the sensitization exercise with the State Governments, the goal, objectives and benefits of creating forest reserves were highlighted; as well as the need for promoting their establishment.

5.2 Goal of establishing forest reserves:

Capture elements of biological diversity abundant in mangrove forests that can be missing from harvested or depleted sites.

5.3 Objectives:

Retain mangrove wood that is typically extracted from the forest ecosystem by the communities or which is being depleted due to activities by oil communities.

To obtain the ideal mangrove forests by allowing only natural disturbance processes to determine the structure and composition of the forest ecosystem.

Facilitate biological monitoring to establish baseline data on the species, natural communities, and ecological processes that occur in mangrove forest ecosystems reserved from deforestatation.

5.4 Overall Benefits:

a. Allow comparison of species, natural communities, and ecological processes on deforested sites with sites reserved from human activities.
b. Provide late-successional forest habitats for wildlife that represent the diversity of mangrove forest ecosystems in coastal Nigeria.

c. Provide unique recreational and aesthetic opportunities in biologically mature forest habitats that will develop over time in reserves.
d. Provide revenue for the concerned states from tourist activities and/or harvesting of timber.

5.5 Benefits of promoting forest reserve establishments to each Coastal State:

Encouraging investors to maintain these private lands in forests provides:

a. **Habitat for game and non game species of wildlife** that depend upon forests for all or part of their life;
b. **Watershed protection** for the stream and rivers in these states;
c. **Economic development in terms of the timber that is harvested**, however, this option is left to each state;
d. **Air quality enhancement** as the standing and living trees absorb toxic carbon and other pollutants;
e. **Outdoor recreation for property owners, neighbors, and visitors** to the states;

5.6 Benefits of these forest reserves to the local communities include:

- ❖ Legacy to pass along to their heirs
- ❖ Industry support
- ❖ Critical wildlife habitat
- ❖ Private investment in the forest
- ❖ Incentive to be given to the community members as compensation
- ❖ Cleaner air
- ❖ More forests
- ❖ Improved Water quality
- ❖ Increased property values
- ❖ Keeps marginal farmland out of production
- ❖ Climate benefits
- ❖ Increased property values of adjoining lands
- ❖ Source of high quality and volume of wood for industry

- ❖ More private forest reserve ownership reduces pressures on state lands
- ❖ Greater soil erosion control
- ❖ If allowed, hunting brings in revenue for surrounding communities
- ❖ Slows urban sprawl
- ❖ Aesthetics and tourism
- ❖ Enhanced wildlife habitat
- ❖ Fewer livestock grazed timberland
- ❖ Less premature harvesting of timber
- ❖ Opportunities for outdoor recreation and hunting
- ❖ Timber revenue for landowner and wood industry
- ❖ Improved quality timber harvesting to pay income taxes
- ❖ Being able to hold on to family farms and forestland
- ❖ Incentive for forest landowners to retain their forests without payment
- ❖ Allows people to manage their timber for economic gain
- ❖ Helps provide a timber base for wood industry businesses
- ❖ Outdoor recreation opportunities for public when granted permission.

5.7 Why are forest reserves important?

5.7.1. Forest reserves allow people to experience and to understand how forest ecosystems function when timber and other wood products that are normally extracted for human use remain in place. These reserves will also be free from one of the major causes of mangrove depletion being the daily activities of oil companies.

5.7.2 While it is important to have the great majority of forestland open to the sustainable harvest of wood products in order to support the Niger Delta communities especially in view of their poor standard of living, it is equally important to retain portions of our forested landscapes in a condition where all components of the ecosystem remain in place. In addition

5.7.3 Establishing these forest reserves will allow the states to more fully assess human impacts on deforested sites, and may provide insights into how extractive management of harvested forestlands can be improved.

5.7.4 State-owned forestlands are generally able to provide more accumulation of large woody debris than private lands.

5.7.5 Reserves will likely support substantially higher densities of certain species of moss and lichens that typically occur only on older trees (Selva 1996).

5.7.6 Forest reserves provide potential refuge for unique species assemblages, and may provide habitat for invertebrate wildlife and soil micro-organisms that have not been well studied to date.

5.7.7 Reserves will provide unique recreational, aesthetic, and educational opportunities for the people in these coastal states.

5.7.8 Forest reserves provide reference sites for objective assessment of the sustainability of forest management practices (Norton 1999), and are essential for practicing adaptive resource management (Walters and Holling 1990).

5.7.9. Reserves create opportunities for connectivity within the landscape, conservation of species and processes, buffering against future uncertainty, and other hard to measure but valuable functions (Hunter 1996).

5.7.10 While no mangrove forest in the Niger Delta is free of human impact from ubiquitous influences such as air and oil pollution, and invasive, exotic organisms introduced by people, forest reserves can still help ensure that representative examples of biodiversity indigenous to an area are more likely to be conserved since wood fiber is not extracted and invasive plant species are less likely to be introduced in reserves.

5.7.11. Natural disturbance processes will, to a large degree, determine the structure and composition of the forest ecosystem in reserves.

5.7.12 Reserves will provide valuable forest habitat for wildlife that may ultimately support species assemblages and abundances that do not occur on the deforested sites.

5.8 Location of the forest reserves

These forest reserves should occur in relatively un-fragmented mangrove forest landscapes where they can be buffered from impacts of human development.

5.9 Management of the Forest Reserves:

5.9.1. Monitoring and Evaluation: There is need to regularly monitor the forest reserves by the forest management team. Long term ecological monitoring (LTEM) needs to be planned on reserve sites to document the composition of plant and animal communities over time.

5.9.2. Community Participation:

5.9.2.1. The process of involving local communities living around these established reserves in its management should start with getting to know people's concerns about the forest. During the awareness campaign, it was observed that the local people were concerned about:

a. mismanagement of the forest;
b. high level of corruption among forest managers;
c. 'outsiders' being given preferential access to the resource as opposed to local people; and
d. lack of direct financial benefits to the local people.

5.9.2.2 The states were thus encouraged to organize a series of local work-shops within the communities to create awareness among both local people and intended staff within the district. In addition, representatives of the various stake-holders should be selected by the communities and visits organized to well-established forest reserves (within the country or in neighbouring countries) to study how local communities are involved in managing the forests they use. This team should consist of atleast one representative from the State Ministry (Forestry), community leader and/or elders, local councilors, women, young people and chairpersons of the slocal governments involved. Upon their return, the team will then undertake the task of educating the local people, patrolling the forests and drafting the Memorandum of Understanding (MOU).

5.9.2.3 Objectives of collaborative mangrove forest reserves management

The overall objective of community participation in the establishment and management of these forest reserves is to manage these reserves in a sustainable manner, while the specific objectives are to:

i. Conserve mangrove biodiversity;
ii. Protect the heritage of the communities in particular and Nigeria as a whole;
iii. improve the condition of the forests;
iv. regulate utilization activities; and
v. enable the forests to contribute directly to income generation for the communities.

5.9.3 The need to make institutional changes to enable community forestry

Changes need to be made in forest policy allowing local communities to participate in the management of forest reserves. The States' Forestry Departments has to institutionalize community forestry within its operations at all levels. Staff capacity at all levels needs to be strengthened to implement community forestry. To help local communities manage effectively, the Forestry Department should give a significant percentage (e.g.40 percent) of revenue collected from the forest resources within the local areas to the community concerned as incentives.

The government can also grant constitutional power to local administrations to have the responsibility and right to manage forest resources for the benefits of the local people.

5.10 Constraints and Solutions of Community Forestry/Forest Reserve Management

These constraints include

- ❖ Legal frameworks
- ❖ Tenure system
- ❖ Conflicting policies
- ❖ Lack of alternative sources of income
- ❖ Youth restiveness
- ❖ Conservative, traditional foresters with inadequate training

The Forestry Department can react to some of the constraints by initiating the following schemes:

a. sharing revenue obtained from the forest resources with the community;
b. collaborating with other sectors;
c. offering leases at affordable rents to interested individuals, groups of individuals and companies for the establishment of commercial forestry; and
d. encouraging the participation of forestry department staff in national and international workshops on community forestry.

Section 6:

Conclusion and Recommendations

6.1. RECOMMENDATIONS

The following are the recommended long-term wise practices:

Expansion plan:

i. Compilation of our awareness campaign materials in school/educational books and pamphlets for greater and more effective reach.
ii. Documentation of all our findings in a library.
iii. Replicating our campaigns in occasionally in the states to ensure that the information reaches all concerned.
iv. Submitting survey information in national newspapers to be published under the environmental section.
v. Establishing a functional network of workshop participants and other mangrove conservationists and the subsequent launching and hosting of an exclusive website.
vi. Compilation of our campaign materials on CD ROM for easy download.
vii. Continuous capacity-building
viii. Inclusion of reforestation message in seminars/workshops attended.
ix. Continuous sensitization of the oil companies and the latter's involvement/sponsorship of developmental projects bothering on mangrove conservation.

Information, Education and Communication Support

To spread awareness on the need for conservation and practice of reforestation, there is every need:

- To promote the sustainable use of mangrove resources;
- To support initiatives of the local population in the development of other means of livelihood in form of small scale industries, leading to the self-sufficiency and development of the population;
- To promote scientific research and activities which fall within the framework of protecting and rehabilitating the environment.

Table XVIII: Roles and responsibilities of key actors

Local Awareness Committee (LAC)	i. Participate in training, workshops, field trips, activities and meetings. ii. Planning and implementation of local awareness events. iii. Carry out awareness activities within the communities and neighbouring villages. iv. Mobilize villagers
State Government Ministries	i. Act as go-betweens for the Local Communities and Federal Government. ii. Liase between the Local Communities and Oil Companies. iii. Act as local focal point and provide logistical support during events. iv. Assist in the implementation of all activities. v. Act as co-trainers in workshops. vi. Give presentations to community audiences. vii. Monitor all activities/progress. viii. Provide/Solicit for financial assistance. ix. Assist communities in their community conservation/reforestation projects.
Non-Governmental Organizations, Community based Organizations (NGOs/CBOs)	i. Participate in the strategic planning of events and activities. ii. Networking and linking with local community heads. iii. Networking and linking with all stakeholders. iv. Coordinate activities of the LAC. v. Execute trainings and Organize workshops. vi. Provide technical assistance, administrative support and facilities. vii. Carry out awareness campaigns on the State, National and International levels. viii. Monitoring and Evaluation.
Environmental Information Centre (EIC)	i. General organization and supervision of all activities; ii. Follow-up, monitoring and reporting; iii. Organize national events and events for the media; iv. Organize and conduct workshops and field trips; v. Production of awareness and training materials. vi. Data Collection, Storage and Analysis
Oil Companies	i. Adopt safer methods of oil exploration. ii. Sponsor activities/community development projects aimed at reforestation and the sustainable use of mangrove resources. iii. Liaise regularly with the Government and Local communities.

Please note that the EIC is to be coordinated by BDCP with the help of the State Ministry of Environment.

6.2. CONCLUSION

The high level of decimation/degradation of the mangrove forest of Nigeria located within the South-Eastern Nigeria (Niger Delta region) has led the government to undertake the task of control of the Nypa palm under the GCLME project. Such an action, along with the planned re-forestation project, will no doubt restore the country's mangrove ecosystem. However, the success of these actions is dependent upon a carefully implemented awareness and public participation campaign which has been carried out in this project.

The public awareness programs have effectively educated and sensitized the local communities and State Governments, and have generated a lot of positive interest in participatory management of the mangrove resources by all stakeholders including the oil companies. It is hoped that the support of the Federal and State Government, instillation of a sense of ownership of the resources by the local population, and their legal empowerment so that they are able to institute and execute control measures on their mangrove resources will serve as essential components in the process aimed at achieving full community support for the sustainable utilization and management of mangrove forests. It is thus expected that local communities will begin to protect and to plan better ways of exploiting their mangrove resources using knowledge/skills acquired through the awareness campaigns.

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Original English

IMPLEMENTATION OF A PUBLIC AWARENESS PROGRAMME IN RELATION TO MANGROVE DEPLETION AND PROPOSED REFORESTATION

FINAL REPORT

Volume 2

Prepared for the United Nations Industrial Development Organization

Based on the work by

Bioresources Development and Conservation Programme (BDCP)

Project Managers: C. Ibe/C. Ukwe

United Nations Industrial Development Organization, Vienna.

2007

Section 7-

Annexes, Attachments

ATTACHMENT I: BACKGROUND INFORMATION

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 potamidididae)*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 t be a low-level sustainable activity. At the national scale, it is estimated that coastal populations extract $4m^3$ 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 $10,000km^2$ national mangrove coverage, about $5,000km^2$ 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 m^3 or a standing stock of 546.7m3 per hectare (Anon). The annual yield has been put at $6x\ 10^5$ 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 m^3 and an exploitable volume of 10 million m^3. This corresponds to a total standing volume of 16.7 million m^3.

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 XIX- 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 '000 HA	YIELD '000 CUM	AREA '000 HA	YIELD '000 CUM	AREA '000 HA	YIELD '000 CUM	AREA '000 HA	YIELD '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 XX: 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 XXI: 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 unfossiliferrous sand stones and gravel weathered from underlying pre-cambrian basement (Akpati, 1989). Above the course 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 been seen are certainly very numerous.

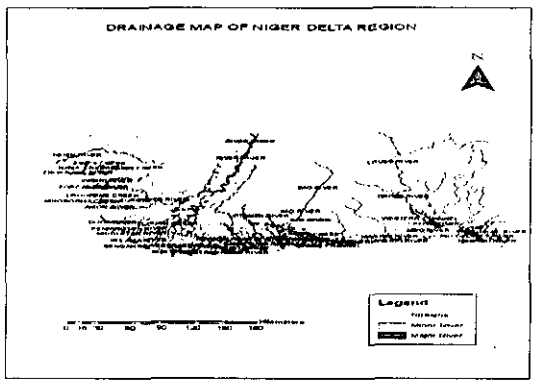


Figure 191a: The drainage system in the Niger Delta

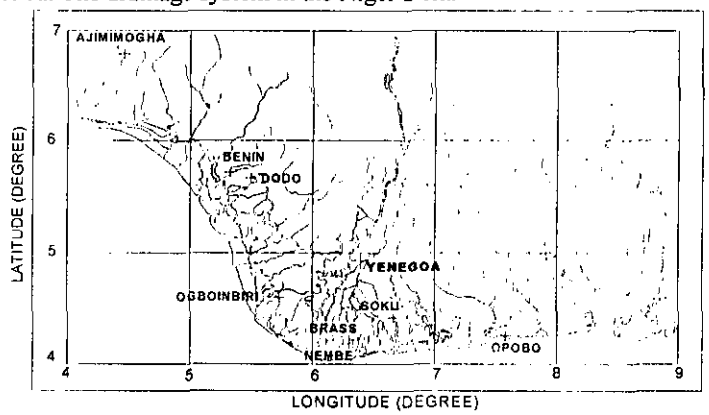


Figure 191b: Drainage System in the Niger Delta

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 magroves on the Niger Delta while figure 1.1b shows the changes that have taken place on the mangrove ecosystem of the Niger Delta.

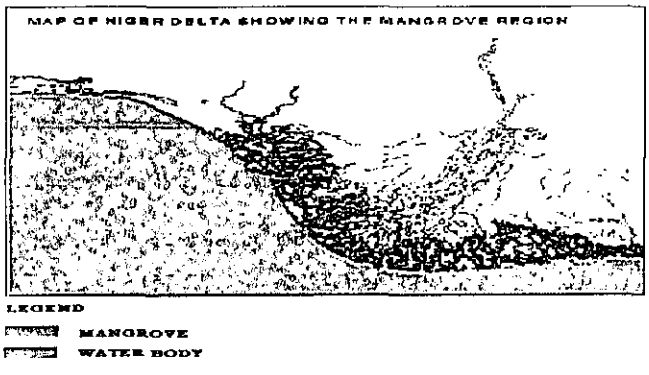


Figure 192a: Map of the mangroves of the Niger Delta.

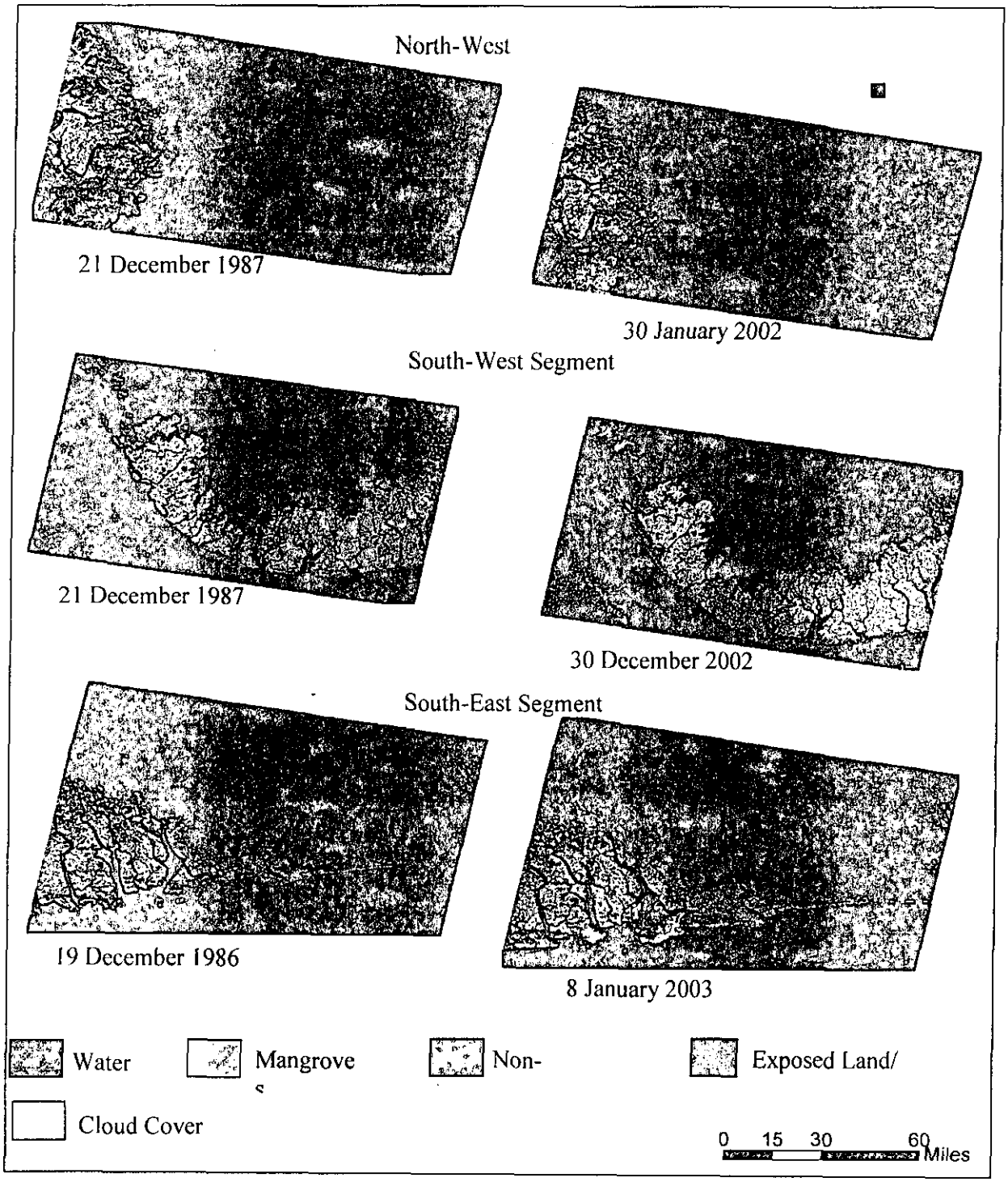


Figure 192b: Changes in the Mangrove Ecosystem between 1987 and 2002 obtained from the Landsat satellite imageries (James *et al*, 2007)

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:

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

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 Güm2a/r3 and -Güm2a/r3 where a is the radius of the Earth, r the distance between the centre of the Earth and that of the Moon, $ü$, 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:

$$F = (K1 + O1)/(M2 + S2) \quad \text{.....(1.2)}$$

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.

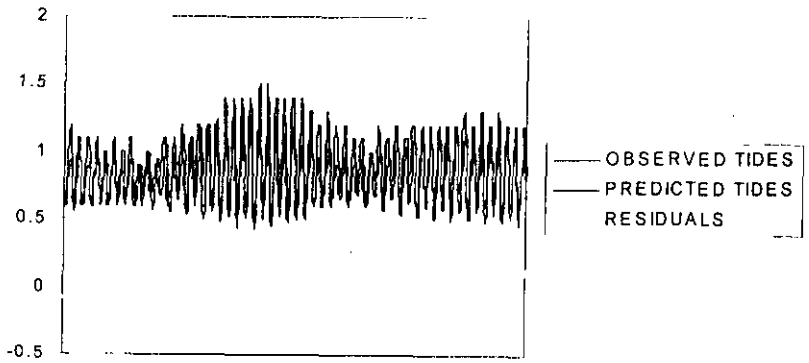


Figure 193a: Observed, predicted and residual Tides at Dodo for February 1993 (after Ezeigbo et al, 2003)

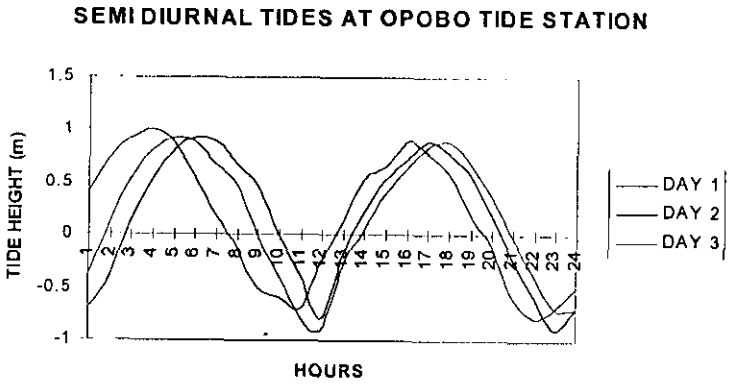


Figure 193b: Semi Diurnal Tides at Opobo (after Ezeigbo *et al,* 2003).

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 19years. 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.

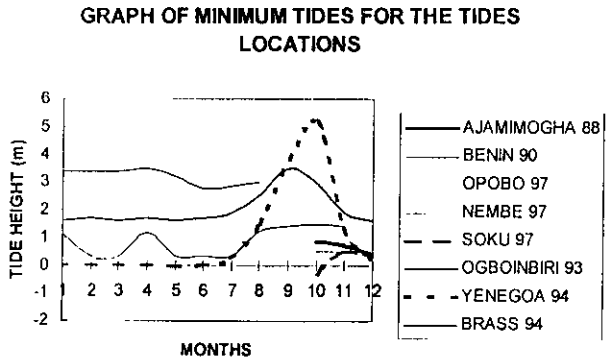


Figure 194a: Minimum Tidal data for 8 locations in the Niger Delta (after Ezeigbo et al, 2003)

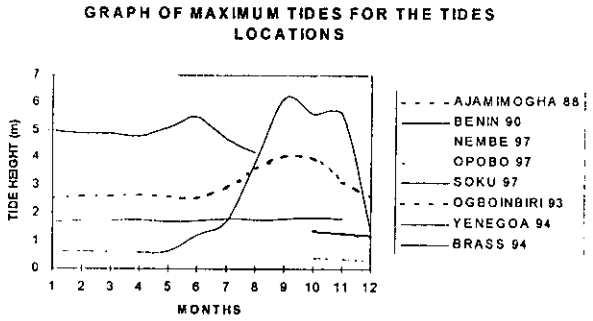


Figure 194b: Maximum Tidal Data for 8 locations in the Niger Delta (after Ezeigbo et al,2003)

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 14b).

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 Vestracte (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 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 all, (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 XXII: 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

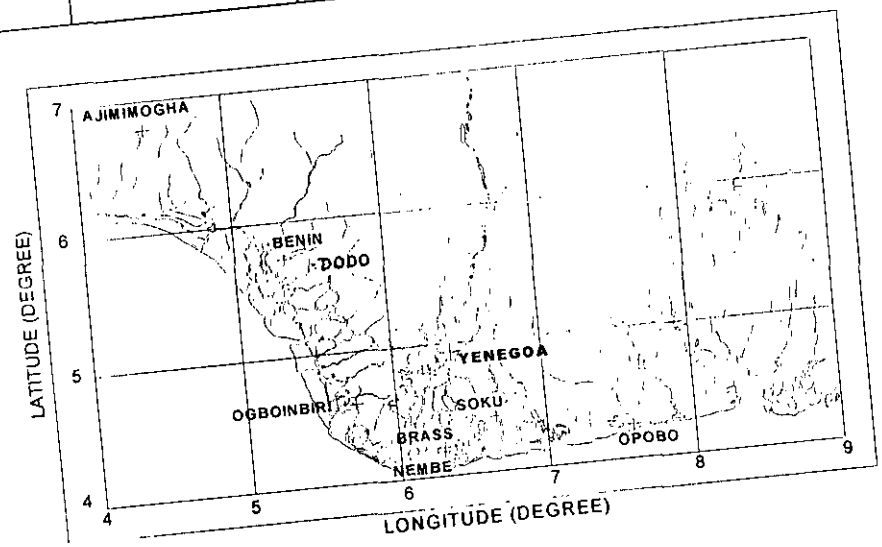


Fig 195 Distribution of tide gauge locations

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:

$$Y(t) = H_0 + \sum_{i=1}^{n} f_i H_i Cos(\omega_i t + Vu_i - g_i) \qquad (1.1)$$

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):

$$Y(t) = H_0 + \sum_{i=1}^{n} (A_i Cos\omega_i t + B_i Sin\omega_i t) \qquad (1.2)$$

Where,

$$A_i = f_i H_i Cos(Vu_i - g_i) \qquad (1.3)$$

$$B_i = -f_i H_i Sin(Vu_i - g_i) \qquad (1.4)$$

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

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

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

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 (equation1.1), 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:

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

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:

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

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 evedent that this is semi-diurnal Ezeigbo *et al)*.

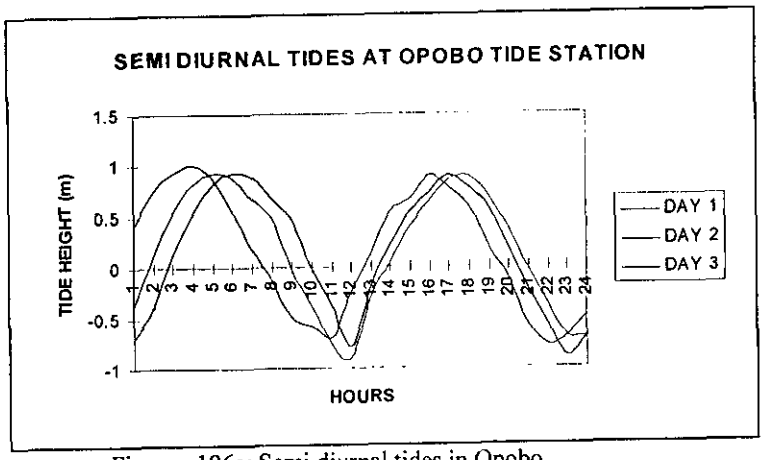


Figure 196a: Semi diurnal tides in Opobo

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 form 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 Figures1.3a and 1.3b.

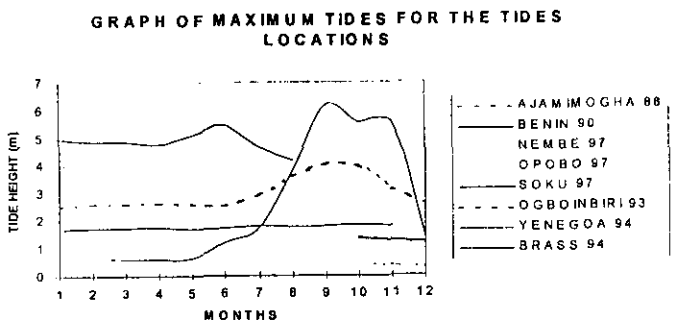


Fig 196b: Maximum Tides in the Area (after Ezeigbo *et al).*

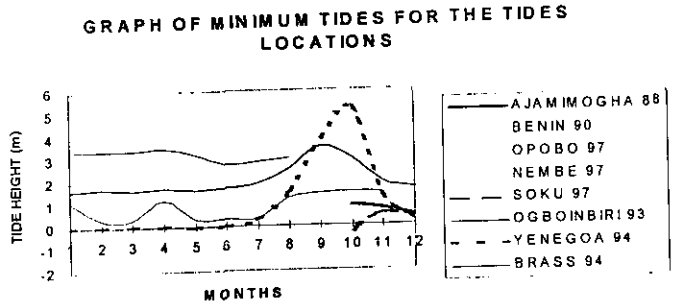


Fig 196c Minimum Tides in the Area (after Ezeigbo *et al).*

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 XXIII: 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

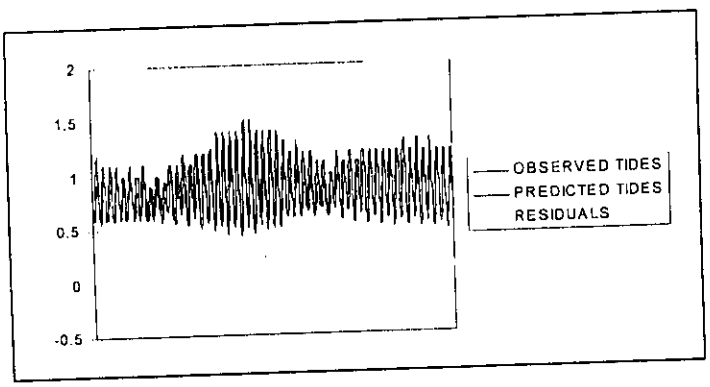


Fig 197: Observed, predicted and residual Tides at Dodo for February 1993 (after Ezeigbo *et al).*

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.

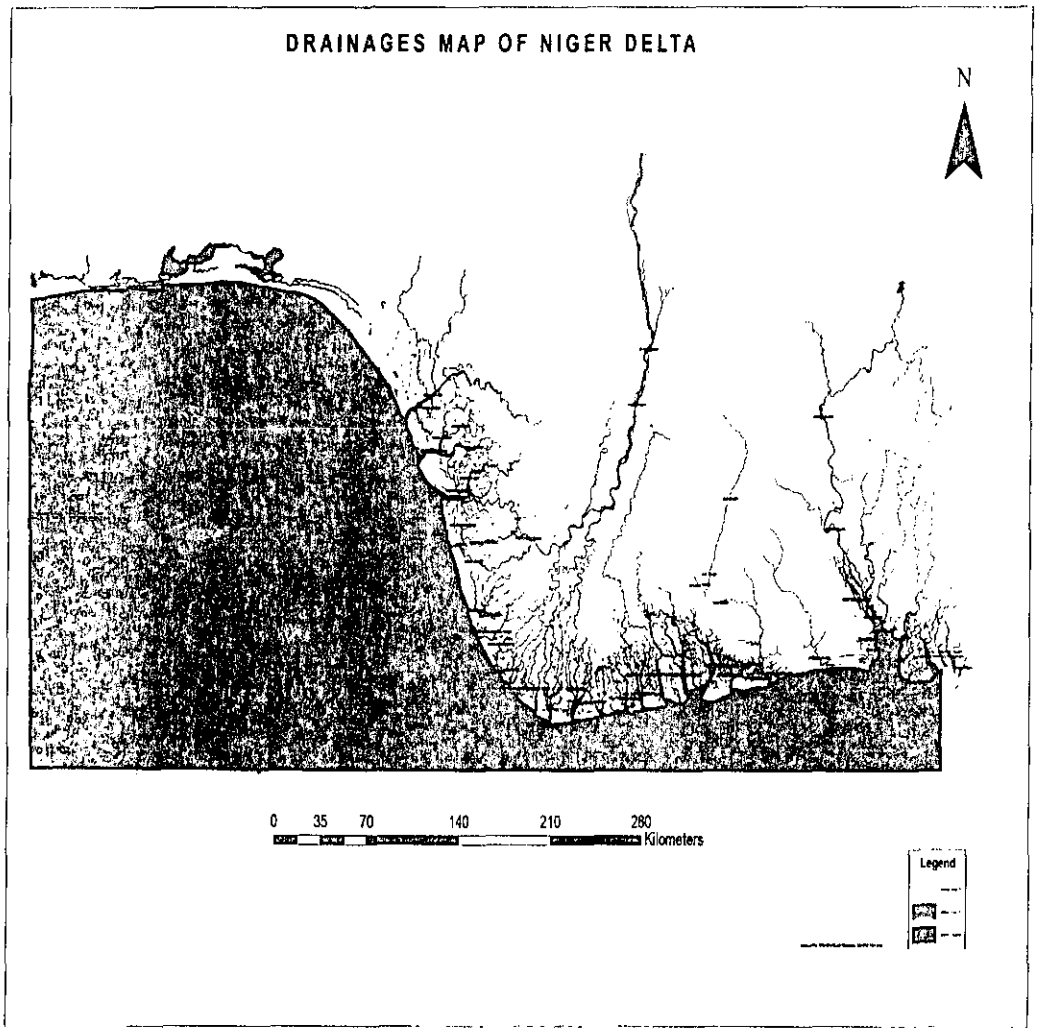
ANNEX 1: WORK PLAN

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

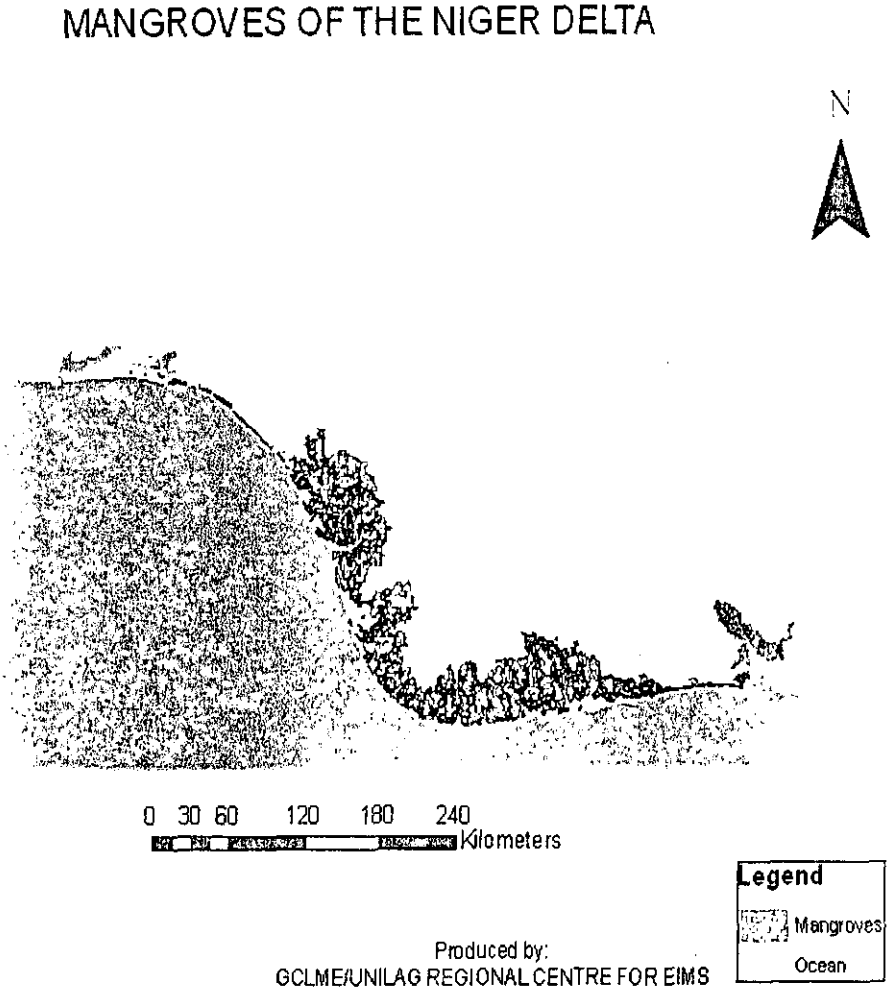
UNDERTAKE OUTREACH PROGRAMMES AIMED AT STOPPING FURTHER DECIMATION OF MANGROVE FORESTS. The Public Awareness Campaign/education will be plan–based: i.e., it must have a vision, mission, phases and objectives.	communities on the status of decimation of the Mangrove Forest and also collect data.	promotion through national radio, television and print. Hold Rallies/Exhibitions and distribute questionnaires. Consultative meetings/fora and distribute questionnaires. Distribute pamphlet/booklets and/or teaching aids that will be translated in local dialects.		sixty (60) days.	created. Public educated (formally and informally) on the need to conserve the Mangrove forest.
The fifth step will be ANALYSIS/ ASSESMENT OF DATA/INFORMATION COLLECTED	To Assess existing information for each site. To analyze the data collected during the outreach programme.	Analyze information gathered from the questionnaires and outreach program.	BDCP.	Eight (8) days.	All data collected are fully analyzed. Level of awareness and public suggestions noted.
The sixth step is to SUGGEST PREFFERED SITES WITH DETAILED DESCRIPTION AS NECESSARY FOR THE PLANNED RE-FORESTATION PROGRAMME.	To prioritize the sites according to the level of degradation. To proffer sites for the planned reforestation programme.	Holding a steering committee workshop.	BDCP, Government agencies, Project steering, technical and Scientific advisory committee.	Four (4) days will be used for this stage	Sites for reforestation programme identified.
The seventh stage is ENLIST WILLINGNESS OF COASTAL POPULATIONS AND ALL OTHER	To get Commitment letters from all Stakeholders. To draft a	Hold Stakeholders meeting.	BDCP and all Stakeholders.	This will take us two (2) days to accomplish.	Commitment letters obtained from all Stakeholders.

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/conserve 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 2: NIGER DELTA DRAINAGE SYSTEM



ANNEX 3: MANGROVE FORESTS OF NIGER DELTA



ANNEX 4: 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
Plants- Non-woody plants, Woody plants
Mammals
Birds
Reptiles and amphibians
Fish
Crustaceans and molluscs
Arthropods
Other invertebrates
Fungi
Microorganisms
Genetically modified organisms (GMOs)
Other (Please specify) .....

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 5: 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? Please include local names.

Yes .....

No .....

2. Are you familiar with the status of mangrove forests in your locality? If Yes, state where they are.

Yes .....

No .....

3.Does the mangrove forest affect your daily existence?

	Yes
	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 6: MANGROVE WORKING GROUP RECOMMENDATIONS

Attendance

S/No.	NAMES	ORGANISATION	ADDRESS	E-MAIL	PHONE NO.
1.	Ewansila O.Steve	NDHERO	Block 3b RD 10, Fed.Housing EST.Agip Port Harcout.	steveewansilo@yahoo.com	08056103446
2	Chinedu Uwnegbulam	The Guardian	Rutam House, Isoko, Lagos	neduu@yahoo.com	08033098502
3	Dr.F.M.Nwosu	IOC UNICAL	UNICAL	fmnwosu@yahoo.com	08038355564
4	Dr. Emeka Azubuike	Friends of the Environment	12 Okafor Drive Asaba Delta	emekazubby@yahoo.com	08032696669
5	Engr. Akinbowale J.A.O.	Min. of Environment Abeokuta.	Ogun State Min.of Envt. Abeokuta	jaowale@yahoo.com	08033819877
6	J.A.Epkere	Independent Consultant	Po.box 21824 u.i post Office Ibadan	Jekpere@yahoo.com	08033230430
7	Attah Anthony	Concern Universal	41 IBB way Calabar	Tonyatah2000@yahoo.co.uk	08037759864
8	B.O.Akinyami (Mrs)	ODM.H.H.$ ENVT.	Min. of Lands Housing $Environment Akure, Ondo State	boloakoryamisk@yahoo.com	08034754321
9	K.D.Semudara	OSOPADEC	Osopadec, Oba-ILE Akure		08055591734
10	T.F.Fameso	Forestry Dept. FME.HUD, Abuja.	Fed, Dept. of Forestry. Fed. Min. of Houing and Urban Development, Abj	folufameso@yahoo.com	08055142456
11	R.E. Emupenne	Baale	Baale Ajegunle Community Ondo State		08054977314
12	TF Okujagu	NNMDA	9 Kofo Abayomi Road Victoria Island, Lagos	tibuomi@yahoo.com	08034443555
13	Gabriel Ogar	Living Earth Nig.	Plot 278 Bible Way Calabar	gabeogar@yahoo.com	08056894325
14	Henry Onwe	CEF	60165 Ndidem road Usang Iso Road Calabar	EmpowermentRound@yahoo.com	08025388499
15	Ligali Olayinka	Committee Resp.Lagos	No.7 Olayinka StreetNiajidun Avori, Ikorodu Lagos		08023987645
16	Evangelist Y.Otudeko	Community Rep.	Ode Omi		08057886973
17	Edet Akpan	Colin Rep.	S.H.E.Calabar	Coastalife02@yahoo.com	08033950108
18	C.O Oshunsanya (mrs)	FMEHUD, Abuja	S.H.E Calabar	coosunsanya@yahoo.com	08033063512
19	Dr. Ekpo E.Antai	UNIDO	University of Calabar	Ekpoantai@yahoo.com	08037454788
20	Prof. M.G.Ogbe	Resource Person	DELSU ABRAKA	ogbegbenn@yahoo.com	08033013825
21	Hon. Tom Agi	Hon. Comm. Min. of Envt. Cross Riv. State	Min.of Environment	Okifor@yahoo.com	08035524443
22	Esther Edu	Unical	Botany Dept.	Esiedu@yahoo.com	08037238078
23	Ernest Chinwo	Thisday Newspaper	Calabar	ernestchinwo@yahoo.com	08033412429
24	Chiefe E.N. Ekeng	Communiy Chief	49 Mustak Way Oron	edyekeng@yahoo.com	08033799275
25	Evang. I.H. Pepple	MFCSN (NGO)	22 King Amachiez road ph	Iwomgtprit2003	08033364412
26	Agba Samson T.	Eastern Obolo Community Dev. Foundation	1 IKO Town Okoroete road Iko, Eastern Obolo LGA Akwa Ibom State	agbasamp@yahoo.com. easternobolo@yahoo.com	08027713958
27	Dr.S.I Udousoro	Min. of Environmental Resources,	Min. of Environmental, Resource	inyapudosoro@yahoo.com	08023206392
28	Mr Adimorah N.	BDCP		Nnaoma@bioresources.org	08054969823
29	Ms. Ngozi Aligwekwe	BDCP		Ngozi@bioresources.org	08036310802

EXPECTED OUTPUTS

The following are the expected outputs, which the two working groups deliberated on and arrived at some recommendations/resolutions.

1. All project sites assessed all data relating to sites are validated.
2. Awareness already created on the need to conserve the Mangrove forest.
3. Data collected by completion of questionnaires and information fully analyzed.
4. Level of awareness and public suggestions noted.
5. Sites for reforestation Programme identified with detailed description.
6. Commitment letters obtained from all stakeholders especially the oil companies.
7. Memorandum of Understanding signed by all stakeholders.
8. Firm commitment obtained from the State government officials of the coastal states to create/conserve Mangrove reserves.

RECOMMENDATIONS

Below are the Mangrove sites in the following states and the most impacted sites

1. All project sites assessed all data relating to sites are validated

AKWA IBOM

- Oron
- Udunguko
- Mbo
- Urue Effiong/Oruko
- Opobo
- Uruan
- Ikot Abasi
- Essien Eket
- Ibeno
- Eastern Obollo
- Parrot Island

Sites most Impacted

- Oron
- Udunguko
- Mbo
- Ikot Abasi

Cross River State

- Akpabuyo
- Calabar South
- Odukpani

- Bakassi
- Calabar Municipality

Sites Most Impacted

- Calabar South
- Bakassi
- Akpabuyo

Rivers State

- Bonny
- (Cawthorn Channel, Kala- Ibiama)
- Febiere
- Finima
- Okirika
- Ogu-bolo
- Opolo
- Andoni
- Port Harcourt

Sites Most Impacted

- Bonny
- Andoni
- Opobo

Ogun State

75%-80% of the Mangrove is in the water side LGA, but there are patches in the following areas-Ipokia LGA and banks of Ogun River.

- Water Side LGA (Makun, Odeomi)
- Upokia LGA (Tony Island)
- Ogun River (Baals)

Sites Most Impacted

- Odc-Omi
- Makun-Omi
- Tongeji Island

Ondo State

Ilaje LGA

- Ayetoro
- Awoye

- Ipepe

Ese-Odo LGA

- Gbekebo
- Apata
- Arogbo

Most of the Mangroves are concentrated in Ilaje LGA. There are patches of mangroves in Ese-Odo LGA. At Awoye community where we have sea incursion which led to high level of siltation, it is the presence of the white mangroves at right side of the community that offered high resistance to the sea up-surge thereby preventing the coastal line from being further eroded.

Note: Frequent occurrence of siltation had made the Awoye people to relocate about six (6) times.

Sites Most Impacted

- Ayetoro
- Awoye
- Ipepe

Lagos State

Preferred sites

- Ikorodu (Majidun-Awori)
- Epe
- Ibeju-Lekki (Ise)
- Badagry

Delta State

Preferred sites

- Warri South (Warri)
- Warri North (Abe Igborodo)
- Warri Marina

Edo State

- Needs more of Conservation

2. Awareness already created on the need to conserve the mangrove

- We need to create a positive awareness
- We need to sustain the Awareness
- The communities are fully adequate aware of the mangroves both positively and rely

- The communities' campaign should preach sustainable harvesting of the mangroves. We must put up a slogan
  Cut 1 and 4

3. Data collected by completion of questionnaires and information fully analyzed
The group could not analyze the questionnaire data because the questionnaires were not yet returned. It was decided to leave it to BDCP to analyze.

4. Level of awareness and public suggestions noted

The group could not deliberate on this issue due to the fact that the awareness campaign was still to be done. This can be judged from the responses when we go to the coastal communities and interact with them.

5. Sites for reforestation programme identified with detailed description

We had already treated this item in No 1. We referred to it as the most impacted sites. We did a state by state analysis. The only state we left was Bayelsa because we did not have any representative from there. BDCP was urged to furnish this detail when they go on the enlightenment campaign.

6. Sustainable awareness campaign

- There must be firm commitment from the communities and they must own the process
- Existing policies can undermine a good project e.g. in Cross River State all Forests are owned and managed by Forestry Commission.

7. Form a network of concerned stakeholders
- It's not easy for an NGO to get a commitment from the Governments. It is easier for the FMEHUD or UNIDO to get such commitments from them.