

OIL SPILL PROBLEMS AND MANAGEMENT IN THE NIGER DELTA

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ABSTRACT

The coastal area of the Niger Delta is the home to oil explorations and exploitations in Nigeria. Oil spill incidents are common along the Nigeria. The main sources of oil spill on the Niger Delta are: vandalism of the oil pipelines by the local inhabitants; ageing of the pipelines; oil blow outs from the flow stations; cleaning of oil tankers on the high sea and disposal of used oil into the drains by the road side mechanics. By far the most serious source of oil spill is through the vandalism of pipelines either as a result of civil disaffection with the political process or as a criminal activity.

To reduce the rate of oil incidents along the Nigerian Coast particularly as a result of vandalism, the Federal Government through an act of the National Assembly created the Niger Delta Development Commission (NDDC). Part of the responsibilities of the commission is to develop a master plan for the development of the Niger Delta, provide infrastructure and create an enabling environment for industrialisation and employment. There are also several other laws dealing with issues related to oil pollution in the environment. Also, standards for the development of the environmental sensitivity index maps for the coast of Nigeria have been developed by the Environmental Systems Research Institute (ESRI). These standards are to be used by all the oil companies to prepare ESI maps for their areas of operations in Nigeria. Furthermore, apart from the mechanical and chemical oil spill cleaning methods that have been used in managing oil spill problems, oil spill models have on several occasions being used to manage oil spills on the Nigerian Coast.

A number of Federal and state agencies deal with the problems of oil spill in Nigeria. The agencies include: the Department of Petroleum Resources (DPR), the Federal Ministry of Environment, the State Ministries of Environment and the National Maritime Authority. There is also the "Clean Nigeria Associates" which is an umbrella through which the Oil companies tackle major oil spills.

There is a need to create serious awareness among the populace on the implications of oil spill incidents on the environment. Governments must assist the rural communities in claiming their rights on oil spills and ensure that digital ESI maps are readily available for managing oil spill maps. Government should have strict rules for local oil tankers that would ply our coastal and inland waters as a result of the new cabotage law that is just being passed into law in the country.

INTRODUCTION

The Nigerian coastline is about 853 kilometres in length from the border with the Republic of Benin in the west to the Republic of Cameroon in the east. The coastal areas are generally low lying and sandy, rich in natural resources such as, mangrove, fish and crustaceans. Nigeria is the sixth largest exporter of oil and the largest in Africa. The oil is mainly from the Niger Delta. Nigeria's mangrove ecosystem is the largest in Africa and serves as sanctuary to many endangered species of animals. It is the breeding ground for fishes.

Niger Delta

The Niger Delta is the area where the main river channel of the River Niger reaches base level and branches into multiple tributaries, disposing of and distributing the water discharge and sediment load. It is the resultant of the interaction between these river processes and the marine processes dominating the receiving basin offshore (Jelgersma *et al.*, 1993). The shape of the Niger Delta has been described by Sexton and Murday (1994) as being similar to the Nile Delta, with a profile that is curved or bowed with its convex outer margin facing the Atlantic Ocean.

The region has some unique characteristics that tend to make development difficult. The Delta is one of the largest wetlands in the world. It covers an area of 70,000 square kilometres and is noted for its sandy coastal ridge barriers, brackish or saline mangroves, fresh water, permanent and seasonal swamp forests as well as low land rain forest. The whole area is traversed and criss-crossed by a large number of rivers, rivulets, streams, canals and creeks. The coastal line is buffeted throughout the year by the tides of the Atlantic Ocean while the mainland is subjected to regimes of flood by the various rivers, particularly the River Niger.

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

The soils underlying the Niger delta are generally characterised as soft, highly compressible, organic and inorganic silty clays overlying fine sands at great depths (Nig. Coastal Erosion and Subsidence. Tech. Report no.1, 1991). These soil characteristics



FIGURE 1.0: MAP OF NIGERIAN COASTAL AREAS

make the Niger delta highly susceptible to subsidence. Although no conclusive studies or research have been carried out to determine the degree of subsidence, increased flooding and inundation of the barrier islands and swamps seem to indicate that the rate of subsidence is appreciable. A preloading survey of the liquified natural gas site in Bonny tend to support the idea that the delta is still undergoing natural subsidence (Nwilo, 1995, Ibe, 1988). Other forces such as damming, oil, gas and water extraction have recently come into play in the determination of the physical configuration of the Delta. For example, the construction of dams across the River Niger has led to a reduction in the volume of sediment getting to the coast. This reduction has invariably led to increased erosion problems along the coastline.

Sources of Oil spillage on the Niger Delta

Oil spill incidents have occurred at different times along the Nigerian coast. Between 1976 and 1996, a total of 4647 incidents resulted in the spilling of approximately 2,369,470 barrels of oil into the environment. Of this quantity, an estimated 1,820,410.5 barrels (77%) were not recovered. Available records for this period indicate that approximately 6%, 25%, and 69% respectively, of total oil spilled in the Niger Delta area, were in land, swamp and offshore environments.

Table 1 ~ Reported oil spills 1997~ 2001

Year	Total number of reported spills	Quantity in barrels
1997	339	59,272
1998	390	-
1999	319	-
2000	637	84,072
2001	412	120,976

Table 1 gives an example of the number of spill and the reported volumes of oil spilled into the marine environment over the period 1997 ~ 2001 Nigeria's largest spill was an offshore well-blow out in January 1980 when an estimated 200,000 barrels of oil (8.4million US gallons) spilled into the Atlantic Ocean from an oil industry facility and that damaged 340 hectares of mangrove.

The main sources of oil spill on the Niger Delta are: vandalism of the oil pipelines by the local inhabitants; ageing of the pipelines; oil blow outs from the flow stations; releases, both accidental and deliberate, from oil tankers on the high sea and the disposal of used oil into the drains by the road side mechanics. By far the most serious source of oil spill is through the vandalism of pipelines either as a result of civil disaffection with the political process or as a criminal activity.

IMPACTS OF OIL SPILLAGE IN THE NIGER DELTA

Major oil spills heavily contaminate coastal shorelines, causing severe localised ecological damage to the near-shore community. Ever since the discovery of oil in Nigeria in the 1950s, the country has been suffering the negative environmental consequences of oil development. The growth of the country's oil industry, combined with a population explosion and a lack of enforcement of environmental regulations has led to substantial damage to Nigeria's environment, especially in the Niger Delta region.

Oil spills in the Niger Delta have been a regular occurrence, and the resultant degradation of the surrounding environment has caused significant tension between the people living in the region and the multinational oil companies operating there. It is only in the past decade that environmental groups, the Federal Government, and the foreign oil companies operating in the Niger Delta began to take steps to mitigate the impacts. Large area of the mangrove ecosystem have been destroyed. The mangrove forest was in the past a major source of wood for the indigenous people. In some places it is no longer in a healthy enough state to sustain this use.

Oil that is spilled in and not recovered will have an impact on the local environment, spreading over a wide area and affecting both terrestrial and marine resources, inappropriate clean up actions can make the situation worse. the development of the region has led to the degradation of some sites reducing their value and use. In the past, spills have also necessitated the complete resettlement of some communities. Loss of agricultural land, for example, translates into loss of livelihood for farmers while the psychological and social problems associated with displacements include loss of ancestral homes, familiar surroundings, religious and other cultural artefacts (NDES, 1997).

MANAGEMENT OF OIL SPILL INCIDENTS IN NIGERIA

Many strategies have been taken by governmental and non-governmental agencies to effectively manage oil spill incidents in the country. Some of the measures taken to control oil spill incidents include the setting up of the Niger Delta Development Commission to tackle ecological and environmental problems. There have also been laws and regulations introduced to control oil exploration and exploitation, and the creation of environmental sensitivity index maps produced to help in taking decisions that will protect the coastal ecosystem. These measures and others are discussed in the following subsections.

The Niger-Delta Development Commission

The Federal Government as part of its efforts to protect the marine and coastal environment of the Niger Delta, through an act of the National Assembly in 2000, passed into law the Niger Delta Development Commission. The Act among other things, established a Commission to carry out among other things the following tasks:

- Cause the Niger-Delta area to be surveyed in order to ascertain measures which are necessary to promote its physical and socio-economic development;
- Prepare plans and schemes designed to promote the physical development of the Niger-Delta area;
- Identify factors inhibiting the development of the Niger-Delta and assist the member states in the formation and implementation of policies to ensure sound and efficient management of the resources of the Niger-Delta;
- Assess and report on any project funded or carried out in the Niger-Delta area by oil and gas producing companies and any other company including non-governmental organisations and Ensure that funds released for such projects are properly utilised;

(e) Tackle ecological and environmental problems that arise from the exploration of oil in the Niger-Delta area.

(f) Liaise with the various oil mineral and gas prospecting and producing companies on all matters of pollution prevention and control.

Essentially, items (e) to (f) deal with issues pertaining to oil exploration and production and the NNDC act is a strategic way of dealing with all forms of pollution from these activities in the Niger Delta.

Laws and Regulations

Part of the means of managing the environment is to have in place the necessary laws and regulations and guidelines. Nigeria already has quite a number of laws that deal with oil activities and the environment generally. Nigeria has also signed international agreements relevant to the environment. Some of these laws, regulations and international agreements include:

- a. Endangered Species Decree Cap 108 LFN 1990.
- b. Federal Environmental protection Agency Act Cap 131 LFN 1990.
- c. Harmful Waste Cap 165 LFN 1990.
- d. Petroleum (Drilling and Production) Regulations, 1969. This requires licence holders to take all practical precautions, including the provision of up-to-date equipment approved by the appropriate authority to prevent pollution of inland waters, river courses, the territorial waters of Nigeria or the high seas by oil or other fluids or substances.
- e. Mineral Oil (Safety) Regulations, 1963. This regulation deals with safe discharge of inflammable gases and provides penalties for contravention and non-compliance.
- f. International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971
- g. Convention on the Prevention of Marine pollution Damage, 1972
- h. African Convention on the Conservation of Nature and Natural Resources, 1968
- i. Petroleum Regulations 1967. This prohibits discharge or escape of petroleum into waters within harbour area and make provisions for precautions in the conveyance of petroleum and rules for safe operation of pipelines.
- j. Oil in Navigable Waters Act 1968. This prohibits discharge of oil or any mixture containing oil into the territorial or navigable inland waters.

The Environmental Impact Assessment (EIA) decree No 86 of 1992 was promulgated to protect and sustain our ecosystem. The law makes the development of an EIA compulsory for any major project that may have adverse effects on the environment (Ntukekpo, 1996; Olagoke, 1996). It sought to assess the likely or potential environmental impacts of proposed activities, including their direct or indirect, cumulative, short term and long term effects, and to identify the measures available to mitigate adverse environmental impacts of proposed activities, and assessment of those measures. (Ozekhome, 2001).

Environmental Sensitive Index Mapping

Environmental sensitivity index (ESI) mapping can and do assist in the management of oil spill incidents. ESI mapping was first initiated in Nigeria in the early 1980s. Gundlach *et al* (1981) describes the ESI system of mapping and symbology and suggested the categories that could be used for Nigerian shorelines. Over the years these shoreline categories have been accepted on a fairly universal level (Gundlach and Murday, 1987; and IMO/IPIECA,

1998), although nuances exist between the versions of sensitivity maps dependent on the area of study and project objectives.

In order to assist the decision-makers in choosing the areas of priority, coastal sensitivity maps of Nigeria including areas of ecological and socio-economic interest must be produced at small scales. As part of an environmental baseline studies project for the Nigerian National Petroleum Corporation (NNPC), sixty coastal and two hundred riverine/estuarine stations were studied in 1984 and 1985. Data gathered at these stations were used in describing regional and site-specific shoreline types. It is mandatory in Nigeria today for an oil producing company, operating in the Nigerian coastal waters, to produce an ESI map of the area of operation to assist in managing oil spill problems in case of an oil release. The use of Geographic Information Systems (GIS) as operational tools can be very effective in reducing the response time and improving the decision-making process.

Establishment of Relevant Government Agencies on Pollution Matters

The Federal Ministry of the Environment is legally vested with the responsibility of protecting and sustaining the Nigerian environment through the formulation and implementation of regulatory frameworks. The National Policy on the Environment on the other hand, is one of the instruments developed by the Ministry to carry out its tasks. The document describes guidelines and strategies for achieving the policy goal of sustainable development (Ntukekpo, 1996). Also, the Federal Government has recently set up a new commission, the Oil Detection and Response Commission with the sole purpose of managing oil spill problems in the Nigerian Coastal and Inland waters. Other agencies that deal with pollution are the National Maritime Authority, which deals pollution in Nigeria's maritime waters and the Department of Petroleum Resources, which is the environmental watch dog of the oil industry. All these play one role or another in managing pollution although there appear to be conflicts in roles and responsibilities.

Due to increasing awareness on the need to prevent and control spills in Nigeria, the Clean Nigeria Associates (C.N.A.) was formed in November 1981. The C.N.A. is a consortium of eleven oil companies operating in Nigeria, including N.N.P.C. The primary purpose of establishing the C.N.A is to maintain a capability to combat spills of liquid hydrocarbons or pollutants in general. The Clean Nigeria Associates employ the whole range of different methods and techniques for responding to oil spills. Too much detail, that is not really relevant to paper

Nigeria-Sat 1 Satellite

The launching of Nigeria Sat 1 into orbit makes Nigeria, Africa's most populous country, the continent's fourth nation with a satellite in orbit. Algeria, Egypt and South Africa also operate Earth satellites. The Nigerian satellite has joined the Disaster Monitoring Constellation, an international early-warning satellite network transmitting real-time information about droughts, earthquakes, deforestation and man-made disasters observable from space. The Nigeria Sat-1, would also help to monitor the perennial problem of oil pipeline vandalisation, and could assist in combating and managing oil spill incidents.

International Co-operation

To shore up the fight against oil smugglers in Nigeria, the US has donated three 56 metre (180ft) refitted World War two-era patrol boats to the Nigerian Navy. Another four vessels are due to be delivered by December, according to the United States Government. The United States Government spends about \$3.5m for refurbishing each of the boats. These measures are already yield-

ing good results as the Nigerian Navy has intercepted several oil bunkering ships.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Oil spill incidents create serious environmental problems in Nigeria. Available records indicate that approximately 6%, 25%, and 69% respectively, of total oil spilled in the Niger Delta area, were on land, swamp and offshore environments. Vandalisation of oil pipes and storage facilities by pirates is the major factor responsible for oil spill incidents in the region.

Oil spillage has led to pollution of drinkable water, destruction of the ecosystem, death of marine fishes and animals in the Niger Delta. Lack of strict compliance to existing environmental protection rules and regulations, with the inability of governmental and non-governmental agencies to enforce these laws have contributed to the pollution of the ecosystem of the Niger Delta.

Numerous laws and guidelines exist in Nigeria for controlling oil pollution in the country. Federal Environmental Protection Agency and the Clean Nigeria Associates (C.N.A) have been empowered to combat and control oil pollution in the country. The Oil Spill Detection and Response Agency has been set up to manage oil spill incidents in the Niger Delta.

Recommendations

In order to ensure effective management of oil spills on the Niger Delta, the Federal Government and Federal Environmental Protecting Agency should ensure that those responsible are held to account under the law whenever a major oil spill incident pollutes the ecosystem.

Since it is the principal reason for oil spills in the region, the Federal Government should step up its campaign against pipeline vandals by prosecuting all people caught in this criminal act.

The activities of the newly set up Niger-Delta Development Commission should be closely monitored and supervised by the Federal Government. This will ensure transparency, honesty and fairness to all in the Niger Delta;

Medium scale digital maps should be made from the newly launched Nigeria Sat-1. Images from the satellite and other satellites in orbit could also be use for managing oil spill incidents in the country.

The Federal Government should enforce strict rules for the quality and operation of local oil tankers that would ply our coastal and inland waters as a result of the new cabotage law that have just being passed into law in the country.

BIOGRAPHY

Dr. P.C. Nwilo holds a Ph.D (1995) in Environmental Resources from the University of Salford, Salford, United Kingdom and a B.Sc. (1980) and M.Sc. (1985) Degrees in Surveying from the University of Lagos. He has been an Associate Professor of Surveying and Geoinformatics at the University of Lagos since 1999; a Senior Lecturer in 1995; Lecturer I in 1992 and Lecturer II in 1989. He is also the Sub-Dean, School of Postgraduate Studies, University of Lagos. Dr. Nwilo is currently a consultant

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Dr. Nwilo is an expert in Surveying and Geoinformatics, erosion and other physical environmental issues, sea level variations along the Coast of Nigeria including Coastal Management issues and capacity building. Dr. Nwilo has published extensively in his field of research particularly in the areas of erosion (land and coastal), sea level variations and their impacts, spatial data infrastructure, subsidence and application of geographic information in the management of the coastal areas, pollution and tourism. He has over 56 papers in journals, local and international conferences and workshops. Dr. Nwilo has jointly edited three books, the most recent being a jointly funded publication by UNIDO and the National Inland Waterways Authority on Strategies for the Management of Pollution and Sedimentation in the Nigerian Inland Waterways.

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