

10.5281/zenodo.7566666

Effects of Oil Spills on Aquatic Lives: A Study of Kporghor Community in Tai Local Government Area, Rivers State

¹Patience Itaa, ²Lenyima Festus Kale, Francis Itaa & Charles Itaa

¹Department Community Health, Rivers State College of Health Science and Management Technology, Port Harcourt.

²Centre of Excellence, Marine and Offshore Engineering, Rivers State University Port Harcourt.

Abstract

Oil spill incidents have occurred at different times along the Niger Delta area and Ogoni in particular. These incessant oil spills have caused tremendous pollution and death of aquatic lives. This study therefore, adopted the survey design to investigate the causes, effects, implications, prevention and remediation of the polluted aquatic environment of Kporghor community of Tai Local Government Area in Rivers State. The study population was estimated at 1500 adult men and women of Kporghor community, with a sample size of 316 purposive sampling technique. Questionnaire was used as the research instrument which was validated by experts from School of Community Health while test retest was used to determine its reliability. The results of the findings showed that the aquatic environment of the community has been badly polluted by incessant oil spills, leading to destruction of sea food, contamination of water, devastation of means of livelihood, sicknesses and death of animals and humans of Kporghor community and Niger Delta at large. It is concluded that this incessant pollution could be avoided if the local content act and the standard practices as recommended by international organizations are followed dutifully.

Keywords: aquatic, contamination, health, oil spills, seafood

1.0 Introduction

From the discovery of the first commercially viable oil wells in Oloibiri of Bayelsa, in the Niger Delta, Nigeria, in 1956 and Ogoni in 1958 to the present days, the issue of oil production and its effect on the environment has been the source of great concern between oil companies and their host communities. Shell Petroleum Development Company (SPDC) has acknowledged in some instances that, most environmental problems related to the oil industry are due to oil spills, gas flaring, dredging of canals and land taken for construction of facilities (Raji & Abejide, 2013). Large oil spills, depending on their location, may go undetected for many days or even months with untold damage to the fragile ecology of the Niger Delta aquatic and environment. These oil-related activities have affected the aquatic life and fishing activities; the major economic preoccupation of indigenes and residents of the communities.

The primary occupations of the people in the coastal areas of the Niger Delta are fishing and farming; and according to a report by United Nation Development Programme (UNDP, 2006), more than 70 % of the people of this area depend on the natural environment for their livelihood (Ebegbulem et al, 2013). However, we know that almost every resident in the community depends on the surrounding waters for one purpose or the other. According to Niger Delta Environmental Survey (NDES) sometimes ago, oil production and other industrial activities are just some of the factors that have greatly impacted on the evolution of the Niger Delta and Ogoni in particular and has drawn several attentions especially that of international community to the devastation and degradation of lands and waters in the region. The operations of the oil industries have introduced pollutants as liquid discharges and oil spills into the air, land, and water components of the environment (Omajemite, 2021). Akpofure (2020), noted that when there is an oil spill on water, spreading takes place immediately. The gaseous and liquid components evaporate while some get dissolved in water and even oxidize and some undergo bacterial changes and eventually sink to the bottom by gravitational force. The soil is then contaminated with gross effect upon the terrestrial and aquatic lives in many ways. As the evaporation of the volatile lower molecular weight components affect

aerial life, so the dissolution of the less volatile components, with the resulting emulsified water affects aquatic life.

Environmental pollution caused by petroleum is of great concern. This is because petroleum hydrocarbons are toxic to all forms of life and harm both aquatic and terrestrial ecosystems. The pollution of marine habitats has caught the attention of researchers and environmentalists. This is due to the serious impact of oil spills on marine life, as well as on people whose career relies on the exploitation of the sea's resources (Bartha & Bossert, 2014). An oil spill is the release of a liquid petroleum hydrocarbon into the environment, especially the marine ecosystem, due to human activity, and is a form of pollution. The term is usually given to marine oil spills, where oil is released into the ocean or coastal waters, but spills may also occur on land. Oil spills may be due to releases of crude oil from tankers, offshore platforms, drilling rigs and wells, as well as spills of refined petroleum products (such as gasoline, diesel) and their by-products, heavier fuels used by large ships such as bunker fuel, or the spill of any oily refuse or waste oil. It can occur by accident, or deliberate release of oily refuse by operators, pipeline vandalism and / or oil theft, or due to systemic failure as a result of poor maintenance of the facility.

Oil spills penetrate into the structure of the plumage of birds and the fur of mammals, reducing its insulating ability, and making them more vulnerable to temperature fluctuations and much less buoyant in the water. Oil spills can have disastrous consequences for society; economically, environmentally, and socially. As a result, oil spills incidences have initiated intense media attention and political uproar, bringing many together in a political struggle concerning government response to oil spills and what actions can best prevent them from happening (Wout, 2015). This is the root cause of Niger Delta militancy and agitations.

Additionally, marine life may be affected by clean-up operations. It may also be indirectly affected by the physical damage to the habitats in which plants and animals live in. Petroleum marine fuel spills, which result from damage, transportation accidents and various other industrial and mining activities, are classified as hazardous waste. They are considered to be the most frequent organic pollutants of aquatic ecosystems. In recent years, there have been numerous studies regarding the levels of contamination of the seawater by hydrocarbons. (Barron, 2012). This study however, focused on the cases of oil spill and its devastating effect on aquatic lives in Kporghor community, Tai Local Government Area of Rivers State, Nigeria as case study.

Statement of the Problem

The people of Ogoni land and Niger Delta depend largely on farming and fishing as their means of livelihood. These they do within the blessed environment provided them by God. Unfortunately, the aquatic environment and lives have been destroyed with the pollution of traditional fishing grounds, exacerbating hunger and poverty in fishing communities forcing the affected communities and youths of the land to be aggressive in some cases. Clark and co scholars as early as 1999, sums up the experience of local fishermen and farmers as follows: "having lost their traditional subsistence lifestyle to pollution and other drastic changes in their immediate environment, many oil producing communities are now forced to buy their food. This is even worse today. In Ogoni land where Shell Petroleum Development Company operated for decades and devastated the environment, operations have led to the loss of fish populations along the coasts. Fishing is available only to those who can afford large boat engines and trawlers to venture into the high seas. The rest of the population buy "ice fish" (frozen fish), a practice totally unknown some years back. This paper therefore aims at reviewing the challenges of oil spills on the aquatic environment and to suggest the way forward.

2.0 Research Methodology

2.1 Design of Study

This study adopted a survey design with the aim of investigating the impact of oil spillage on aquatic lives in Kporghor community of Tai Local Government Area of Rivers State while employing both qualitative and quantitative approach in conducting the study analysis.

2.2 Population of Study

The population of this study is made up of an estimated 1500 dwellers of Kporghor Community in Tai Local Government Area who have experienced oil spills and its devastation of the environment (both aquatic and terrestrial habitats).

2.3 Area of Study

The study was carried out in Kporghor, Tai Local Government Area. Tai is a Local Government Area (LGA) of Rivers State in Nigeria. It covers an area of 159 km² and at the 2006 Census, it had a population of 117,797. It was created in 1996 with its seat of power located at Saakpenwa. Tai is located on coordinate: 4°43'0"N 7°18'0"E. Most of the people are Ogoni, speaking the Tee and Baan languages. The primary occupations are farming, and fishing to a lesser degree.

2.4 Sample and Sampling Techniques

Stratified and simple random sampling techniques were used in selecting the sample for this study. This is because simple random sampling technique permits the researcher to have representation of the population without bias. In other words, every member of the population had equal chance of being represented or chosen. The sample size used for this study is three hundred and sixteen (316) fisher men, women, and youths of Kporghor community. The sample was determined using Tara Yamane's formula.

2.5 Instrumentation for Data Collection

The questionnaire was the main instrument for data collection; it was constructed by the researcher and submitted to the project supervisor and other experts for corrections and approval. The questionnaire was titled, Oil Spillage Implications on Health (OSIH). The questionnaire has two (2) sections, section A, and section B. Section A contains the personnel data of the respondents while Section B deals with the oil spillage and its implications on the health of Kporghor community dwellers. The respondents indicated their response on Likert 4-point scale of Strongly Agree, Agree, Disagree and Strongly Disagree.

2.6 Method of Data Collection and Analysis

The instruments were administered to the respondents by the researcher in person, with the aim of explaining items that might not be cleared to the respondents. Upon successful completion, the instruments were retrieved directly by the researcher for analyses. The responses from the respondents were collated and presented on tables. Thereafter, simple percentage was used to analyse the data and discussion was made on the analyses.

3.0 Results

Table 1 Causes of Oil Spillage on the Aquatic Environment

S/N	Research Items	SA		A		D		SD	
		Score	%	Score	%	Score	%	Score	%
1	A good number of spills occur due to pipeline and tanker accidents- whereby tanker or pipeline is damaged leading to oil spill.	253	80%	63	20%	0	0%	0	0%
2	One major cause of oil spillage is sabotage- in forms of oil theft or illegal siphoning of oil from punctured pipelines.	190	60%	126	40%	0	0%	0	0%
3	Day to day operations of oil and gas firms such as SPDC and others causes oil spill and consequent pollution of the environment.	190	60%	95	30%	32	10%	0	0%
4	Equipment failure or damage causes oil spill to aquatic environment.	158	50%	126	40%	32	10%	0	0%
5	Corrosion of pipelines and tankers cause	221	70%	95	30%	0	0%	0	0%

rupturing or leaking of old production infrastructures that often do not receive inspection and regular maintenance.

6	Prominent offshore oil platform spills typically occur as a result of a blowout due to excessive pressure on the facility.	126	40%	158	50%	32	10%	0	0%
---	--	-----	-----	-----	-----	----	-----	---	----

SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree

Table 1, considers the causes of oil spill in Kporghor community and by extension, the Niger Delta region of Nigeria. Six (6) items were considered on the possible causes of oil spill. About 253 (80%) of the respondents strongly agreed with Item 1, 63 (20%) agree while 0(0%) disagreed or strongly disagreed. On sabotage- in forms of oil theft or illegal siphoning of oil from punctured pipelines, 190 (60%) strongly agreed while 126 (40%) agree that this is one major cause of oil spill. On equipment failure or damage as a cause of oil spill to aquatic environment, 158 (50%) Strongly agreed, 126 (40%) agree, 32 (10%) were of contrary opinion. For Corrosion of pipelines and tankers, 221 (70%) strongly agreed or while 95 (30%) agreed that corrosion of pipelines is one major cause of oil pollution of aquatic environments.

Table 2 Effects / Impacts of oil Spillage

S/N	Research Items	SA		A		D		SD	
		Score	%	Score	%	Score	%	Score	%
7	Oil spillage has a major impact on the ecosystem into which it is released and may constitute ecocide (complete destruction of the ecosystem).	253	80%	32	10%	0	0%	32	10%
8	Oil spills cause immense destruction of the mangroves and seafood within the impacted areas.	284	90%	32	10%	0	0%	0	0%
9	The environment is polluted by oil spills (the water bodies).	126	40%	158	50%	32	10%	0	0%
10	Spills in populated areas often spread out over a wide area, destroying crops and aquacultures through contamination of the groundwater and soils.	221	70%	32	10%	32	10%	32	10%
11	Oil penetrates into the structure of the plumage of birds and the fur of mammals, reducing their insulating ability, and making them more vulnerable to temperature fluctuations and much less buoyant in the water.	95	30%	158	50%	63	20%	0	0%
12	Animals who rely on scent to find their babies or mothers cannot due to the strong scent of the oil. This causes a baby to be rejected and abandoned, leaving the babies to starve, exposed to predators and eventually die.	190	60%	63	20%	63	20%	0	0%

SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree

Table 2, considers the effect / Impact of oil spill on the environment. 253 (80%) strongly agreed, 32 (10%) agree, while 32(10%) strongly disagreed that oil spills result to ecocide (complete destruction

of the ecosystem). On destruction of the mangroves and seafood within the impacted areas, almost all 284 (90%) the respondents strongly agreed. For pollution of the aquatic environment, and death of aquatic animals, similar result is seen.

Table 3 Remediation and Prevention of Oil Spillage

S/N	Research Items	SA		A		D		SD	
		Score	%	Score	%	Score	%	Score	%
13	One major way of preventing oil spill is for oil companies to adopt international acceptable best practices while carrying out oil production.	188	80%	95	30%	0	0%	0	0
14	Oil sabotage in form of oil theft should be avoided by workers as it presents the potential for leakage.	253	80%	32	10%	0	0%	32	10%
15	Illegal and artisanry refining (popularly known as kpoo fire) should be avoided by community youths.	126	40%	158	50%	32	10%	0	0%
16	Bioremediation is a proven alternative treatment tool that can be used to treat certain aerobic oil-contaminated environments.	253	80%	63	20%	0	0%	0	0%
17	Biodegradation which involves treating of polluted site using biological means can be adopted in remediation of oil polluted sites in Ogoni.	221	70%	95	30%	0	0%	0	10%
18	Removal of contaminated sediment, invasive vegetation and debris can help in remediation of polluted aquatic environment.	253	80%	63	20%	0	0%	0	0%

SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree

Table 4.3, considers the analyses of ways of preventing pollution and methods of remediation. For adoption of internal best practice, 188 (80%) strongly agree, 95 (30%) agree; 80% strongly agreed that oil sabotage/theft should be avoided, 32 (10%) agreed while 32 (10%) strongly disagreed. On remediation methods, 80% favour bioremediation, 70% for biodegradation and 80% for removal of contaminated sediments and removal of debris and invasive vegetation.

4.0 Discussion of Findings

Incessant oil spills, is a common occurrence in Niger Delta and Ogoni in particular. The people of the land live with polluted environment from the activities of oil companies operating within the area. The land is devastated, the environment polluted, means of livelihoods destroyed and life is difficult. On the possible causes of oil spillage on aquatic lives, six (6) research questions were considered and all accepted. Meaning, the study found out that the causes of oil spills on aquatic lives in our communities include: pipeline and tanker accidents- whereby tanker or pipeline is damaged leading to oil spill; sabotage- in forms of oil theft or illegal siphoning of oil from punctured pipelines; day to day operations of oil and gas firms such as SPDC and others; equipment failure or damage; corrosion of pipelines and tankers; blowout due to excessive pressure on the facility among other causes. This finding is similar to those of Nwilo and Badejo (2011) who found that corrosion of pipelines and tankers can cause rupturing or leakage of old production infrastructures that often do not receive inspection and regular maintenance. When any or combination of these happened, oil spills into the aquatic environment leading to its pollution and devastation. These results and findings are also in tandem with the findings and position of Bartha and Bossert (2014) who asserted that oil spills may be due to releases of crude oil from tankers, offshore platforms, drilling rigs and wells, as well as spills

of refined petroleum products (such as gasoline, diesel) and their by-products, heavier fuels used by large ships such as bunker fuel, or the spill of any oily refuse or waste oil.

The effects of incessant oil spill on the aquatic environment is enormous and include, ecocide (complete destruction of the ecosystem); destruction of the mangroves and seafood within the impacted areas; spreading out over a wide area, destroying crops and aquacultures through contamination of the groundwater and soils; oil penetrates into the structure of the plumage of birds and the fur of mammals, reducing their insulating ability, and making them more vulnerable to temperature fluctuations and much less buoyant in the water. Also, animals who rely on scent to find their babies or mothers cannot due to the strong scent of the oil. This causes a baby to be rejected and abandoned, leaving the babies to starve, become susceptible to predators and eventually die in most cases. Also, the water is contaminated with foul-smell and chemical taste.

This is similar to the findings of Ebegbulem, Et al (2013), whose studies show that oil spill represents an immediate fire hazard and destruction of human lives within the affected vicinity. Spilled oil contaminates drinking and utility water supplies as our people rely on surrounding stream waters for drinking, cooking, washing and bathing. Contamination can have an economic impact on tourism and marine resource extraction industries negatively. Oil spills also harm air quality as toxic chemicals in crude oil are mostly hydrocarbons and can introduce adverse health effects when being inhaled into human body. The destruction of mangroves, seafood causes economic hardship as the people are majorly farmers and fisher men. Incessant oil spills have damaged the aquatic and terrestrial habitats, destroying animal, aquatic and human lives, impose hardship and trauma with all forms of attendant health challenges on the people leading to the untimely death of countless numbers (Omajemite, 2011).

Oil spillage has a major impact on the ecosystem into which it is released and may constitute ecocide (Okon, 2017). Immense tracts of the mangrove forests, which are especially susceptible to oil (mainly because it is stored in the soil and re-released annually during inundations), have been destroyed. An estimated 5 to 10% of Nigerian mangrove ecosystems have been wiped out either by settlement or oil (Simire, 2012). These positions or findings are similar to those of this research. Also, the destruction of mangroves, seafood causes economic hardship as the people are majorly farmers and fisher men who have been frustrated as their source of livelihood has been devastated by the incessant spills of oil and fire outbreak in Ogoni and Niger Delta at large.

Several methods are used for the remediation of oil polluted environment. One very effective method is bioremediation. Bioremediation is a technique that may be useful to remove spilled oil under certain geographic and climatic conditions. Bioremediation is a proven alternative treatment tool that can be used to treat certain aerobic oil-contaminated environments. Typically, it is used as a polishing step after conventional mechanical clean-up options have been applied. It is a relatively slow process, requiring weeks to months to effect clean-up. If done properly, it can be very cost-effective, although an in-depth economic analysis has not been conducted to date. It has the advantage that the toxic hydrocarbon compounds are destroyed rather than simply moved to another environment (Badejo&Nwilo, 2014).

Bioremediation is the process where microorganisms transform organic contaminants in oceans, soils, groundwater, sludge and solids, into an energy source. The two main approaches to oil-spill bioremediation are:

- i. Bioaugmentation, in which oil-degrading bacteria are added to supplement the existing microbial population, and
- ii. Bio-stimulation, in which nutrients or other growth-limiting co-substrates are added to stimulate the growth of indigenous oil degraders.

Both of these procedures can be employed to remediate the oil-polluted environment of Ogoniland and Niger Delta.

In terms of management of oil spill and the polluted environment, Badejo and Nwilo (2014) observed and advanced that a number of laws already exist in the Nigerian oil industry through extant laws. Most of these laws provide the framework for oil exploration and exploitation. However, only some of these laws provide guidelines on the issues of pollution (Salu, 1999). According to the Federal Environmental Protection Agency, Lagos Nigeria, the following relevant national laws and international agreements are in effect:

- i. Endangered Species Decree Cap 108 LFN 1990.
- ii. Federal Environmental protection Agency Act Cap 131 LFN 1990.
- iii. Harmful Waste Cap 165 LFN 1990.
- iv. Petroleum (Drilling and Production) Regulations, 1969.
- v. Mineral Oil (Safety) Regulations, 1963.
- vi. International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971.
- vii. Convention on the Prevention of Marine pollution Damage, 1972.

These regulations have to be followed strictly before, during and after decommissioning in order to prevent pollution of the environment.

5.0 Conclusion

Oil spill has occurred several times along the Nigerian coast as a result of upsurge in oil exploration and exploitation activities especially in Ogoniland and Kporghor community in particular. Causes of oil spills along our coast are corrosion of oil pipes and storage tanks, sabotage and carelessness during oil production operations. The impacts of spillage on our coastal areas are enormous. Lives have been lost, the coastal habitat and ecology have also been destroyed. There have been numerous calls and agitations for resource control by oil producing states in the country. These calls have made the Federal Government to give the states the rights to control minerals within 200m bathy lines and the coastlands. The polluted waters and lands in Ogoni and Niger Delta must be cleaned following UNEP recommendations with politicizing the process. The community must stop all forms of illegal refining and bunkering to save our environment.

References

- Akporfure, E.A., Efere, M.L. & Ayawei, P. (2020). The adverse effects of crude oil spills in the Niger Delta: Urhobo Historical Society. Retrieved August 20, 2022, from http://www.waado.org/environment/petrolpolution/oilspills/OilSpills_AdverseEffects.html.
- Badejo O.T. & Nwilo P.C. (2014). Management of Oil Spill Dispersal along the Nigerian Coastal Areas. Department of Surveying and Geoinformatics, University of Lagos, Lagos-Nigeria. <https://www.isprs.org/proceedings/XXXV/congress/comm7/papers/241>.
- Bartha R, Bossert I. (2014) 'The Treatment and Disposal of Petroleum Refinery Wastes'. In: Atlas RM. (ed.) Petroleum Microbiology. *Macmillan Publishing Company, New York*; 2014. p1-61.
- Ebegbulem, J.C., Ekpe, D. & Adejumo, T.O. (2013). Oil exploration and Poverty in the Niger Delta Region of Nigeria: A critical analysis. *International Journal of Business and Social Science*, 4(3): 279-287.
- Nwilo, P.C. & Badejo O. T. (2011). Impacts of Oil Spills along the Nigerian Coast. *The Association for Environmental Health and Sciences*, 2011. https://en.wikipedia.org/wiki/Environmental_issues_in_the_Niger_Delta.
- Okon, O. (2017). "Bioaccumulation of Heavy Metals in Cucurbita maxima Duch. and Telfairia occidentalis Hook. F. Grown on Crude Oil Polluted Soil Citation". *American Journal of Agricultural Science*. 4: 88–93.
- Omajemite, B.U. (2011). The economic dimensions of the Niger Delta ethnic conflicts. *African Research Review*, 5(5): 46-55.
- Raji, A.O. & Abejide, T.S. (2013). An assessment of environmental problems associated with oil pollution and gas flaring in the Niger Delta region Nigeria, C.1960s-2000. *Arabian Journal of Business and Management Review*, 3(3): 48-62.
- Salu A. (1999). Water Pollution in Nigeria and its Effect on Marine Environment. *Securing Environmental Protection in the Nigerian Oil Industry MPJFIL* (3)(2);337. <https://www.researchgate.net> > Home > Asteraceae > Niger.
- Simire, M. (2012). "Oil wealth and worrisome environmental challenges in Niger Delta". *EnviroNews Nigeria* -. Retrieved 2022-0-23.
- Wout B. (2015). "Crisis-induced learning and issue politicization in the EU". *Public Administration*. 94 (2): 381–398. doi:10.1111/padm.12170.