

# **EVOLVING STRATEGIES TOWARDS OIL SPILLAGE MANAGEMENT**

**A CASE STUDY OF NIGER DELTA REGION IN NIGERIA**

**SUBMITTED BY:**

**ISIAKA RAFIU FOLORUNSHO**

**PGD/GEO/2000/2001/156**

**TO**

**THE DEPARTMENT OF GEOGRAPHY,  
SCHOLL OF SCIENCE AND SCIENCE EDUCATION.  
FEDERAL UNIVERSITY OF TECHNOLOGY,  
MINNA**

**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR  
THE AWARD OF POST GRADUATE DIPLOMA  
IN  
ENVIRONMENTAL MANAGEMENT  
OF THE FEDERAL UNIVERSITY OF TECHNOLOGY,  
MINNA – NIGER STATE.**

**MARCH, 2002.**

## DECLARATION

I hereby declare that this research project has been prepared by me, under the supervision of Dr. A.A Okhimamhe of the Department of Geography, Federal University of Technology Minna, and it has not been presented in any previous application for higher degree. All source of information are specially acknowledged by means of references.



**ISIAKA RAFIU F.**

March, 2002

**CERTIFICATION**

This is to certify that this project is an original work undertaken by me, pgd/geo/2000/2001/156 and has been prepared in accordance with the regulation governing the presentation of project in the Department of Geography, Federal University of Technology, Minna, Niger State.

Relevant work by other authority are duly given acknowledgement and accorded credit in this research work.

.....  
*A. Okhimamhe*  
**DR. A.A. OKHIMAMHE**  
Project Supervisor

.....  
*20/03/2002*  
**DATE**

.....  
*M.T. Usman*  
**DR. M.T. USMAN**  
Head of Department

.....  
*20-03-02*  
**DATE**

.....  
**EXTERNAL EXAMINER**

.....  
**DATE**

.....  
**PROF. J.A. ABALAKA**  
Dean Post Graduate School.

.....  
**DATE**

## **DEDICATION**

This work is dedicated to my parent for their foresight towards my academic pursuit morally and financially.



## **ACKNOWLEDGEMENT**

It is a common saying that behind every successfully completed work are men who appreciate hard work.

I want to express my profound gratitude to all the people who made this project possible such as my supervisor Dr. A. A. Okhimamhe, Programme Co-ordinator Mr. Saliu, Dr. M. T. Usman, the Head of Department, Professor M.J. Baba, Professor D.O. Adefolalu, Dr. S. Halilu, Dr. A.S. Abubakar, Dr. G.N. Nsofor, Dr. P.S. Akinyeye all of Department of Geography, Federal University of Technology, Minna. For all their valuable contributions and necessary corrections during my training period.

I owe special debt of thanks to my Colleagues in Ekito Construction Company, Abuja. Mr. Adebayo Adeleye, Mr. Ben Alabi Alamu-Gabriel, Engr. Segun, Master Ehmmede "Mola-Ben the Typist, also to my friend Mr. Thompson Hope and all my course mates for their contributions and supports especially Abdulkarim Yunusa.

To cap it all, my unreserved appreciation goes to my family especially my wife, the entire staff of NNPC Abuja Planning and Research Department Corporate Headquarter, Abuja and Communities member around Elolo Oil Field and Staff of Chevron Oil Company for their response to my questionnaires.

May Almighty Allah bless every ones effort accordingly and continue to shower his bussing on us. Amen.

**Isiaka Rafiu F.**  
February, 2002.

## ABSTRACTS

Before the discovery of oil in 1889 at Titus Ville, Pennsylvania in the United States, nothing was known about this all-important resource, that has in recent time become an index of appropriating wealth. Its discovery led to ways and means of extraction and refining into gasoline, other petroleum materials and products and its subsequent transportation and handling from one point to another.

While the search and demand kept on being intensified, other alternative technology has not kept pace with that of the oil industry, with the resultant effect that other alternative technology are dwindling very rapidly.

It was pointed out that while the oil industry has become a beehive of environmental speculation's and ascertains, it has encouraged environmental pollution and subsequent degradation leading to Environmental catastrophe as can be rightly seen in areas where oil spillage has become a re-occurring decimal.

Like an end-time holocaust oil spillage occurs on daily basis in the Niger Delta region of Nigeria in various magnitude, some minor, others major causing untold hardship not only on lives and properties of affected

areas but also the environment experiencing what can be referred to as ecological disruption and imbalance.

Environmental issues arising from oil spillage will be very difficult to handle if considered merely as environmental problems. Inter-mixed with these with problems are issues of management has political, social and economic connotations.

In Nigeria however, the Niger Delta Region has become the melting point of oil and gas related industrial activities, with the surrounding environmental being worse for it. It is in the light of the fore-going that this thesis will be trying to address issues associated with oil spillage management strategies. Vis-à-vis reasons why oil spills occur, options available towards remediation and clean-ups, what role do the multi-national oil companies who are major stake holders do play government policies and actions in this direction and activities of host communities will be x-rayed.

By and large, the approach, findings, recommendations and conclusion from this study will be useful guides towards enhancing the management of oil spillage in Nigeria.

## TABLE OF CONTENT

|                   |      |
|-------------------|------|
| Title Page        | Page |
| Declaration       | i    |
| Certification     | ii   |
| Dedication        | iii  |
| Acknowledgement   | iv   |
| Abstracts         | v    |
| Table of Contents | vii  |
|                   | ix   |

### CHAPTER 1

|       |                                          |    |
|-------|------------------------------------------|----|
| 1.0   | Introduction                             | 1  |
| 1.1   | Background information                   | 1  |
| 1.2   | Location                                 | 1  |
| 1.1.2 | Geographic Morphology                    | 3  |
| 1.1.3 | The People of the Niger Delta            | 6  |
| 1.1.4 | Traditional Major Economic Activities    | 8  |
| 1.1.5 | Background to oil exploration in Nigeria | 9  |
| 1.1.6 | Niger Delta Reforms                      | 11 |
| 1.2   | Problem statement and Research Questions | 13 |
| 1.3   | Aims and Objectives of the study         | 14 |
| 1.4   | Justification of the study               | 15 |
| 1.5   | Description of study area                | 16 |
| 1.6   | Scope and limitation of the study        | 24 |

### CHAPTER 2

|         |                                               |    |
|---------|-----------------------------------------------|----|
| 2.0     | Literature Revision and Theoretical Framework | 26 |
| 2.1     | What is oil Spill                             | 26 |
| 2.2     | History of oil spill                          | 28 |
| 2.3     | The effects of oil spill                      | 31 |
| 2.4     | Nature of oil spill                           | 32 |
| 2.5     | Causes of oil spill                           | 33 |
| 2.6     | Detection and Surveillance of oil spill       | 38 |
| 2.6.1   | Visual detection and Surveillance             | 39 |
| 2.6.2   | Aerial Monitoring                             | 39 |
| 2.6.2.1 | Radio transmitting Buoys                      | 40 |
| 2.6.2.2 | Satellite Surveillance                        | 40 |
| 2.6.3   | Side looking Airborne Radar                   | 41 |
| 2.6.4   | Satellite Tracking                            | 42 |
| 2.7     | Initial response to oil spill                 | 42 |
| 2.8     | Oil spill Disposal                            | 44 |

### **CHAPTER 3**

|     |                                        |    |
|-----|----------------------------------------|----|
| 3.0 | Data Collection and Method of Analysis | 47 |
| 3.1 | Source of Data                         | 47 |
| 3.2 | Analytical statistical Methodology     | 48 |
| 3.3 | Sample method and size                 | 48 |

### **CHAPTER 4**

|     |                                        |    |
|-----|----------------------------------------|----|
| 4.0 | Data Presentation and Analysis         | 50 |
| 4.1 | Data presentation and analysis         | 50 |
| 4.2 | Additional information from Field work | 70 |
| 4.3 | Discussion                             | 72 |

### **CHAPTER 5**

|     |                                        |    |
|-----|----------------------------------------|----|
| 5.0 | Finding conclusion and recommendations | 78 |
| 5.1 | Findings                               | 78 |
| 5.2 | Conclusion                             | 80 |
| 5.3 | Recommendations                        | 80 |

## **CHAPTER 1**

### **1.0 INTRODUCTION**

#### **1.1 BACKGROUND INFORMATION**

Niger Delta Region which is the focus of this study is located in Nigeria, lies along the coast, it extends from the Benin River in the West to the Bonny River in the East.

Interland, it begins a few kilometers below the village of Aboh at a point where the Niger forks into the Nun and Forcados Rivers. It is a low-lying region riddled with an intricate system of natural water channels through which the Niger finds its way into the sea. Before the mouths of these channels were blocked by bars the delta produced the largest number of sheltered ports sites along the coastline of West Africa, and historic ports of Bonny, Warri, Brass and Forcados were located in this region.

The causes and consequences of oil spillage on the people of Niger Delta Region has prompted this study. When oil spilled to the rivers, creeks ocean e.t.c it suffocate every living organism found in such water and make it unsuitable for domestic use. Thereby affecting eco-system of this region. Also it's adverse effect on the economy of the Nation in general.

#### **1.2 LOCATION**

The Niger Delta Region which is the focus of this study, lies at the

critical south with four distinct ecological zones: coastal ridge barriers, mangrove, fresh water swamp forest and lowland rainforests. It is one of the worlds largest deltas with a spanning estimate of between 40,000 - 70,000 square kilometers. It is endowed with immense natural resources especially hydrocarbon deposits. It is estimated that the value of natural gas when sufficiently harnessed coned exceed the total economic benefits derives at present from crude oil.

Despite of its abundant natural resources, the Delta is an environmentally sensitive and fragile region owing to its peculiar natural, physical setting and its distributive ecological features and functions which over the years have drawn the attention of conservationist especially on the need for sustainable development and the protection of biological diversity. It is traversed by creeks and rivers that make navigation difficult especially in dry seasons.

Considerably changes are occurring in the ecological environment and in the socio-economic setting of the Niger Delta as a result of exploitation of natural mineral resources, especially petroleum.

Despite of the resources endowment of the Delta, it's immense potential for economic growth and sustainable development, the region is m a critical state and it's resources base is severely threatened.

According to World Bank reports (1905) the Niger Delta thus is



tributaries, but also areas in the region that are associated with oil development. Additionally, political boundaries principally defined by the Nigeria States of Rivers Delta and Bayelsa and their associated Local Government Areas. (L.G.A) provide the third level of complexity.

The Niger Delta area extends seaward to the edge of continental shelf, and includes areas of extensive offshore oil development. The total land area covered or defined as the Niger Delta Regions is approximately 25,900km<sup>2</sup> or 2.8% of Nigerians total land area (NDES 1997). It is made up the upper Delta region, the height of flood wave, over 7m above the dry season water level produces well developed drainage channels and associated lakes on the flood plain. As flood waters enters the lower Delta and divide into numerous distributaries, the peak of the flood wave decreases and flattens. As the Delta is rather flat and does not have well defined flood plain boundaries and the interior of Delta gets flood to accommodate the large volume of water. Thus a considerable part of the discharge of the Niger Delta takes place on land.

The Niger Delta shoreline is bounded by the Atlantic ocean, saline water flow into the lower Delta with rising tide, particularly during the dry season. On a failing tide, flow direction reverse and fresh water and brackish water conditions increasingly dominate the lower Delta.

movement may have been affected by civil engineering activities, such as dredging and canalization. The actual or nature of the effects of these activities on ground water characteristics is, however, not clearly defined.

### **1.1.3 THE PEOPLE OF THE NIGER DELTA**

The Niger Delta people are currently identified under five major linguistic categories:- The Ijaw, the Yoruba, the Edo, the Igbo and the Delta - Cross according to NDES 1997.

Each of these categories embraces a large number of ethnic/linguistic communities most of which extends beyond the boundaries of the Niger Delta. There are over 500 ethnic groupings in the Region. The Ijo (Ijaw) comprise the oldest and most complex single group of settlers in the Niger Delta. They are estimated to have separated from the Yoruba the Edo and the Igbo and moved into the Niger Delta over 7,000 years through aquatic routes. Possibly down the Niger. The antiquity of the Ijo settlement of the Niger Delta is relative isolation from other Nigerian groups, has resulted in it clear linguistic distinction from its neighbours. Since then, an internal division of the Ijo into four dialects cluster has taken place. They include the following:- Easter Ijo, Nembe, Akassa, Izon and Inland Ijo.

The Ilaje and Ikale of Ondo State and the Itsekiri of Delta State, constitutes the major representatives of the ethnic/ linguistic -communities

of Yoruba origin in the Niger Delta. There is little published held on the Ilaje and Ikale, compared with the available materials on the Itsekiri. All these groups are estimated to have entered the Niger Delta less than 2000 years ago from the Yoruba land. The Itsekiri are regarded basically as a Yoruba ethnic/linguistic community.

The communities of Igbo extraction in the Niger delta Ika and Ukwani in Delta State Ndoni, Egbema, Ogba, Ikwere and Ekpeye in Rivers State, Ohaji in Imo State and Asa in Abia State, represents movement South ward from more northerly original homes. As in the case of the Delta people of Edo region, claims from among Ogba and other groups to migration from Benin must refer to secondary movement of population that were absorbed by the original igbo majority. The experimental dating of Ali-Ogba excavations suggest that the occupation of these parts of the Niger delta may have taken place over a thousand years ago.

The Delta-Cross linguistic group comprises central Delta (Ogba in Bayelsa, Abia, Odual etc. of Rivers State). Ogoni (Khani, Gokama, Eleme, Ogoni etc also of Rivers State) and lower cross (Obolo/Andoni of Rivers State and Akwa Ibom State and Ibero, Ibibio, Oron etc Akwa Ibom State). As the name implies, migration of these communities into the Niger delta was from the East, largely from the Cross River valley and beyond, less than 2000 years ago.

small-sized firm holding of less than one hectare per household. Commonly very simple traditional farming tools, including cutlass, hoe and axes are employed in single and mixed crop farming.

These oil production communities depend and thrive mainly on subsistence agriculture and fishing. Unfortunately, the discovery and production of oil rather than help in the development of the agricultural potentials of these communities came with it, the systematic destruction and attrition of not only this very vital industrial sector, but also the environment. This has led to the basic problems that face these oil-producing communities namely, persistent poverty, unemployment and feeling of deprivation.

The deluge of protests and unrest in the Niger-Delta according to Maduka (1998) only buttresses the fact that apart from seeking attention to their socio-economic grievances, the tranquility that these areas are known for and which is a tonic to development and growth no longer exists.

#### **1.1.5 BACKGROUND TO OIL EXPLORATION IN NIGERIA**

In 1938, Shell d'Arcy was granted a sole oil exploration license right covering the entire mainland of Nigeria of about 367,000 sq. miles. Shell d'Arcy which later become shell-BP an. Ando Dutch concern, had a monopoly of the concession areas until about 1957. Since then, the production of crude oil has increased tremendously and rapidly too, with other companies jostling for increased capacity production.

The number of producing companies has increased to eleven with a total of 159 oil fields according to Niger Delta Environmental Survey Report 1997; with a total average number of production oil well of 148.

Out of this number, Shell petroleum development company of Nigeria Limited (SPDC) accounts for more than a half of the total production (See table below). Joint Venture Contracts with NNPC (the state owned NNPC) accounts for more than 90% of oil production in the country.

| <b>COUNTRY</b> | <b>NUMBER OF OIL FIELD</b> | <b>AVERAGE NO. OF PRODUCTION WELLS</b> |
|----------------|----------------------------|----------------------------------------|
| AENR           | 1                          | 16                                     |
| AGIP           | 20                         | 137                                    |
| ASHLAND        | 8                          | 89                                     |
| DUBRIL/PHILIPS | 1                          | 1                                      |
| ELF            | 6                          | 116                                    |
| CHEVRON        | 17                         | 220                                    |
| MOBIL          | 17                         | 104                                    |
| PAN OCEAN      | 1                          | 1                                      |
| SPDC           | 83                         | 748                                    |
| TENNECO        | 1                          | 1                                      |
| TEXACO         | 4                          | 48                                     |
| STATOIL        | 0                          | 0                                      |
| FSSO           | 0                          | 0                                      |
| CONOCO         | 0                          | 0                                      |
| <b>TOTAL</b>   | <b>159</b>                 | <b>1481</b>                            |

**Source:** Ministry of Petroleum Resources.

Proven oil reserves in Africa are put at about 66 billion-barrel of which holds 20 billion barrels, (NDES 1997).

At current production levels this is sufficient to give Nigeria another 30 years of production. Nigeria and specifically the Delta, is even richer in natural gas than oil. The gas reserves according to the same report are placed at

more than 3 trillion cubic metres, and may last for more than 150 years.

Presently, there exist, the clamour for the allocation of more oil blocks. What this implies is that more economic activity associated with crude oil production are going to take place with its attendant negative externalities such as oil spill.

#### **1.1.6 NIGER DELTA REFORMS**

The Federal Government through the establishment of various agencies has indicated by their act that there exist problems which are peculiar with the Niger Delta Region.

At different times, agencies has been set-up with the aim of addressing the ills of pollution arising from crude oil exploration and exploitation in the region, all with the intention of raising the people's standard of living. But over time agencies and commissions come and go with people's standard of living deepening everyday. It does appear, that some thing drastic have to be done mal attempt to improve on the situation.

There are quite a number of such agencies and bodies that either have been constituted, inaugurated or commissioned. While some have gone comatose, some are moribund, some scrapped while some barely functioning or exist in a name (redundant) some of such agencies include the following:

- (a) Niger Delta Basin Development Authority (NDBDA)
- (b) Directorate of Food, Roads and Rural Infrastructure (DFRRI)



- (c) Oil Mineral Producing Areas Development Commission (OMPADEC)
- (d) Niger Delta Development Commission (NNDC Act 2000)
- (e) Petroleum Trust Fund (PTF)

While DFFRI and PTF has been scrapped Niger Delta, Basin - Development Authority (NDBDA) only exists in a name because their impact are neither known nor felt by the people of the region whom they are meant to serve

The oil mineral producing area development commission which was set up in (1992) as a development agencies to see to the needs of the oil communities with a 3 percent budgetary allocation, later revised to 13 percent from the Federation account has very laudable objectives, aimed at specifically uplifting the social and economic well being of these communities that has suffered environmental degradation arising from incessant oil spills and other Environmental hazards. The allocations according to available records are about N1 billion released between 1992 - 1994 to the commission.

The same record the according to Maduka (1998)-showed an average of 3 billion disbursed in 1995, 1996,1997 respectively. A cumulative total of N20 billion was disbursed by (OMPADEC between 1992 - 1997.

It is unfortunate that, despite of this disbursement there are still more questions than answers as the Niger Delta Environment and its people

continue to suffer deprivation, abuse and neglect. Gradually the oil boom is creeping in to oil doom for the Niger Delta people. What then can be done? or has these problems differed solution?

The Federal Government having sensed the pit tails and inadequacies of OMPADEC. Establishment in 2000, the Niger Delta Development Commission with wider powers and responsibilities with a mandate of producing a master plan blue print of the Niger Delta region and its subsequent implementation which may lead to development and arresting the incessant but urged cases of Environmental pollution and degradation including oil spills.

It is on records, almost more than a year gone-by the commission is still battling with identify and crises of direction.

## 1.2 **PROBLEM STATEMENT & RESEARCH QUESTIONS**

In Nigeria, however the Niger Delta region has become the focus of all oil and gas related industrial activities with the surrounding environment being worse for it. It is in the light of the fore-going that this study will be trying to address issued associated with oil spillage management strategies viz-a-viz reason. The causes and consequences are remedies of oil spillage. The roles played by the multi-nation oil companies are the major stake holders government polices and steps taken in this direction and the activities of the host communities in this area.



It is also imperative to pose the following as research questions as a way of making good findings which are among other:-

- (i) What are the possible reasons that gives rise to oil spill in the Niger Delta region?
- (ii) Are reasons the same all over the world?
- (iii) What are the measure put in place to check oil spills?
- (iv) Are the measure adequate enough to caution the effects arising from oil spills?
- (v) What can be done to forestall incessant oil spills?

### **1.3 AIM AND OBJECTIVES OF THE STUDY**

The major aim of the research is to study/assess the various strategies towards oil spillage management in Nigeria using Niger Delta Region as a case study with the followings set objectives which are:

- (i) To provide technical and managerial measures towards handling oil spills.
- (ii) To educate the people on the need to be environmentally conscious
- (iii) To optimize the usage of natural resources potentials.
- (iv) To recommended an approach of evaluating latent lost of oil spills.
- (v) To make recommendation on possible solution intervention models to be adopted in attempt to minimize oil spill in Nigeria.

#### **1.4 JUSTIFICATION FOR THE STUDY**

The importance of this study can not be over emphasised and could not be quantified in monetary terms because of its effects on human and the " environment

The incidence of oil spillage has caused a lot of harm to humanity and its environment many life has been lost properties are wasted, air and water has been polluted and many other loses which affecting the economy directly or indirectly as shall be explained below:-

For example Niger Delta most serious oil spill occurred ten years before the Exxon Valdez. In July 1979, a storage facility at the West Niger Delta Shell operated Forcados terminal collapsed. It spilled an estimated 560,000 barrels into the surrounding land, mangrove swamps and into the Atlantic, There was hardly and respite. Six months later, in January 1980, a major blowout occurred which spewed out Atlantic and destroyed some 840 across of Niger Delta mangrove.

Also according to NDES (1995) there are over 400 oil production and storage facilities scattered within the Niger delta swamps creeks and lands which cumulatively produces about 2 million barrels of crude oil. The threat of oil spillage (accidental or operational) is always present when this happens, it results in pollution of the lands and water of these areas.

From this standpoint, one will begins to appreciate the challenge posed there from and seriousness of developing a viable mechanism as

well as framework toward oil spillage management in this region.

## **1.5 DESCRIPTION OF THE STUDY AREA**

- (i) Location:- From geographical point of view the Niger Delta region which is the focus of this study extends (between latitude  $04^{\circ} 12' N$  and  $07^{\circ} 50' N$  by North of the Equator from Forcados in West to the Bonny River in the East, a distance of about 350 km and from apex of delta at Abo to the coastline which is about 150km.

The Delta has also a narrow coastal strip varying in width from a few meters about 16km. Most of the 10,000km<sup>2</sup> of the Delta is made up of swamp with the few islands of solid red earth, trending north-south which form only firm dry land, the mean elevation of these island is approximately 20m. The Niger delta area extends seaward to the edge of continental shelf, and includes areas of extensive off shore oil development. It is made up upper Delta, region the height of flood ward over 7m above the dry season water level produces well developed on the flood plain.

The Niger Delta shoreline is bounded by Atlantic ocean. Saline water flood into the lower Delta with rising tide particularly during the dry season on a failing tide, flood direction reverse and fresh water and brackish the conditions increasingly dominate the lower Delta. The

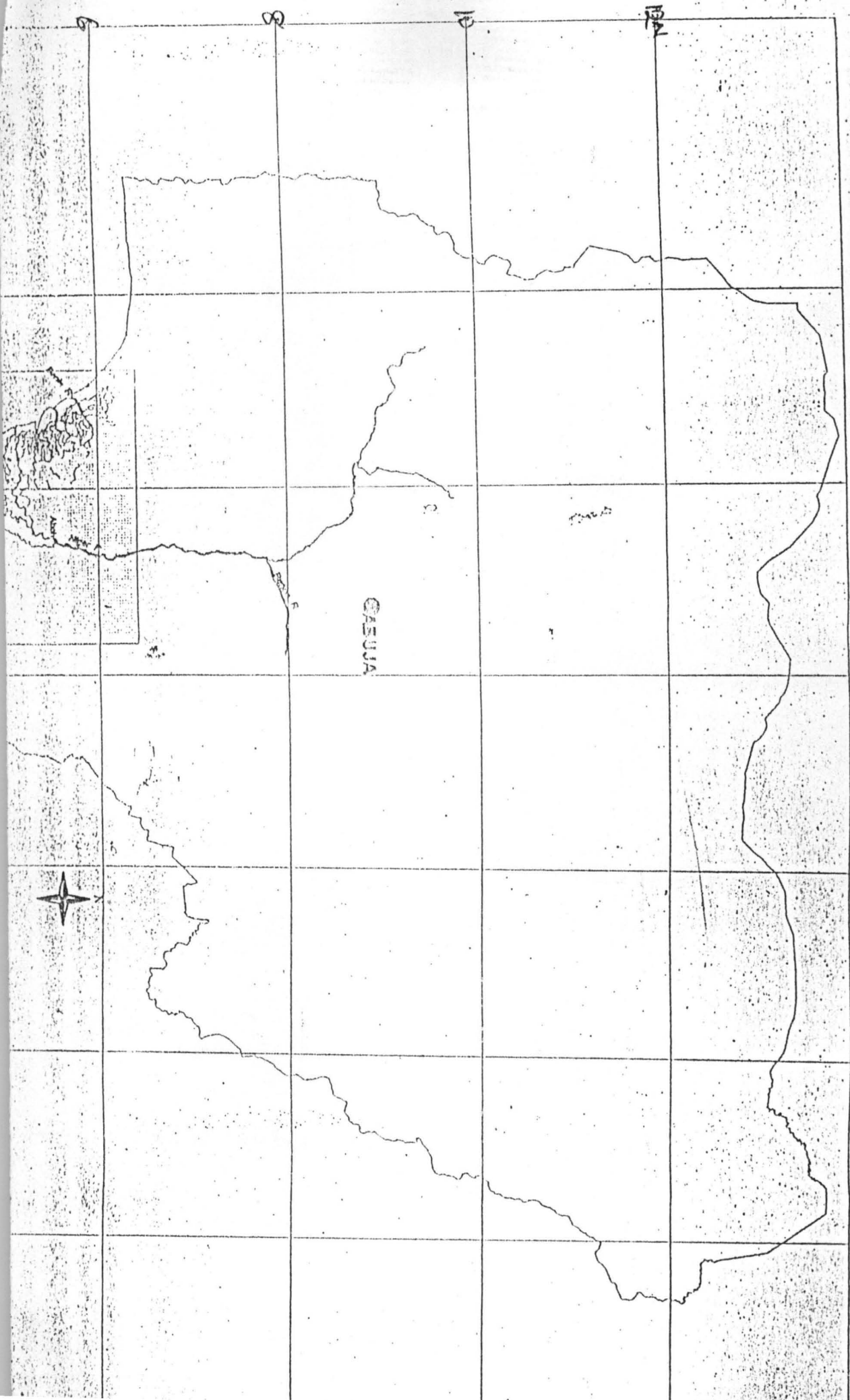


figure 1.1 below is showing of Niger Delta region.

- (ii) Relief: The land form of Niger Delta region appears to be generally flat, monotonous. It has been even been described in some published literature as a horizontal structure of low relief. A close examination of the relief of the region in detail, however, shows the plains as gently inclined structures which are broken in many places by small logback ridges and shallow swamp basins especially towards the west and south-west. This trend is arrested at the coast by sandy beach-ridge barriers lying between the swamp and the open sea. These ridges trend mainly in either a E-W or NW-SE direction depending on the direction of the coastline. In some areas, the ridges attain a height of 100 meters above sea level while the gently undulating coastal plain lowland to its north an northeast show height ranges between 3.05 and 55meters above sea level. In areas where it occurs the beach-ridges barrier serves as a depositional environment for coarse and fine sands from the sea, thus when viewed as a landform complex, it typically this region has a relief which ranges from 1 meter to 120 meters above sea level. Almost every part of the delta is under water at one time of the year or another, but northern part which is the habitable part, remains dry after the rains and the Niger Delta floods except for the large swamps referred to above.

In Isoko and the Ahoada area of the delta flooding is so extensive that the aspect of the landscape is entirely different in January and February, when the water in the Niger and its distributaries is at its lowest, to the high water period, which is also the flood season. A common geomorphic feature associated with these annual floods is the continual changing of the river course in the delta. Indeed it is the resulting abandoned meander loops which make up a large number of the lakes and swamps in the delta.

The entire topography is also characterized by a maze of waterway creeks and swamps criss-crossing the low lying plains. The prevalence these has been enhanced by low relief character of the region under this study. The large rivers such as the Niger, Forcados, Orashi, have channels wide (often in excess of 0.5km) even at their more northerly point in the Otamiri/Mechlium system, the New Calabar river and the coastal creeks often have widths in excess of 100 meters (up to 2.1 kilometers) especially at their middle and lower courses.

- (iii) Climate: Rainfall in the Niger Delta region is seasonal, variable and energetic in downpour. Generally; South of Latitude 05°N, rain occurs, on the average, every month of the year but with varying duration circulating over the area (approximately 04° 12'N, 05°N by 05° 22'E, 07° 36' E) is the same as circulation over most of West Africa. Primarily, rainfall is controlled by two air masses; the South West



monsoon and the Northeasterly harmattan wind. The South West monsoon originates from the region of the subtropical high-pressure belt over the Southern Atlantic Ocean. From this region it undergoes some modifications and eventually arrives over West Africa. As most, cool, air from a Southwesterly direction.

The second opposing air mass is the harmattan, from a continental origin in the sub-tropical high pressure belt of the Sahara desert. It is a hot dry airmass which also undergoes some modifications during its track and convergence marks the rainfalls zone known as the inter-tropical discontinuity (I.T.D) Zone. It marks the northern boundary of intrusion of moisture-laden maritime air. This boundary moves back and forth slowly and irregularly during the year and from year to year. The boundary migrates northward and southward with the overhead sun, reaching this region by January when it is retreating. The surface location of this zone (ITD) divides West Africa into five weather zones.

The Niger Delta region falls predominantly under the third zone at peak rainy SEASON WHICH IS BETWEEN June and September. The region also experiences the July/August break which is known as the little dry season. Though the actual months of occurrence vary both in time and place within the region it occurs in July or in August.

Another striking features of rain day distribution in this region under this study pronounced spatial variation of the magnitude. The magnitude of rain day (defined as a day during which rainfall equals or exceeds 0.25mm is determined by closeness of the coast and also by the elevation of the given station in the region, in addition to a marion effect, also benefits from orographic rain, being on the Leeward side of the Cameroon mountain opbo being nearer, and some part of Calabar area has higher rainfall. Like raindays by annual rainfall, is influenced by proximity to the coast as well as by physiography.

Air temperature of peaks in the months of February about 20<sup>0</sup> c, 30<sup>0</sup> c in September, and 26<sup>0</sup>c in November are usually experiences in the Niger Delta. The lowest relative humidity of 65% is recorded in May. The highest relative humidity of 83% is recorded in August. From August it makes a downward plugs with the arrival of harmattan.

- (iv) Topography/Geology: Delta Geology comprises all the surface and below surface earth features on the triangular shaped land mass on which and through which the Niger River discharges its waters and loaded to the sea. The geology of the delta therefore goes beyond oil exploitation and other activities which involve the subsurface only, but also includes all surface activity of rivers and soils. The Delta has been



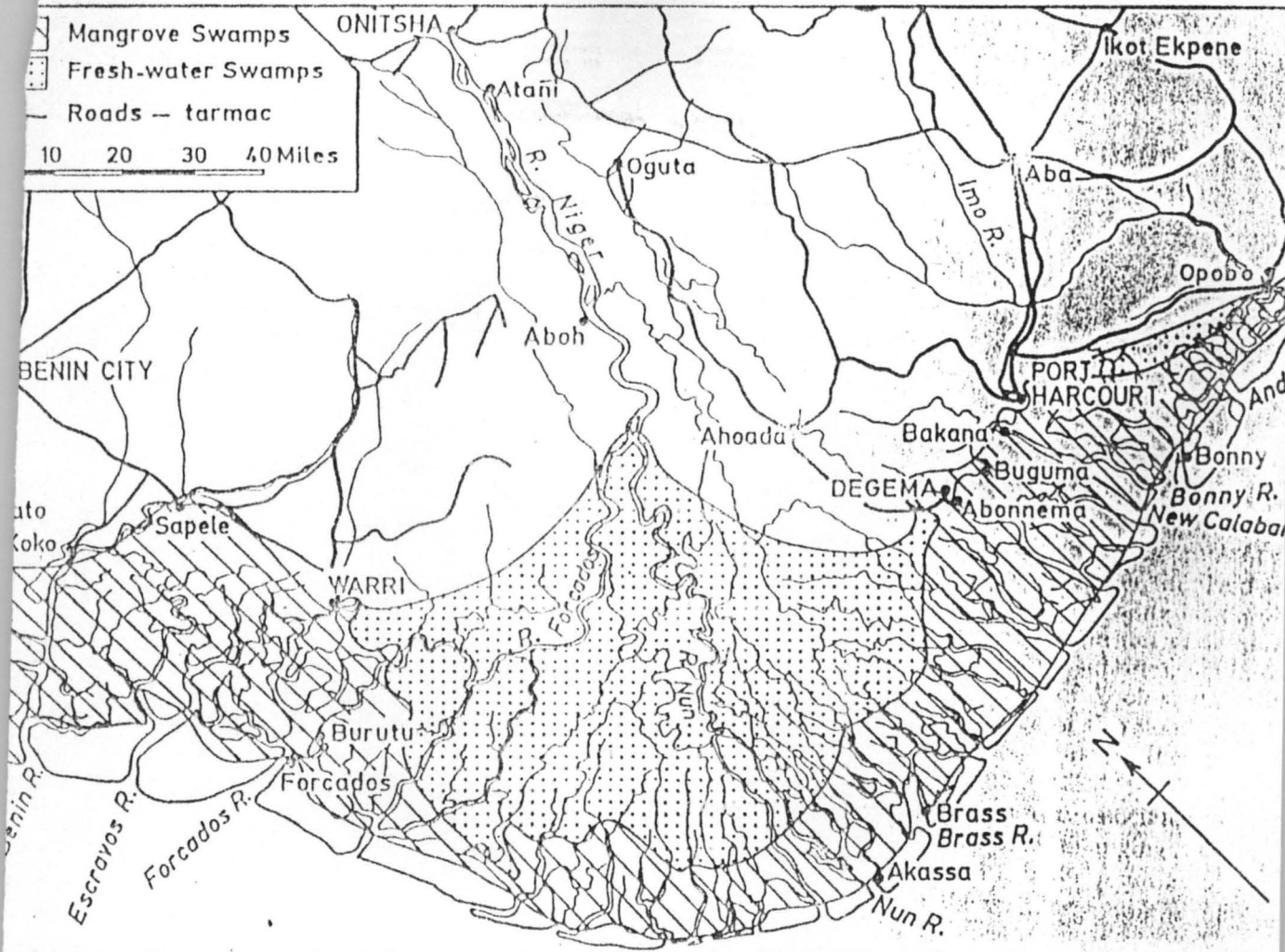
growing from Paleocene times. (Sixty-five million years before present (Okonny, et al 1989). That is from the time of the separation of South America from the African continent.

Predominantly, the sequence of deposition in the Niger Delta Basin is of massive continental sand stones overlying marginally marine sandstone and shales. These sequences eventually grade downwards into dominantly marine shales. The economically exploitable oil, being a lighter and more gaseous variety of crude oil, occurs in the inter calved sandstone and shale sequence. This is probably due to nearest of the petroleum source rocks to Cameroon volcano line, since the earth movements around the Cameroon volcanoes are presumably acting as a potential 'Kitchen; to the oil and gas.

There are two main types of geological structures in the delta. First, there are surface structures which are caused by the movement of bodies water. The second type are structures below surface caused by earth movement and the weight of sediments on each other. Among the first category are structures such as shimping, sandspits and gullies. The structures below the surface include diapirs growth faults and folds.

- (v) Vegetation and Soils: A mixture of raffia palms and broadleaved trees in which the former predominates is the chief type of vegetation of the Niger Delta region. Hence the fact that the main products of these swamps are palm wine, the raw material of illicitgin and some timber:

THE COASTLANDS OF GUINEA



Physical Regions of the Niger Delta. The unshaded narrow strip fronting the open sea is the region of sandy beaches

Extract from Physical Regional Map of the Niger Delta.  
 Figure 1.2

In the Central part of the Niger Delta, mangrove swamps, which are largely muddy and uninhabitable, occur South of the freshwater swamps. Elsewhere, but particularly in the Sapele Warri and Port-Harcourt -Abonnema areas, where the widest stretches of the mangrove swamps occurs, these swamps are bordered on the landward side by firm sedimentary rock of the coastal plain formation and not by fresh water swamps (Figure 1.2) attached below, there are about 6,000 km<sup>2</sup> of mangrove swamps in the Delta region, .With swamps may be found a number of fairly high lands which are dry throughout the year. Such patches of dry land provides site on which settlements like Buguma, Bakana, Degema and Tombia are built. But these islands are often plagued by creek erosion, which is to occur when the level of these falls at which time the creeks erode their lowest part and begin to cut back gradually. Soil of the swamps are rich in organic matter in top layer, but contain too much salt especially in dry season.

The third physical division of the delta is the narrow strip sandy ridges and beach ridges which lie very close to open sea. The width of the strip varies form a few meters to 15 km and is bordered on the land water side by swampy areas containing many creeks. As a result of the heavy rainfall in this area, the swamps are covered with freshwater vegetation, but further inland, these swamps give way to mangrove swamps. The

soil of the sandy ridges are mostly sandy or sandy loams which sometimes have an underlying layer of impervious pan. The high rainfalls also causes much leaching in the soils, which are rather poor but do support crops like mangoes, coconuts, cashew nuts and oil palm trees. Excepting the region of the mangrove swamps where trees grow only close to the banks of the creeks, the whole delta is covered with a dense vegetation.

Apart from mangrove swamps and fresh water swamps forest, the tropical rainforest can also be found in some part of Niger Delta region, the tropical rainforest is the most complex in terms of structure species numbers of the three main vegetation types present in Niger Delta region. At a glance it appears as a bewildering mass of vegetation hidden uncountable numbers of wild animals and venomous creatures. A close look, however, reveals that the forest is not as amorphous and awesome as first appear. It has a definite structure and no particular plant species dominant as is the case in the mangrove, fresh water swamp, and main temperate forest ecosystems.

A remarkable characteristics of many tropical rain forest is the buttress structure at their bases. Usually triangular, there buttresses serve a firm anchors for the tress. The buttresses may rise several meters above soil surface and stretch out for quite a distance along the ground. Another unique and interesting features tropical rainforest the pressure of

cauliflorous plant species. These are plants that produce their flower and inflorescences and consequently, fruits, on leafless woody trunks and large branches instead of producing them on tiny twigs within the crowns of the trees.

The flooding condition of this region normally changes the colour of soil from the brown loams and sandy loams at the crest of the levee to more acidic and more clayed soils on the slopes. Flooding preventing the cultivation of levee slope soil which are closely populated by oil palm trees. The sub-recent of Niger terrace (or sombreiro-warri deltaic plain) (Okonny et al 1989). Represents the remnants of a delta that was later eroded away. The remnants are found in the Northern part of the salt water zone and they consist islands sandy deposit about 3m above the present deltaic plain. Some of these are the island on which Degima, Abonnerna, Buguma, are sited. The soils are brown to dark greyish brown in the surface layer and yellowish brown in the sub-soil. They contain about 75% sand and 5 - 20% clay and very strongly acidic (PH 3.8-4.7) low in organic matter and poor in essential nutrients, hence of low fertility rating. They are not subject to flooding except in back swamps areas.

## **1.6 SCOPE AND LIMITATIONS OF THE STUDY**

The study recognise the multiplicity of problems associated with crude oil production but the scope here is limited strategies specifically within a



unique geographic, fragile and delicate ecosystem such as that of Niger Delta Region in Nigeria. The study need not go into analytical laboratory model associated with the rigours of oil spillage component determinants but they may be mentioned en-pass in the course of the study.

The study recognises incongruities associated with quality data and there are causal chain of events which leads to significant data gaps and limitations in analysis. Unfortunately even where they exist, they are not subjected to rigours quality control, particularly for consistency of terms and definition.

Furthermore, these database are not linked, making it very difficult for researchers to search in and compare multiple data bases. Also there exists a lacuna in series of unreported cases of oil spills, most of whom cannot be accounted for tear of whatever concern, the multinationals who are major stakeholders in the petroleum industry heard information in the direction of this research which they term as classified. All these put together has constitutes enormous research.

## CHAPTER 2

### 2.0 LITERATURE REVIEW AND THEORETICAL FRAMEWORK

The discovery of oil in 1956 at Olobiri in Rivers State marked the beginning of environmental conflicts in the Niger Delta Region of Nigeria. The magnitude of destruction, disorder and disruptions to the Environmental and Socio-economic psychic of the people is enormous.

Everywhere within the Niger Delta where oil is exploited there is a pronounced stark reality of environmental degradation arising from oil spills.

According to NDES (1995) There are over 400 oil production and storage facilities scattered within the Niger Delta swamps, creeks and lands which cumulatively produces about 2 million barrels of crude oil. The threat of oil spillage (accidental or operational) is always present when this happens, it result in pollution of the lands and waters of these areas.

From this standpoint, one will begin to appreciate the challenges posed therefore and *the* seriousness of derailing ^ viable mechanism as well as framework towards its management.

### 2.1 WHAT IS OIL SPILL:

Crude oil no doubt is a natural resource arising from the decay of plants and animal material in layers of sedimentary rock deep under the Earth surface spanning over geologic years of formation. In its formation, photosynthetic, energy rich bonds are captured, thus making it an excellent

fuel commonly referred to as fossil fuel. Sometimes, petroleum appears on the surface in the process as a result of sedimentary erosion or seepage and there are also unwanted release of petroleum compounds from routine, chronic discharges from accidental events or sabotage. These changes can be spontaneous sometimes from pipeline ruptures. Oil spillage can therefore be describe as thee spontaneous discharge of oil and its allied products into the air, water or land leading to Environmental pollution and degradation.

Oil spills especially from non-point source may appear small but the cumulative effect of it can be disastrous to the general environment. According to UNEP, over 10,000 spills are recorded per year all over the world, and this estimates to about 10 - 30 percent of the under ground storage tanks leaking, ground water and surface water are also affected from these discharges. 70 - 80 percent of spills results from accidents, Equipment malfunctions, etc deluding sabotage.

Oil spills are usually more severe in lakes and static environments compared to Rivers and streams except if there is a large spill. Vandermenla' et al (1996) noted that when there is a spill that moves underground, soluble organic compound from liquid petroleum can cause widespread contamination of acquirers because of the difficulties that may be associated in spotting out the leakage overtime, which may take reasonable time.

Records available shows that, there is an increasing trend in oil spills in terms of their number and there severity. National Research Council (NRC)



On March 24 1989, the Exxon Valdez went aground in Prince William and discharged 42 million litres of Alaska crude oil. It lead to a catastrophic damage to marine wildlife as several thousand of Kilometers of shoreline were oiled. More than one year after that, scientific studying the effects of the pollution have found themselves increasingly embroiled in the litigation as law suites are field against Exxon. Many experts predict that the contamination from this spill will last for decades.

Niger Delta's most serious oil spill occurred ten years before the Exxon valdez. In July 1979, a storage facility at the West Niger Delta, shell operational forcados terminal collapsed. It spilled land, mangrove swamps and into the Atlantic. There was hardly any respite, six months later, in January 1980, a major blowout occurred which spewed out 200,000 barrels of crude oil into the Atlantic and destroy some 840 acres of Niger Delta mangrove.

In January and February 1991, during the Gulf war between Iraq and the American - led United nations backed Allied forces, Iraqi President Saddam Hussein restored to ecological terrorism which resulted in oil pollution to the Gulf of Arabia of the coast of Kuwait by the Iraqi invasion forces and spread along the coast of Kuwait and Saudi Arabia.

The deliberate sabotage and discharge of vast quantities of oil from oil refineries by the Iraqi army created one of the biggest oil slicks ever known to civilization, through the exact Quantity of oil released remains uncertain according to Pickering et al (1994).

On March 24 1989, the Exxon Valdez went aground in Prince William and discharged 42 million litres of Alaska crude oil. It lead to a catastrophic damage to marine wildlife as several thousand of Kilometers of shoreline were oiled. More than one year after that, scientific studying the effects of the pollution have found themselves increasingly embroiled in the litigation as law suites are field against Exxon. Many experts predict that the contamination from this spill will last for decades.

Niger Delta's most serious oil spill occurred ten years before the Exxon valdez. In July 1979, a storage facility at the West Niger Delta, shell operational forcados terminal collapsed. It spilled land, mangrove swamps and into the Atlantic. There was hardly any respite, six months later, in January 1980, a major blowout occurred which spewed out 200,000 barrels of crude oil into the Atlantic and destroy some 840 acres of Niger Delta mangrove.

In January and February 1991, during the Gulf war between Iraq and the American - led United nations backed Allied forces, Iraqi President Saddam Hussein restored to ecological terrorism which resulted in oil pollution to the Gulf of Arabia of the coast of Kuwait by the Iraqi invasion forces and spread along the coast of Kuwait and Saudi Arabia.

The deliberate sabotage and discharge of vast quantities of oil from oil refineries by the Iraqi army created one of the biggest oil slicks ever known to civilization, through the exact Quantity of oil released remains uncertain according to Pickering et al (1994).

of Mexico.

Not minding the gains of crude oil the abundant negative impacts on the human and ecological environment tends to vitiate the gains measured in Naira and Kobo.

### **2.3 THE EFFECTS OF OIL SPILL.**

The effect of oil pollution can be disastrous for many ecosystems. Birds, fish, invertebrates, plant life can and often do, die in large quantities. The behaviour of oil when spilled into the sea and its dispersal and degradation. Oil especially gasoline pollution affects fish because it is toxic, and it cause suffocation, either by coating the gills, or by coating the surface of the sea and inhibiting the diffusion of oxygen into the water. Oil sinks to the bottom of the sea and may immobilize sperm and reduce fertilization rates. Similarly oil affects birds by coating their feathers, which then reduces buoyancy and insulation. Lipid pneumonia and intestinal irritation can result it may also affect birds eggs, reducing the permeability of the egg and cut down the food supply as the fish life dies. Oil spills also affects many other organisms, such as plants and invertebrates, all an essential part of food webs and the ecosystems.

Oil represents a major threat with the destruction of vast quantities of sea grass and algae. These plants form the base of important food webs, providing the food for higher organisms. Destruction of these food webs means the death of vast quantities of marine animals, many of which are

of Mexico.

Not minding the gains of crude oil the abundant negative impacts on the human and ecological environment tends to vitiate the gains measured in Naira and Kobo.

### **2.3 THE EFFECTS OF OIL SPILL.**

The effect of oil pollution can be disastrous for many ecosystems. Birds, fish, invertebrates, plant life can and often do, die in large quantities. The behaviour of oil when spilled into the sea and its dispersal and degradation. Oil especially gasoline pollution affects fish because it is toxic, and it cause suffocation, either by coating the gills, or by coating the surface of the sea and inhibiting the diffusion of oxygen into the water. Oil sinks to the bottom of the sea and may immobilize sperm and reduce fertilization rates. Similarly oil affects birds by coating their feathers, which then reduces buoyancy and insulation. Lipid pneumonia and intestinal irritation can result it may also affect birds eggs, reducing the permeability of the egg and cut down the food supply as the fish life dies. Oil spills also affects many other organisms, such as plants and invertebrates, all an essential part of food webs and the ecosystems.

Oil represents a major threat with the destruction of vast quantities of sea grass and algae. These plants form the base of important food webs, providing the food for higher organisms. Destruction of these food webs means the death of vast quantities of marine animals, many of which are

Another important factor in determination the potential harm to the environment is the degree to which the oil has been 'weathered'. Weathering is a series of chemical and physical changes that cause spilled oil to be altered through the natural processes of dissolution, evaporation, emulsification and oxidation for instance, when oil spill occurs close to shore, it has an increased potential to cause harm because the oil is not weathered significantly before it reaches shore, and as a result, still contains many toxic compounds. Weathering is also critical in determining the type of response method that will be effective. For example emulsification retards the loss of toxic compounds through evaporation and limits the use of dispersants or in-situ burning. In addition, emulsification of a spill significantly increases the volume of only liquid to be recovered, which exacerbates the problem of oil and debris disposal.

Oil spills have to a great extent added to the environmental burden, and the so called oil boom is widely referred to as oil doom as could be seen in the impacts and cost of oil spillage.

## **2.5 CAUSES OF OIL SPILLAGE**

Oil spillage can occur as a result of one or more of the several factors listed here under.

### **(i) Flow line/pipeline leaks**

Oyefolu et al highlighted in their study that flowline and pipeline leaks accounts for about 28% of the total occurrences and

contributes some 43% of the overall quantity of oil spilled within 1978/9. Internal corrosion of the major pipelines and sand erosion of flowlines especially at areas located in seasonal swamps are also causative factors that are very necessary to be noted in areas like, Ughelli, Agbema, Ebocha Districts and the Obagi/Erema fields where low soil sensitivities are expected. Sand erosion of pipe materials such as well heads rise to a number of oil flowline elbows can give often are of great magnitude.

(ii) Over Pasture/Over flow

These can be noticed in the following areas

- (a) Overflow of separators leading to carry-over to the flare.
- (b) Overflow of storage tanks in Tank farms.

No matter how careful well-heads, flow stations and Tank farms may seem to be, there may cause where automatic safety devices if not integrated into a safety system could result in a failure of the system. In fact lack of flow control devices on the oil outlet of separators^ the absence of pressure safety valves on inlet headers and non provision of emergency shutdown systems are some of the anomalies that can give rise to over pressure/overflow. Instrument failure and equipment breakdown often constitutes the most frequent causes of separator and tank overflow.



(iii) Sabotage of oil field facilities

Another study by (Fubara Dm (1983) also reveals that frequent sabotage of oil field facilities including pipelines could cause oil spillage but that it ranks least among the known major causes in terms of total quantity. However the asserted that investigation has revealed that this act is carried out by experienced ex-oilmen with enough knowledge to identify and cut dry or non-flowing lines, such as during work over.

He stressed that it is important from the viewpoint of cost consideration and operational constraints to highlight the inconveniences and loss which operating companies has always shown in such circumstances.

(iv) Hose Failures:

Though occurring least frequently, spillage arising from hose failures are almost always major events. According to Oyefolu et al (1979) 44% - 55% of the total quantity of oil spillage within 1978/79 were due to this factor. It is therefore only natural

that operators should feel greatly concerned about the phenomenon.



(vi) Failures due to vibration:

Acute vibration obviously constitutes a potential danger to the whole piping and other structures of an installation. Development of cracks and shake loose on expansion on pumps effects on welded or fitted connection on pump discharge arms and headers such as pressure nipples, flange gaskets and pipe connection (particularly at T-junctions) are few of the observed effects of excessive vibration originating from over worked pumps, generators and compressors. In comparison to land locations however, vibration effects are worse felt on platform installations apparently because they are raised and could constitute most of the worst known cases.

Other causes of oil spillage include

(a) Pig Barrel:

- The failure of some of the following components of the facilities can be responsible for a number of oil spillage.
- The rubber seal at the pig trap door if gone bad as a result of which oil can spray out from the edges.
- Broken seal and bolt on the cover of a receiving scraper barrel

- Operational fault e.g. if a drain pipe on a pig receiver barrel is found open. As 200 - 6,000 bbls of oil can be severally recorded as spilled on such occasions.

(b) Well Cellars

They are supposed to provide containment for leaks and discharges from the well head field inceptions however revealed that these cellars are almost always filled with storm water or gravel.

(c) Bundwalls:

Bundwalls such as are required around well heads are also necessary around the flare stacks. Most at times operators are not concerned about this development in most locations.

Adequately sized, solidly built and well-maintained bundwalls should normally surround and isolate each storage tank in flow stations and tank farms.

(d) Well headfires and blowouts.

Well headfires and blowouts may arise as a result of poor geologic information to exploration, however experience has shown that negligence during operations rather than inadequacy of equipment could give rise to blowouts. The

prospect of hydrocarbons occurrences below the over-pressure zone in the Niger Delta is beginning to occupy the thinking of many operators. Blowouts are due to excessive production of sand with the flowing oil. The sand abrades the well causing eating it until the casing ruptures, resulting in a blowout.

Another common cause for blowouts is gas cutting according to Imevbore A.M (1979) when this occurs, the rig hits a very high-pressure gas zone and because the gas pressure is so great, it uproots the rig top.

## **2.6 DETECTION AND SURVEILLANCE OF OIL SPILL.**

Oil spill detection implies a process of recognizing that oil has been released into the environment. As a result, detection and surveillance are necessary and important way of responding to oil spill operations. According to Meyers et al (1989) surveillance is the process of monitoring oil movement in an attempt to:

- (i) Identify areas and resources which could be impacted by drifting oil.
- (ii) Established priorities and develop plans for the response operation.
- (iii) Obtain data defining logistical requirements and counter measures for the oil spill response operation.

Environment Canada (1979) stressed that detection and surveillance are starting points towards remedying an oil spill. And therefore identified the following methods of detection and surveillance:

### **2.6.1 Visual Detection and Surveillance:**

Visual surveillance can be used to detect and monitor oil spills although it is simple but not effective during darkness, fog, or extensive cloud cover. It may not also be effective for - monitoring spills from decks of vessels or aircraft. The reason being that cloud shadows, suspended sediments, floating seaweed or submerged sandbanks may resemble an oil slick if viewed from a distance.

Some of the problems of visual monitoring from vessels or aircraft can be resolved by placing brightly coloured tracking buoys in a slick as soon as it is detected. Once deployed, these buoys will move with the oil slick and can be easily spilled during good and clement weather conditions. Another problems is if the oil weathers or mixes with sediments in the water, which ever the case it may not be possible to detect these slick by visual surveillance.

### **2.6.2 Aerial Monitoring:**

This s possible through any of the following ways or all the methods can be carried out on a particular spill point for better and efficient result.

### **2.6.2.1 Radio Transmitting Buoys**

Oil spills usually spread very rapidly and form rows that break into separate slicks, as a result aerial surveillance is probably the best approach for oil spill monitoring by aerial surveillance. The buoys are coated with fluorescent orange paint and transmit radio signals which can be detected by portable equipment aboard aircraft. Once these buoys are placed in a slick, the radio signals will allow spill monitoring during periods of reduced visibility. Buoys are constructed from plastics they can be crushed by moving ice<sup>^</sup> therefore they are not suitable for ice - infested water.

### **2.6.2.2 Satellite surveillance**

Satellite imagery offers the best possibility for monitoring oil spills, Meyers et al (1989) noted that due to overlapping orbits, satellites can provide almost continuous coverage. Landsat 4 and 5 provides images in black and white and therefore may not provide a clear distinction between ice and water which makes it possible for time lapse sequence of spills follow trajectory similar to moving ice, satellite surveillance will allow the on-sense coordination to monitor spill movement during broken ice season. However the difficulty associated with satellite surveillance is that they can not penetrate through thick cloud cover or dense fog. Also technical expertise is needed for a clearer interpretation and understanding.

### **2.6.3 Side Looking Airborne Radar (SLAR)**

Side looking Airborne Radar can produce good imagery in most weather conditions and is unaffected by clouds or darkness. Since the detection of oil slicks by this system depends on the dampening of capillary waves by oil, it can not detect slicks on flat, calm seas or very heavy seas. The SLAR will allow sweep within up to 44 nautical miles will large rafts and small boats and up to 136 nautical miles for small cargo ships. SLAR will allow vast ocean areas to be searched for oil slicks and has a 90% reliability for slick detection. Once a target is detected, it can be observed and recorded on video tape.

Oil detection is possible because SLAR is designed to observe level variation in sea clutter. An oil spill makes the polluted surface considerably smoother than the surrounding water. The smoother surface produces less radar back-scatter which makes the oil appears as a dark area on the radar display.

Infrared detection relies on the physical properties of the oil. When an oil slick is exposed to infra-red radiation, it looks downre what colder than the surrounding water. The infra-red system can detect oil during the day or night. The user can also monitor the spreading of oil, which indicates relative oil thickness within the slick. With this information, cleanup operation can be directed for maximum efficiency. The ultraviolet detection system is used only in daylight. It maps the entire area covered with oil. This is possible because oil has a higher reflectivity than water when exposed to ultraviolet light. This

information, in conjunction with the data provided by the infrared system, increases the reliability of aerial monitoring.

### **2.6.3 Satellite Tracking**

Radio tracking buoys providing an alternate approach for oil spills monitoring by satellite surveillance. This technique had been employed in 1983 summer when U.S. Coast guards Personnel deployed ten radio-transmitting buoys in the Beauport sea. Nine of these signals which were received by the satellite service argos. These signals were re-transmitted to a ground tracking station thereby making it possible to continuously monitor the movement of the buoys. Although the technique will work during periods of heavy cloud cover, it should be recognised that the buoys can be destroyed by ice or washed ashore.

The present day technology makes satellite the best method of detection oil spill. In fact, satellite imagery is now adopted in prospecting for oil, which may be several metres or kilometers below the surface. The only problems may lie with the image interpreter.

## **2.7 INITIAL RESPONSE TO OIL SPILLS.**

Oil spills will occur as long as society remains indifferent and dependent upon petroleum and also as long as there is potential for human error in petroleum production and transportation. Oil spills, like forest fires and similar environmental emergencies are unpredictable. Consequently, the key to



effective oil spill response is preparation for the unexpected and anticipation of spills under the worst possible condition (findings M.F et.

Tal 1979). When oil spill has been detected through any of the methods highlighted; Meyer et. al (1989) proposed the following as to what the initial response would entail.

- (i) Stop the spill to minimize spreading and contain it at its source
- (ii) Monitor spills movement and protect sensitive shorelines.
- (iii) Determination the extent of the spill via surveillance.
- (iv) Display equipment for off-shore cleaners
- (v) Remove the spill from surface water
- (vi) Implement shoreline cleanup as required
- (vii) Restore the coastline to its pre-spill condition where possible.
- (viii) Dispose of recovered oil and oil-contaminated material
- (ix) Prepare final report for oil spill.

They further pointed out that there are basically two underlying factors that should govern the success or failure of these response operation sequence. These are:-

- (a) The element of response
- (b) Environmental condition

Cormack (1983) defined elements of response as the personnel, equipment and logistics necessary for conducting an oil spill response operation. And it includes which of the element that will be effective for ensuring that the response operation will be successful.

Environmental conditions are attributes in relation to the climate conditions i.e. rainy. Sunshine, fog, mist, dew or clement whether or iced. Poor weather or reduced visibility can significant during the1 peak-raining season, dense fog exist 25 percent of the time.

## **2.8 OIL SPILL DISPOSAL**

Disposal may prove to be most challenging aspect of oil response; this is because of facilities may not readily be available within the spill sites where recovered oil may be treated or recycled. Also State and Federal agencies may not allow recovered oil to be burned due to the impact that this could have on existing air quality. State and Federal regulations also prohibits recovered oil and only debris from being dumped in areas designated for landfills. In view of these consideration, careful preplanning is needed to ensure that provisions will exist to dispose of recovered oil.

### **Techniques for Recovered oil disposal**

Meyer et. al recommend five various options by which recovered oil can be disposed but stressed that it must be done in such a manner which will render it harmless to the environment or convert it to a substance that will have commercial value. With respect to recovered oil, the following disposal

techniques are available:-

(i) In-situ Burning/Open Burning:

These entail igniting oil or oiled debris and allowing it to burn under ambient restrictions. These disposal techniques are subject to restrictions and permits are required from relevant government establishments. However they must not be used to burn PCBs, Waste oil containing more than 1,000 ppm of halogenated solvents or other substances regulated by law.

(ii) Recycling: This techniques entails removing water, sediment and other foreign materials from the recovered oil and blending it with uncontaminated crude oil.

(iii) Landfill Disposal: This technique entails burying the recovered oil in approved landfills in accordance with procedures established by law.

(iv) Incineration: This technique entails the complete destruction of the recovered oil by high temperature thermal - oxidation reactions.

(ii) Deep well injection: this is the process of injecting recovered oil into the earth through a disposal well which has been approved by relevant authorities.

However, it is important to note that each disposal technique, except recycling is subject to regulatory requirements.

## CHAPTER 3

### **3.0 DATA COLLECTION AND METHOD OF ANALYSIS:**

The Niger Delta Region is a vast area threatened by environmental degradation emanating principally from oil exploration and exploitation activities. A study of this nature can not possible cover the large expanse of the region for obvious reason. As a result a particular study location now as ELOLO FIELD (Escravos) in Delta State will be well from which general deductive conditions and inferences will be made.

### **3.1 SOURCES OF DATA**

In gathering information for this study, data will be collected from both primary and secondary sources. The collection of the primary data will include the use of questionnaire personnel interviews with key informants and personal observations.

In administrating the questionnaire, not less than 2 personnel will be mobilized to help interview respondents on, one on one basis. That of secondary data will include government official records and documents obtained from government Agencies such as NNPC, Department of Petrol resources. Chevron etc.

These information will be collected and analyzed with the use of tables. Conclusion will be drawn upon which further discussion and recommendations will be made to achieve stated goal and objectives.

### **3.2 ANALYTICAL/STATISTICAL METHODOLOGY**

Percentages will be used to analyzed the data. This is because percentages are usually more appropriate when aimed at determining the number of respondents that gave answer to a particular question. By so doing deduction are easily and quickly made.

### **3.3 SAMPLE METHOD AND SIZE**

Elolo field comprised of pockets of isolated settlement and villages. But the study concentrated on principally 3 villages namely Ajudaibo, Madagho and Kpokpo who among other settlements has witnesses the problems of oil spillage.

About 120 questionnaire was administered in the following order from response were gotten.

- (i) Ajudaobo - 60
- (ii) Madagho - 30
- (iii) Kpokpo - 30

10 questionnaire was administered to representatives or workers of the Oil Company that has the pipeline. Because the communities have no defined house arrangement, it was difficult to obtain a representative format of sampling. Therefore a simple random sampling techniques was adopted where building were arbitrarily selected and questionnaire administered on each person/building.

Based on the outcome of the analysis, a general statement will be made peculiar to the Escravos community and some assertions and deductions made relative to the Niger Delta region.



## CHAPTER 4

### 4.0 DATA PRESENTATION AND ANALYSIS

#### 4.1 DATA PRESENTATION AND ANALYSIS

##### SECTION A - Question for Firms

**TABLE 4.1 : THE LENGTH OF THE PIPELINE**

| How long has the pipeline been laid | No | Percentage (%) |
|-------------------------------------|----|----------------|
| 0-10 years                          | 1  | 10.00          |
| 10-20 years                         | 7  | 70.00          |
| 20 years and above                  | 2  | 20.00          |
| Total                               | 10 | 100.00         |

Source: Field Survey

From the survey conducted, the respondents who believed that the pipeline had been laid less than 20 years constituted about 70% while those who agreed that the pipeline has been laid over 20 years past are only 20 percent.

**TABLE 4.2 AVAILABLE PIPELINE EIA**

| Any EIA before the pipeline was laid | No | Percentage (%) |
|--------------------------------------|----|----------------|
| Yes                                  | 1  | 10.00          |
| No                                   | 7  | 70.00          |
| Not aware                            | 2  | 20.00          |
| Total                                | 10 | 100.00         |

Source: Field survey

Out of the respondents 70% agreed that there was no environmental impact assessment report before the pipeline was laid, 10% said there was an EIA while 20% agreed they were not aware whether there was an EIA or not.

**TABLE 4.3: OCCURRENCE OF OIL SPILLAGE**

| Has there been a previous spillage around your facility here | No | Percentage (%) |
|--------------------------------------------------------------|----|----------------|
| Yes                                                          | 8  | 80.00          |
| No                                                           | 1  | 10.00          |
| Not aware                                                    | 1  | 10.00          |
| Total                                                        | 10 | 100.00         |

Source: Field Survey.

80% of the respondents agreed that there has been previous occurrence of oil spillage around the area even through the magnitude differed while 10% said there was none and another 10% claimed that to be aware of any previous spillage around that area. From this, one can therefore infer that this was not the first time that oil spillage is occurring in this area.

**TABLE 4.4: WHAT ARE THE CAUSES OF OIL SPILLAGE**

| If yes what in opinion of the company was responsible | No | Percentage (%) |
|-------------------------------------------------------|----|----------------|
| Equipment failure                                     | -  | -              |
| Sabotage                                              | 7  | 70.00          |
| Exposure due to erosion                               | 1  | -              |
| Blow-out unknown                                      | 2  | 20.00          |
| Total                                                 | 10 | 100.00         |

Source: Field Survey

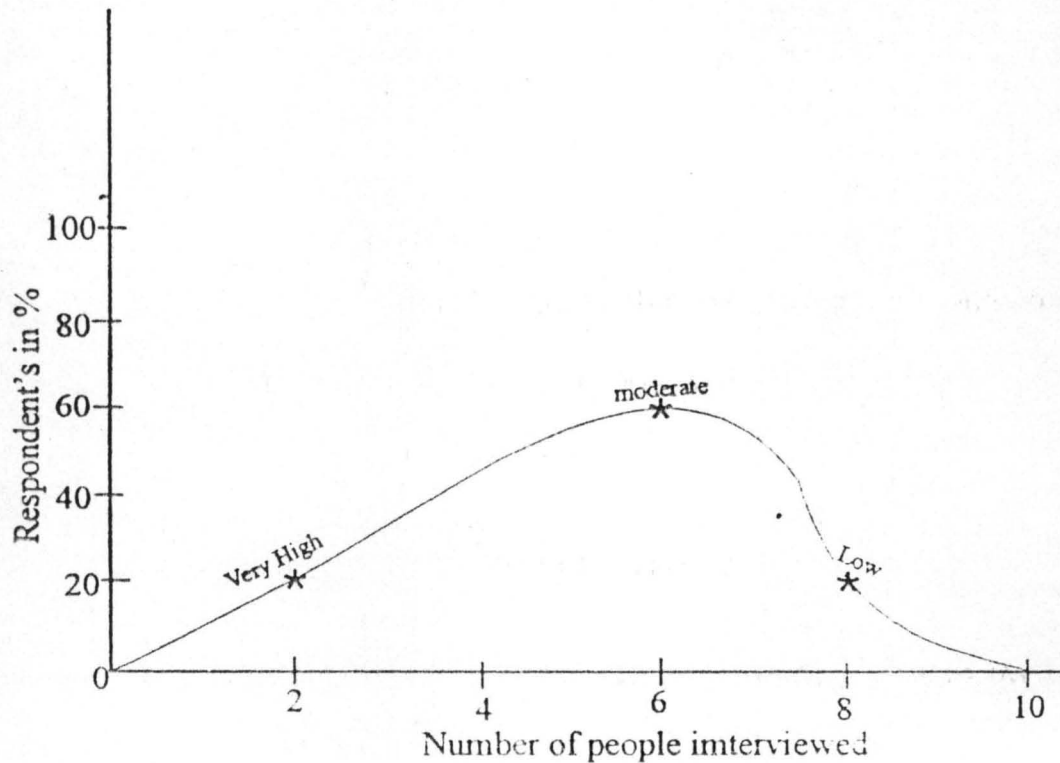
70% of the respondent agreed that oil spillage was due to sabotage while 20% said it was due to corrosion and 10% claimed ignorant of the likely cause of the oil spillage.

### GRAPHIC PRESENTATION

**FIGURE 4.1 CAN YOU ESTIMATE THE SEVERITY OF IMPACT OF-OIL**

#### SPILLAGE

- A. Very high
- B. Moderate
- C. Low



Source: Field Survey

Out of the respondents interviewed, 20% agreed that the severity of the impact of the oil spillage was very high, 60% said that the severity was moderate while; the 20% said the impact was low.

From the sourcing therefore, the survey is concluding that the oil spillage was moderate.

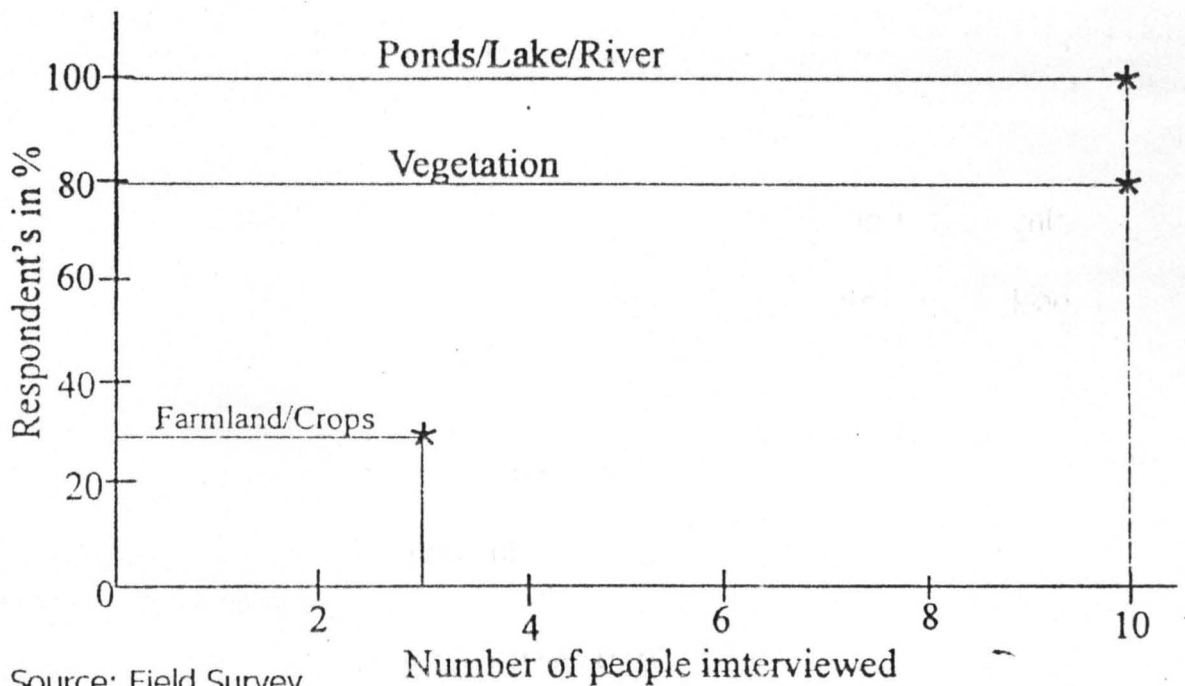
(6) The initial response to the oil spillage according to all the respondents was to stop the spill by tightening the stop cork and gate valves along the spill pipelines.

(7) All the respondents also agreed that not less than 3,000 bbls of crude oil was spilled into the environment.

### GRAPHIC PRESENTATION

**FIG. 4.2 IMPACT IDENTIFIED? (ORDER OF PRIORITY)**

- A. Ponds/Lake/River
- B. Vegetation
- C. Farmland/Crops

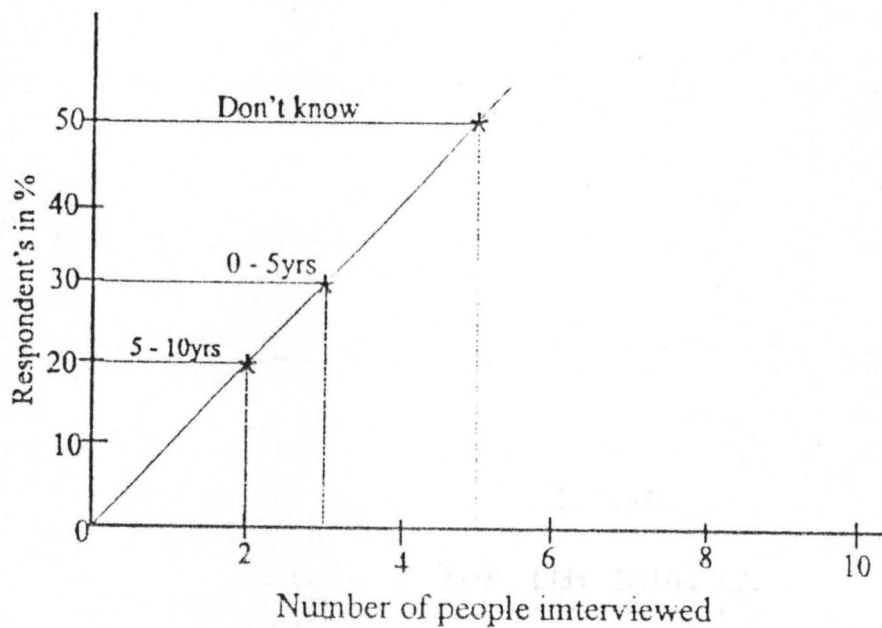


Among the respondents 40% agreed that the cost of clean-up/remediation would take almost N400 million while 60% said that the cost of clean-up/remediation would be in the range of not less than N400 million. After an oil spill is enormous and required huge capital outlay.

### GRAPHIC PRESENTATION

**FIG. 4.3: HOW LONG IS THE ENVIRONMENT MONITORED FOR POSSIBLE RECOVERY AFTER CLEAN-UP REMEDIATION**

- A. 0-5 YRS
- B. 5-10 Yrs
- C. 10-15yrs
- D. 15yrs and above
- E. Don't know



Source: Field Survey:

**(13) TABLE 4.5: OIL RECOVERY DISPOSAL**

| How do you dispose oil recovery from spills | No        | Percentage (%) |
|---------------------------------------------|-----------|----------------|
| In situ burning                             | -         | -              |
| Recycling                                   | 10        | 10.00          |
| Land till disposal                          | -         | -              |
| Incineration                                | -         | -              |
| Deep well injection                         | -         | -              |
| Other (specify)                             | -         | -              |
| <b>Total</b>                                | <b>10</b> | <b>100.00</b>  |

Source: Field Survey

All the respondent agreed that the oil recovered from the spills was sent back for recycling and remnants that were mixed up with debris were burn-off although in an unorganized manner.

**(14) TABLE 4.6: AVAILABLE OIL SPILLAGE RESPONSE TEAM**

| Do you have special oil spill response team | No        | Percentage (%) |
|---------------------------------------------|-----------|----------------|
| Yes                                         | 10        | 100.00         |
| No                                          | -         | -              |
| Not aware                                   | -         | -              |
| <b>Total</b>                                | <b>10</b> | <b>100.00</b>  |

Source: Field Survey

All the respondents agreed that they have special oil spill response team from their environment pollution unit

**(15) TABLE 4.7: THE RATE OF THEIR TRAINING**

| If yes how often are they trained and retrained | No        | Percentage (%) |
|-------------------------------------------------|-----------|----------------|
| Very often                                      | 7         | 70.00          |
| Not quite often                                 | 3         | 30.00          |
| Not all                                         | -         | -              |
| <b>Total</b>                                    | <b>10</b> | <b>100.00</b>  |

Source: Field Survey

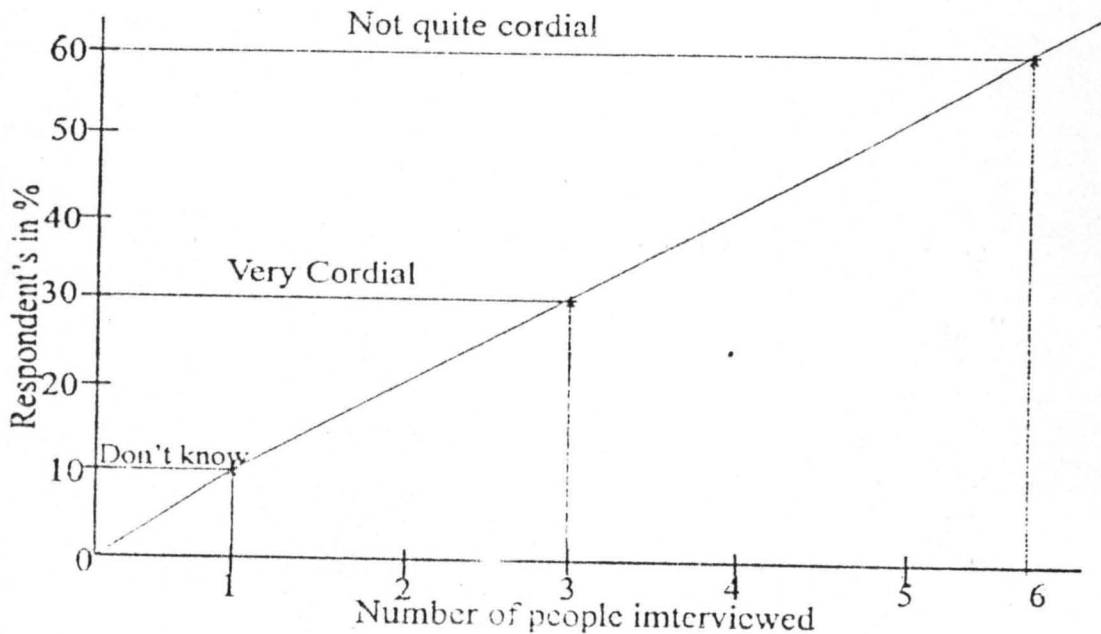


While 70 percent of the respondent agreed that they very often are sent training/retraining programmes to meet-up their schedule of duty, 30 percent said that although they are often sent on training but that it is not very often.

### GRAPHIC PRESENTATION

#### 16. FIG. 4.4: CAN YOU ACCESS THE LEVEL OF RELATIONSHIP BETWEEN THE COMPANY-COMMUNITY?

- A. Very cordial
- B. Not quite cordial
- C. Bad/frosty
- D. Don't know



Source: Field Survey

Out of the respondents interviewed, 30 percent agreed that the level of relationship between the company/community is very cordial while 60 percent responded that it is not quite cordial and 10 percent would not know how to access the relationship.

17) All the respondent agreed that the company has not contributed much towards helping the community. The only project that the host community has benefited is in terms of scholarship schemes.

## **SECTION B- SOCIO ECONOMIC SURVEY FOR COMMUNITY**

**(1) TABLE 4.1.1: PLACE OF ORIGIN:**

| Place of Origin | No  | Percentage (%) |
|-----------------|-----|----------------|
| Indigene        | 96  | 80.00          |
| Non Indigene    | 24  | 20.00          |
| Total           | 120 | 100.00         |

Source: Field Survey

Out of the respondents interviewed, 80 percent agreed that they are indigenes which is characteristics of a rural community, while only 20 percent is said to be non-indigenes.

**(2) TABLE 4.1.2: OCCUPATION**

| Occupation     | No  | Percentage (%) |
|----------------|-----|----------------|
| Civil Servant  | -   | -              |
| Farming        | 12  | 10.00          |
| fishing        | 72  | 60.00          |
| Company Worker | 12  | 10.00          |
| Self-employed  | 10  | 8.00           |
| Unemployment   | 14  | 12.00          |
| Total          | 120 | 100.00         |

Source: Field Survey

Out of the respondents sampled for interview, 10 percent are farmers, while 60 percent are fishermen, company workers 10 percent, self employment constitutes 8 percent and the unemployed 12 percent. The survey therefore shows that the people are predominantly fishermen.

**(3) TABLE 4.1.3: EDUCATIONAL LEVEL**

| Level of Education   | No  | Percentage (%) |
|----------------------|-----|----------------|
| No of school at all  | 30  | 35.00          |
| Primary School       | 60  | 50.00          |
| Secondary            | 24  | 20.00          |
| Technical/University | 2   | 2.00           |
| Others/Specify       | 4   | 3.00           |
| Total                | 120 | 100.00         |

Source: Field Survey

The level of education of the respondents varies while 25 percent did not go to school at all, 50 percent attended primary school, 20 percent attended secondary education, 2 percent had technical/university education while others represent only 3 percent.

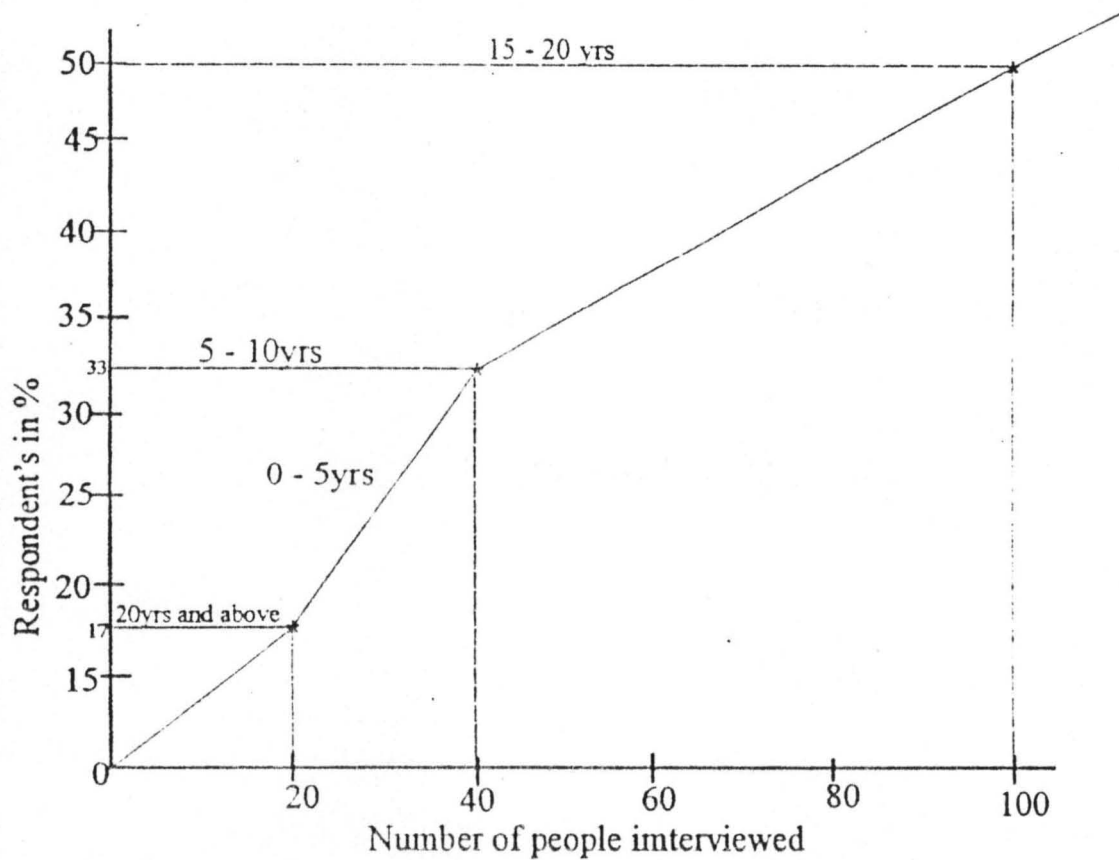
The survey therefore shows that the host community is characterized mainly by Primary school attendants.

## GRAPHIC PRESENTATION

### (4) FIG. 4.1.1: HOW LONG HAS THE COMPANY BEEN OPERATING

#### HERE?

- A. 0-5yrs
- B. 5-10yrs
- C. 10-15yrs
- D. 15 yrs and above



Source: Filed Survey:

The survey revealed that the company has operated in the area for quite a while, as this can be noticed from their response. 33 percent agreed the company has been operating there for about 15 years, about 50 percent agreed they have been there for not less than 20 years while 17 percent agreed they have been around there for over 20 years.

**(5) TABLE 4.1.4:**

| Source of drinking water | No         | Percentage (%) |
|--------------------------|------------|----------------|
| Stream                   | -          | -              |
| Well                     | 117        | 97.5           |
| Borehole                 | 3          | 2.5            |
| Pipe Born water          | -          | -              |
| Others (Specify)         | -          | -              |
| <b>Total</b>             | <b>120</b> | <b>100.00</b>  |

Source: Field Survey

The survey reveals that most of the residents there as the major source of their drinking water locally dug wells representing about 97.5 percent while 2.5 percent have borehole as source of their drinking water.



**(6) TABLE 4.1.5: RATE OF OIL SPILLAGE**

| Any spillage since operating around here | No  | Percentage (%) |
|------------------------------------------|-----|----------------|
| Yes                                      | 103 | 86.00          |
| No                                       | 11  | 9.00           |
| Don't know                               | 6   | 5.00           |
| Total                                    | 120 | 100.00         |

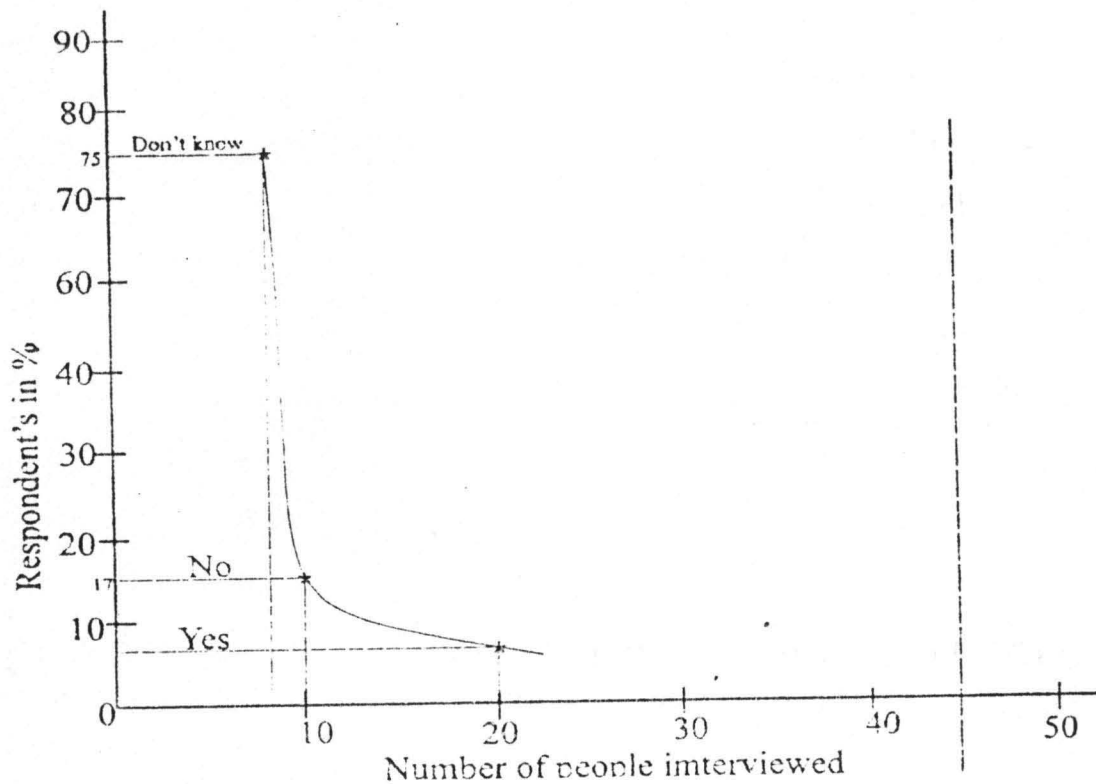
Source: Field Survey

From the respondents 86 percent agreed that, that was not the first time oil spillage occurred within the area. 9 percent agreed it was for the have been a previous oil spillage around the community.

**GRAPHIC PRESENTATION**

**(7) FIG. 4.1.2: HAS MEANS OF LIVELIHOOD BEEN AFFECTED BY OIL SPILLAGE?**

- a. YES
- b. No
- c. Don't know



Source: Field Survey.

Among the respondents 75 percent accepted that their means of spillage has been affected as a result of the spillage. 8 percent said they were not affected while 17 percent could not ascertain in any way whether or not their means of livelihood has affected. It is possible to ascertain the unemployed fell in this category.

**(8) TABLE 4.1.6: INCREAMENT IN DISEASES AND DEATH RATE**

| Are diseases and death on the increase? | No  | Percentage (%) |
|-----------------------------------------|-----|----------------|
| Yes                                     | 106 | 88.34          |
| No                                      | 4   | 3.33           |
| Don't know                              | 3   | 2.50           |
| Same like in the past                   | 7   | 5.83           |
| Total                                   | 120 | 100.00         |

Source: Field Survey

The survey also revealed that diseases and deaths has been on the increase as reflected in the response. 88.34 percent agreed it is on the increase. 33.3 percent said it is not on the increase while 2.50 percent while 5.83 percent agreed that there has been no change in both deaths and diseases.

(9) **TABLE 4.1.7: IMPROVEMENT IN TRANSPORTATION SYSTEM**

| Has the transport system improved in this community | No  | Percentage (%) |
|-----------------------------------------------------|-----|----------------|
| Yes                                                 | 12  | 10.00          |
| No                                                  | 97  | 18.00          |
| Don't Know                                          | 11  | 9.00           |
| Others (specify)                                    | -   | -              |
| Total                                               | 120 | 100.00         |

Source: Field Survey.

10 percent of the respondents agreed that over the years, the people means of transportation systems has improved while 81 percent agreed that it has not changed in any way, inspite of the company's presence. 9 percent said they do not know whether or not the transport system has been affected.

(10) **TABLE 4.1.8: EFFECT OF OIL EXPLORATION ON THE TRADITION AND CULTURE**

| Has tradition and culture been affected by petroleum industry | No  | Percentage (%) |
|---------------------------------------------------------------|-----|----------------|
| No                                                            | 15  | 13.00          |
| Yes                                                           | 95  | 97.00          |
| Don't Know                                                    | 10  | 8.00           |
| Total                                                         | 120 | 100.00         |

Source: Field Survey

Among the respondents 97 percent agreed that their tradition and culture has been affected in a way, probably because of the presence of the company workers and visitors that comes around the community. 15 percent said their tradition and culture are not in any way affected while 8 percent do not know whether or not its been affected.

**(11) TABLE 4.1.9: RELATIONSHIP BETWEEN THE HOST**

**COMMUNITY/COMPANY**

| Has the relationship of the host community/Company | No  | Percentage (%) |
|----------------------------------------------------|-----|----------------|
| Very cordial                                       | 4   | 3.00           |
| Fair                                               | 10  | 8.00           |
| Poor/Frosty                                        | 96  | 81.00          |
| Don't know                                         | 10  | 8.00           |
| Total                                              | 120 | 100.00         |

Source: Field Survey.

The survey reveals that company/community relationship is very poor/frosty (81%), 3 percent said the relationship is very cordial, 8 percent agreed is fair while another 8 percent could not say in clear terms whether it is poor, cordial or fair. For them it was difficult to access the relationship.

**(12) TABLE 4.1.10: PERIOD OF MEETINGS**

| No times of joint meetings (annually) | No  | Percentage (%) |
|---------------------------------------|-----|----------------|
| Once                                  | 93  | 78.00          |
| Twice                                 | 10  | 8.00           |
| Often                                 | -   | -              |
| Not at all                            | 12  | 10.00          |
| Don't Know                            | 5   | 4.00           |
| Total                                 | 120 | 100.00         |

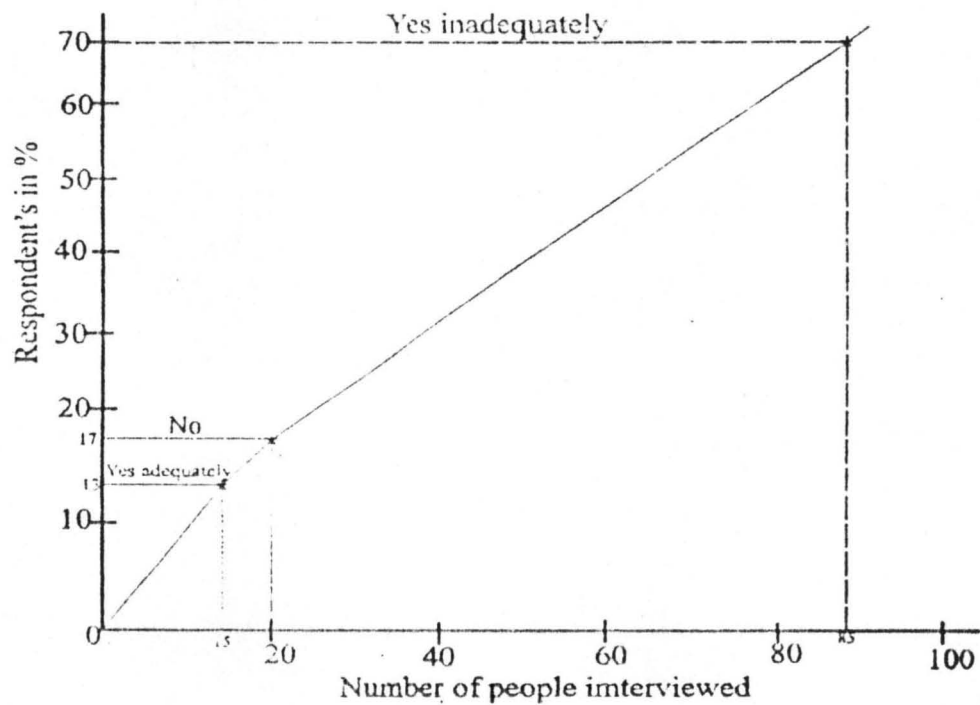
Source: Field Survey.

78 percent of the respondent agreed those joint meetings of the company/community holds once annually. 8 percent respondent that it holds twice while 10 percent agreed that it has never taken place and 4 percent responded that they do not know whether there is a forum of such nature.

## GRAPHIC PRESENTATION

**FIG. 4.1.3: DO THE COMPANY PAY COMPENSATION FOR DAMAGES DURING OIL SPILLAGE**

- A. No
- B. Yes Adequately
- C. Yes



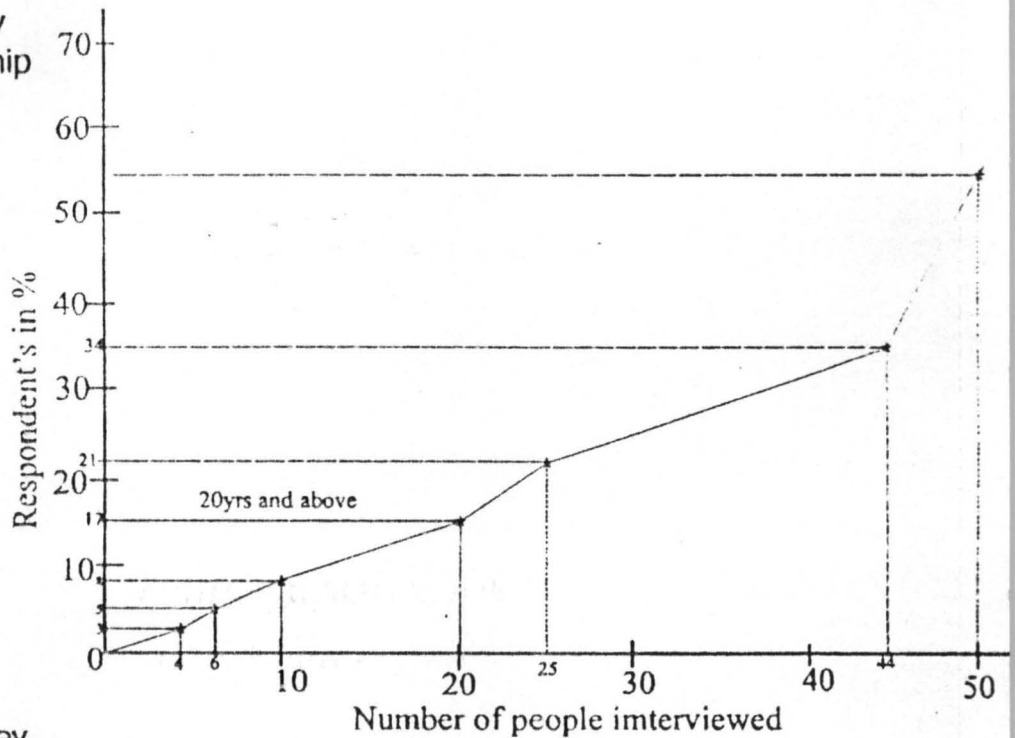
Source: Field Survey

The survey also reveals that 70% agreed that whenever compensation are paid, they are inadequately made, 13% responded that compensation are paid adequately, while 17% discharged that compensations to damages are never made whenever there is an oil spillage.

## GRAPHIC PRESENTATION

**FIG. 4.1.4: WHAT WOULD YOU LIKE THE COMPANY TO DO FOR TOWN APART FROM COMPENSATION?**

- A. Pipe born water
- B. Hospital
- C. School (Secondary)
- D. Roads
- E. Electricity
- F. Scholarship



Source: Field Survey

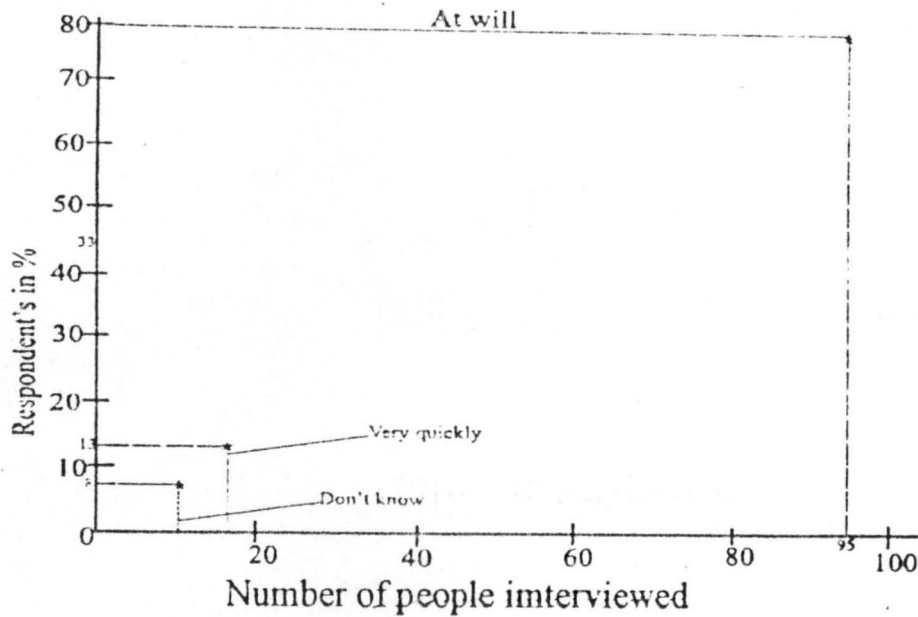
In order of priority 44 percent of the respondent prefer that the company provides pipe borne water for the community, 21 percent ranked hospital as paramount, 17 percent preferred secondary school, 13 percent preferred the provision of fishing Boat/equipment to enhance their means of livelihood, 8 percent preferred good roads, while 5 percent preferred scholarship and 3 percent preferred electricity.



## GRAPHIC PRESENTATION

**FIG. 4.1.5: HOW QUICK DOES THE RESPONSE TEAM RESPOND DURING THE EVENT OIL SPILLAGE IN YOUR AREA?**

- A. Very quickly
- B. At will
- C. Don't know



Source: Field Survey.

The respondents when asked to make a general comment on what the oil company ought to do for the people most of them remarked that they (the host communities) should be given employment opportunities, pay compensation adequately and timely, tar their roads and brings in general development, so that people would be part of them, some even urged the oil company to pay royalties or stop operation in the area.



## **4.2 ADDITIONAL INFORMATION FROM FIELDWORK**

The oil spill occurred around the area referred to as "Elolo field" on 20th June 2001 at -about 10.00 p.m at Escravos along warrn — Escravos line on a 24" pipe crude oil pipeline along the River crossing. Escravos is at the brinks not quite distant from the Atlantic with a vicinity of swamps and marshes with fitted mangrove tress and creeks traversing all the area.

The impacted area included the Escravos River crossing area, adjacent and adjoining creeks and swamps of Madagbo, Kpokpo, Ajudaibo communities and villages among others. The village youths and other community members as at when the spill occurred, condoned-off the spill site thereby preventing the response team from gaining access to the spill location. However, after much pleadings and space meetings/negotiations which lasted for 8 days resulting in supplying of relief materials by PPMC to arrest the community hostilities; the response team later gained access to the site of pipeline breakage and resumed clean-up operations, somedays after the spillage had occurred. The situation was worsened as a result of tidal waves that transported the spillage oil for and near the creeks leaving, while the negotiation lasted.

The first response was the mobilization of the CLEAN NIGERIA ASSOCIATES by Chevron pollution control team, and the Escravos River was boomed *to* certain the oil from further spreading.

### **ACTION TAKEN TO CLEAN-UP SPILL**

A barge with a capacity to retain 1,500 barrels of recovered oils was provided by Chevron and located at the mouth of the Escravos River for oil recovery operations. Clean Nigeria Associates (CAN) provided some clean-up crew including a quarter's master for the vessels/boats. Oil recovery operations commenced on 29th June 2001 (9 days after spill has occurred). The impacted area clean-up started was at the environment, accessibility was hampered greatly, so a swamp buggy was brought in to clear the right of way which has been made accessible for repair work and clean-up operations.

### **ACTION TAKEN TO ARREST SOURCE OF LEAKAGE**

About 10 days after the spillage had occurred, divers who were part of the Response Team went down the creeks to the point of pipeline leakage to identify the source of the leakage. Similarly, the nearby valves were stopped to prevent further oil spillage into the River. Contractors were called in 11 days after the spillage to commence repair works and clean-up.

### **ACTION TAKEN TO REHABILITATE IMPACTED AREA**

While assessments and negotiations were still continuing, impact of damages on the environment were still very much visible and arrangements are on going to handle compensation up with an environmental management plan that will facilitate environmental recovery.

## RECOVERY/FINAL DISPOSAL OF SPILLED OIL

The on-scene Coordinator (CSC) explained that the mandate is to recover as much spilled oil as possible even completely if possible, but because the oil has been exposed, it has consequently been contaminated and therefore efforts are made to take the recovered oil back to the closest point for recycling. At the end of the exercise, whatever remain that is left is burnt-off not minding the -accompanying environmental hazard that is associated with it.

### 4.3 DISCUSSION

The study recognized the fact that, when the oil spill occurred, the itinerant fishermen were the first group of people that noticed the spill and subsequently alerted the Chevron staff - owners of the pipeline at the field, such incidence has been a common occurrence.

In some situations, spills could occur in thick forest vegetation pipelines for days unnoticed, unless they are promptly discovered and reported by the villages or host communities who by way of carrying out their daily economic activities may enter such oil spill sites, otherwise it goes on for days without any response or notice from the oil company responsible.

Also the usually slow response of oil companies to cases of oil spillage is also a major concern to environmental managers. Most of spills have been compounded by the inability of the oil companies to respond immediately to



report of oil spillage. In Escravos (Elolo Field) for example, it took 11 days after the spill had occurred for contractors to arrive at the scene of the incident. Outside Nigeria, oil companies respond promptly and adequately to cases of oil spillage. In Alaska in 1989, Exxon Corporation rushed 69 experts and five plane-loads of equipment to the scene to contain the spill within reasonable time (Green Heritage 2000).

It is on record that pipelines have a life span of 20 years when the pipes are properly coated before they are laid. The Niger Delta Region has been identified as sensitive area, which requires high priority protection especially when laying the pipes, because of the high salinity content of the soil. The research however noted that there has been no change of the pipes since it was laid, so many years ago as claimed by the respondents because aged pipes could in serious circumstances lead to oil slicks or blowouts.

The study also noted that, there exist cases of sabotage as fingered by Oil Company operators, all in attempt to seek for compensation from host communities. The "Statute books" stipulates certain sanction against people who intentionally sabotages oil pipelines ranging from prison terms to death sentence. The act as noted is more of ignorance and poverty in which host communities find themselves amidst sophisticated technology and affluence in which the oil company workers float around. The host communities by their conduct contribute in despoliation of their environment without knowing thereby contributing about 10-15 percent of oil spillage in their-area. While

the basic purpose is to extort money from the oil companies, the harm done to their environment is irreparable. That is where environmental education is important and comes in handy in auspicious times like this towards ameliorating environmental problems.

The study also recognizes, that in areas where cases of not sabotages has been rightly established, oil company foot-drag on the issue of paying adequate compensation because they feel that they do not owe any social responsibility for damages because they pay enough and adequate tariff to the Nigerian government. Thus the buck-passing which goes on between oil companies and Nigeria on the above issue affects innocent citizens whose soil has enriches the country and yet they bear destructive consequences of the industry while some live in abject misery amidst affluence and high technology.

Another area of concern is how the oil companies clean-up spills. While the attempt is situations is to recover as *much* spilled oil as possible, the innovated or left over is burnt off without regard to environmental hazard. This method falls below international standards accepted worldwide. Even cases had -proven that *most* contractors that handle -clean-up contract/remediation lack both the skill and equipment to do the job. Clean-up/remediation efforts is a very highly technical job that should not be left in the hands of mediocre. When an environment is set on fore to wipe-off remnants of oil spill, damage is subsequently Inflicted on the ecology as the



resultant fire in most cases spread to burn vast areas of farmland and forests. Environmentalists insist this is a great cost to the environment; the soil totally burnt -black is said to be lacking in any organic matter and cannot withstand an agricultural activity that forms the bulk of the people's economic mainstay.

In addition to the aged pipelines, flow stations are also blow-outs. When the life span of a field or pipeline is over, the site is returned to its original state. The oil companies have claimed that the current environmental performance should be seen in the context of Nigeria and its major social and economic priorities. (Green Heritage, January - June 2001). This cannot be said to be true as Nigeria has high standards of environmental programme.

The study also recognized that most members of the community whose occupations are basically fishing and farming have suffered occupational inertia and confusion emanating from oil spill. Most of the time, there is frustration on the part of the host community. Leading to confrontation and abduction of expatriates employed by the Oil Company.

Social amenities are also non-existent, no schools, no hospitals, not even maternity homes, no good roads, in fact the whole scenario is that of a rejected and abandoned community.

The survey also revealed that sicknesses and deaths are on the increase arising from congenital malformation which gives rise to depression of the immune system leading to reduced resistance to diseases, malnutrition,

irritation of eyes, nostrils and obstruction of lungs passages (Tell Mag. No 30 July, 2001).

The study also indicated that, the people customs and traditions has been affected as a result of petroleum activities. Accordingly, with the long study of the oil companies over the years in the areas without adequate provision of infrastructure to compensate for the degrading of the environment in addition to the unemployment rate of the area in semiskilled and unskilled jobs has not gone well with the host community. In fact, the host communities are even more aggravated by the disparity in the standard of living between them and the oil workers in their background. Thus as they watch the sophisticated living standard of the oil workers operating as the platforms within their vicinity, they can only imagine how they themselves live in the midst of so much wealth but wallowing in abject penury without good roads, hospitals, petrol stations, potable water and goods standard schools, not even equipment to enhance their fishing activities.

The study also reveals the short-sightedness of the oil companies in terms ensuring that there is continues monitoring of the spill site even so many years after clean-up/remediation has taken place in an attempt to return the environment to its pre-spill stage. The situation is so worrisome that experts has predicted that there are over 2,000 contaminated sites with the Niger Delta resulting from untreated incipience of oil spillage; especially in proven cases of established sabotages (Ofune and Ogamba 1998).

The study also revealed that the clean-up procedures were delayed as the oil remained on the surface of water and adjoining/bordering land for weeks while negotiation lasted worsened by tidal waves activities which increased the contamination and spread of the oil in the water body and its sedimentation-as compared *to* the effects, had faster action been taken.

The spill resulted in serious damage to aquatic fauna and flora; human population suffered chiefly from diminished harvesting of fish and transient deterioration of water resources.

## CHAPTER 5

### **5.0 FINDINGS, CONCLUSION AND RECOMMENDATIONS**

#### **5.1 FINDINGS:**

Some of our findings in the course of this study are as detailed below -

The people living around these spills have little or no knowledge about the environmental implications of oil spillage on them directly or indirectly. The awareness is low, if not they would have been the first to report any oil leakage when it occurred rather than preventing the response team from having access to spill locations. Lack of adequate publicity or education of the people as to the effects of oil spillage on their environment, the economy of the nation, the health hazards posed to the people make them ignorantly sabotage the efforts of the rescue team sent by the oil company; and this is the major cause of the spillage at least 70% of the occurrences.

It was also discovered in the course of this study that most of the pipelines laid were done without proper environmental impact assessment and where it was done the reports were neither partially nor fully implemented. The reconnaissance was not conducted as to determine future occurrences of oil spillage and its subsequent prevention. Negligence on the part of the rescue team is another factor aggravating the occurrence. Their response to arresting leakage pipelines is too slow or too long to prevent spillage. One of the sites visited, Escarvos (Elolo field) it took 11 days after the spill had

occurred before contractors could arrive at the scene of accident in most advanced country for -example in Alasaka in 1989 when there was oil spillage, Exxon corporation rushed 69 (Sixty-nine) experts and five plane loads of equipment to the scene to curtail the spill within reasonable time (Green Heritage 2000).

There were no equipments and the little available were not utilized. The protocol of the response Team were to many to attend to situations promptly to forestall any occurrence, there were no routine maintenance basically no maintenance culture. It is on record that pipelines has a life span of 20 years if pipes were properly coated before they are laid. In this findings, there has been no changes of the pipes since it was laid in Niger Delta region despite the salinity nature of the surrounding soil in this region thus could contribute to oils slicks blow out.

The study also discovered that oil companies washed a lot of time in the issue of paying adequate compensation to the host-community when oil spillage occurred because they feel that they do not owe any social responsibility for damages because they pay enough and adequate tariff to the Nigeria government. Thus the bulk-passing which goes on between oil companies and Nigeria on the above issue affects the innocent citizens of the region whose sol are begin degradation for benefits of the Nation at large.

This study also observed that the process of clean-up spills being adopted by oil companies called for environmental concerned in that, the



system of burnt off without due regards to environmental hazard being impose by this method is 'unwanted'.

## **5.2 CONCLUSION:**

This study has been concerned with the strategies options that are needed towards oil ^spillage management in Nigeria, as a case of study of the Niger Delta region. Considering the findings in the course of the study and the present policies/strategies which were discovered lacking in some aspects and imposing potential damages on the Nigeria environments and the people of Niger Delta being worse off, thus, pave a way for the survival and welfare of future generations of Niger Delta region and the Nation at large? The answer to this view is bound to be complex because both the host - communities, government oil companies and whole Nations at large must be involved *m* process. But ultimate solution towards strategies and policies for proper management of oil spillage in Niger Delta region as against some strategies which was founds inadequate in the regions will be provided with following recommendations.

## **5.3 RECOMMENDATIONS**

The researcher is of the opinion that the following recommendations should be considered vital -as way of improving oil spillage management *m* Nigeria oil industries most especially in Niger Delta region which the focus of this study that, the host-community should made to understand the effect of

oil spillage to their environment. That both the oil companies and government of Ac nation operating *in the* Niger Delta should be organised environment education programmes to make the citizen to be aware of the effect of oil spills to them and the environment.

The oil companies should also provide adequate infrastructure for the host-communities so as to improve the relationship between them *m* order to reduce act sabotage on their side and the government on the other hand should try to formulate policy or act that will make vandalization of pipeline a serious offences in Nigeria so to prevent an act sabotage, where it is being discovered that oil spills occurred as an act of sabotage in attempt to seek for compensation for the host-communities, no form of compensation should be given.

The researcher, also recommended that where oil spills occurs and not to sabotage the efforts of both the government and the company, prompt response to compensate them without delay need to be taken to prevent possibility of the host community on the response Team.

The researchers is of the opinion that well-equipped monitoring unit be setup monitoring unit be set-up by the companies for prompt response to cases of pipeline leakage before it gets out of central. Where spillage occurs without fore knowledge -the companies to provide Aircraft that would respond to such incidence quickly and make the report to appraise unit for prompt action.

The company should established a routine maintenance unit for periodic



inspection and maintenance culture should not be neglected, adequate arrangement to replace worn-off or expired pipes before cases of slick or blow-out are being experienced. All these are to enhance prompt response to arrest source-oil spill within shortest possible time.

That, the oil companies operating in Nigeria, should adopted modern technology available for clean-up/reclamation processes instead of old burnt-off "unwanted method". Which is imposing some environmental problems on the people of Niger Delta-and Nation at large.

The researcher is also recommending that oil-companies short-sightedness should be shopped in terms of ensuring that there is continuous monitoring of the spill site even remediation has taken place in an attempt to return the environment to its pre-spill stage.

As this case has resulted to many contaminated sites within the Niger Delta on the government side who are the policies maker; should drive a massive awareness programmes to substantially improve environmental consciousness -among -the masses of the Niger Delta which would yield good dividends of a healthier environment at cheaper cost. Indeed, it could ultimately go on to render unnecessary the existing sanitation legislation which have proved substantially to be unsuccessful.

There is also poverty among the people of Niger Delta region and the Nation as a whole, in view of this insidious damages effects of poverty on the environment, to achieve that goal would require a thorough review of existing

rural development strategies which would have been more nominal than real in their effects. It will require the elimination of inhibitive institutions it will also require a truly democratic government at all levels of decision making.

## REFERENCES

- Ajiboye M.A (1983) Logistics of Clean-up operations in an off-shore spillage proceeding of (1983) International Seminar sponsored by NNPC
- Aniemeka M.K (1998) Strategies for compensation and litigation on aquatic and maritime of polluted environment proceedings of International seminar on Petroleum Industry and the Nigerian Environment.
- Cormack D (1983) Response to oil and chemical marine pollution. Applied Science Publishers Ltd Essex England.
- Dike K.O. (1830-1888) Trade and Politics in Niger Delta: Oxford Studies in African Affairs) London (1956)
- Ekeh A. et al(1992) Environmental Impact Assessment for NNPC product pipeline and depot Phase II Project FEPA Monograph 3, (Feb.1992)
- Fubara D.M. (1983) The degradation of the aquatic Resources: Effects of Crude oil and petrol chemical industry.
- Imevbore A.M. (1979) Oil Spill Response Guide Woyes Data Corporation New Jersey
- John (1992) Environmental Impact Assessment for NNPC product pipeline and depot phase III project FEPA Monograph 6 (June 1992)
- Maduka N. (1998) Evolving vibrant communities for development and steady growth. International Seminar on the petroleum Industry and the Nigeria Environment.
- Maruin Fingas et.al (1979) The Basic of oil spill clean-up. Supply and services Quebec Canada.
- Meyer R.J. et.al (1989) Oil Spill Response Guide Woyes Data Corporation New Jersey.
- Nwankwo et.al (1998) The Environmental guide lines standards for the petroleum industry in Nigeria. Proceeding of international seminar on the Petroleum Industry and the Nigerian Environment.

- Nwosu E.O. (1998) Petroleum legislation and enforcement on Environmental laws and standards in Nigeria; A critical Appraisal proceeding from International Seminar on the petroleum industry and the Nigerian Environment on petroleum industry and the Environment of the Niger Delta.
- Ogamba B. et.al (1998) The use of simulation models in Environmental Impact Assessment. International Seminar on the Petroleum Industry and the Nigeria Environment
- Okpala J (1992) Enhancing Environmental protection in Nigeria through environmental education. FEPA Monograph 5, Feb. 1992.
- Okuneye P.A (1985) Means of achieving a fast Agricultural Productions in Nigeria NISER Monograph series 13 Ibrahim (1994)
- Okonny P. (1994) et.al: Geography and soil of Niger Delta Region
- Osuno B.A (1982): Impact of oil industry on the environment. Proceedings on Environmental Awareness Seminar for National Policy makers.
- Oyefu K.O. et.al (1979) Environmental Aspects of the Petroleum Industry in the Niger Delta. Problems and solution, proceedings of an International seminar.
- Pickering K.T et.al (1994) Introduction to Global Environmental issues. Routledge N.Y.
- Shitta-Bey T. (1991) "Perilous times for oil producing communities" Nigeria Petroleum Business. Vol. 1 No. 2 May 1991
- Udo R.K& Ogundana B. "Factors influencing the fortunes of ports in the Niger Delta
- Vandermenla et. al (1996) Enhancing Environmental Protection in Nigeria through Environment Education. FEPA Monograph 5, Feb., 1996.
- Wardley Smith J. (1976) The control of oil pollution. Supply and services Quebec Canada.

Basic of Oil Spill Clean up (1979) EPD. Canada

Chemical Pollution (1992) A global overview Earth watch UNEP

National Interest Magazine July 2001

National Research Council (1985) Oil in the sea 0 input, Fates and effects, national  
Academy

NEDECO/Western Niger Delta Reports on Investigation: the Hague (1954)

NRC – National Research Council (1985) Report

Niger Delta Environmental Survey (1997)

Scottish Geographical magazine (No. 82pp. 169-83 1966)

Shell Bulletin, June 1995

Shell Nigeria Brief (1995) The Environment, Shell Petroleum Development Company.

The Green Heritage Quarterly Vol. 1 No. 2 (Oct – Nov. 2000)

The Green Heritage Quarterly Vol. 1 No. 2 (Jan – June 2001)

The News Magazine (July 2001)

Tell Magazine (No. 2 July 2001)

**Federal University of Technology**  
**School of Post Graduate Studies**  
**Department of Geography Minna, Nigeria.**

**Student individual Research Work.**

**RESEARCH TOPIC:** Evolving strategies towards enhancing Oil Spillage management in Nigeria – Case study of the Niger Delta Region.

These questions are aimed at assisting the student Researcher in his individual project work.

The information's sought are purely for academic exercise and will be treated in absolute confidence.

Please assist and co-operate by responding to the questions.

- (1) How long has the pipelines been laid through the area?
  - (a) 0 – 10 Years
  - (b) 10 – 20 years
  - (c) 20 years and above
  
- (2) If is there nay EIA before the pipelines was laid?
  - (a) Yes
  - (b) No
  - (c) Not aware
  
- (3) Has there been a previous spillage around your facility here?
  - (a) Yes
  - (b) No
  - (c) Not aware
  
- (4) Is Yes what in the opinion of the company was responsible/
  - (a) Equipment failure
  - (b) Sabotage
  - (c) Exposure due to Erosion
  - (d) Corrosion
  - (e) Blow-out
  - (f) Unknown
  
- (5) Can you estimate the severity of impact of the oil spillage
  - (a) Very high
  - (b) Moderate.
  - (c) Low



- (6) Identify the impact (order of priority) on the Environment
- (a) Ponds/Lakes/Rivers
  - (b) Vegetation
  - (c) Farmland/Crops
  - (d) Others
  - (e) All of the above.
- (7) Suggest measure forestall failure oil spillage occurrence
- (a) Improved – Community – Company relation
  - (b) Provision of employment
  - (c) Regular monitoring of pipelines
  - (d) Replacing old and worn-out pipes
- (8) Estimate cost of clean-up/Reclamation (N million) in your company opinion.
- (a) 0 – 100
  - (b) 100 – 200
  - (c) 200 – 300
  - (d) 300 – 400
  - (e) 400 and above
- (9) How long is the environment monitored for possible recovery after clean-up/remediation?
- (a) 0 – 5 years
  - (b) 5 – 10 years
  - (c) 10 – 15 years
  - (d) 15 years and above
  - (e) don't know
- (10) Are measures taken adequately enough
- (a) Yes
  - (b) No
  - (c) No comment.
- (11) How do you dispose oil recovered from spills?
- (a) In-situ burning
  - (b) Recycling
  - (c) Land fill disposal
  - (d) Incineration
  - (e) Deep oil injection
  - (f) Others (specify)



(12) Do you have special oil response Team?

- (a) Yes
- (b) No
- (c) Not aware

(13) If Yes how often are they trained?

- (a) Very often
- (b) Not quite often
- (c) Not all

(14) Can you access the level of relationship between the Company – Community

- (a) Very cordial
- (b) Not quite cordial
- (c) Bad, frosty
- (d) Don't know

(15) Do you agreed that your company has not contributed much towards helping the Community.

- (a) Yes
- (b) No
- (c) Don't know

**Federal University of Technology**  
**School of Post Graduate Studies**  
**Department of Geography Minna, Nigeria.**

**Student individual Research Work.**

**RESEARCH TOPIC:** Evolving strategies towards enhancing Oil Spillage management in Nigeria – Case study of the Niger Delta Region.

These questions are aimed at assisting the student Researcher in his individual project work.

The information's sought are purely for academic exercise and will be treated in absolute confidence.

Please assist and co-operate by responding to the questions.

**SOCIO-ECONOMIC SURVEY FOR HOST COMMUNITY**

1. Place of origin:  
(a) An Indigen (b) Non-indigen
2. Sex:  
(a) Male (b) Female
3. Occupation:  
(a) Civil Servant (b) Farming (c) Fishing  
(d) Unemployed (e) Company worker
4. Level of Education  
(a) No school at all (b) Primary school (c) Secondary  
(d) Technical/University (e) Others (specify)
5. For how long has the oil company been working here:  
(a) 0 – 5 years (b) 5 – 10 years (c) 10 – 15 years  
(d) 15 – 20 years (e) 20 years and above.
6. What is your source of drinking water  
(a) Stream (b) Well (c) Borehole  
(d) Pipe borne water (e) others (specify)
7. Has there been any oil spillage since the company started operation  
(a) Yes (b) No (c) Don't know
8. Has your means of livelihood been affected by oil spillage  
(a) Yes (specify) (b) No (c) Don't Know

9. Are diseases and deaths more common now in this town than past years  
 (a) Yes (b) No (c) Don't Know (d) The same like in the past
10. Has the transport system improved in this town (i.e. better roads, vehicles, boats etc)  
 (a) Yes (describe) (b) No (c) Don't know (d) Others (specify)
11. Do you feel that your traditional and cultural values have been affected by the petroleum industry?  
 (a) No  
 (b) Yes  
 (c) Don't know

**COMPANY – COMMUNITY RELATIONS**

12. Can you access the relationship of the community/company  
 (a) Very cordial  
 (b) Fair  
 (c) Poor/frosty  
 (d) Don't know
13. How many times within a year do the company normally have company/community meeting (annually)  
 (a) Once  
 (b) Twice  
 (c) Often  
 (d) Not at all  
 (e) Don't know
14. Do the company pay adequate compensation for damages  
 (a) No  
 (b) Yes, adequately compensated  
 (c) Yes inadequate compensation
15. What would you like them to do for town (State I order of importance)  
 1<sup>st</sup> .....  
 2<sup>nd</sup> .....  
 3<sup>rd</sup> .....
16. Do you have any general comment for the oil companies (state)