

Research Article

Environmental and Health Influences of Crude Oil Spills in Niger Delta, Nigeria: Case Study Oporoma Community

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Abstract

Oil spills have been reported over several decades in many parts of the world including Nigeria. The region of Niger Delta is greatly affected by oil spills in recent years, Oporoma inclusive. About 635 persons (both females and males) from different groups e.g farmers, fisher men and women, community representatives, and youth leaders, were interviewed between the age of 18 and 90 years old. About 25 persons representing farmers and 25 persons representing fisher men and women from each of the twelve compounds that made up Oporoma community, 25 persons were randomly selected for community representatives, and 10 youth leaders were interviewed. The interview focused mainly on health and environmental impacts of crude oil spills in the community. The data and responses gotten from the interview shows negative health and environmental impact on crude oil spill in the community. The presence of crude oil and their constituents in the environment are capable of causing some acute and long-term adverse health effects. Some carcinogens like pyrene, benzene, and polycyclic aromatic hydrocarbons are always found in crude oil, which contaminates the surface water and soil. Therefore, affecting the environment through soil, water, and air, which directly or indirectly harms humans, plants and marine ecosystem. The influence of crude oil spills not only restricted to environment and human health, it has also had impacts on the nations and the local economy, which are includes; livelihoods, farmland, fishing, wild life, and the nations revenue.

Keywords

Oil Spills, Health, Environment, Ecosystem, Impact

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1. Introduction

Crude oil exploration has played a dominant role in the Nigerian economy, from generation of foreign exchange to serving as a source of energy to run the nation's economy. Industries and refineries cannot function efficiently without the means of conveyance of crude oil as well as the refined products to their desired destination without pipelines. By-products from crude oil that makes life easy for man would not have been possible if crude oil was not discovered and exploited. These has shown that crude oil has been a blessing to man and the nation as a whole. The process of modern technology in the exploration, transportation, production, processing, and storage of this God-given resources has resulted in the abuse of man's environment directly or indirectly [1]. The farm lands and water bodies are polluted, leading to the destruction of useful aquatic lives. Different types of diseases have been experienced due to crude oil pollution on lands, water, and air. There are reports on community disturbances by youth in the oil producing communities in the Niger Delta area, who feel cheated by these oil companies harvesting gold in their land and leaving nothing in return [1]. Enormous amounts of money are lost daily by the companies and government due to shut down in oil production. Some of the oil company staffs have lost their lives to irate youths, who want to enjoy from the boom and not to be left in the doom. The militants from Niger Delta, during their violent operations on pipelines, they use dynamites and hacksaw to disrupt crude oil pipelines in order to drain off refined or unrefined petroleum products for financial gains [2]. This leaves the pipeline contents to spill and pollute the environment also amounting to huge costs of pipeline repairs. The spilled products cause destruction to the ecosystem and causing huge costs of cleaning up the environment [2]. All these problems of pollution, fertility loss, rampant spread of diseases, loss of aquatic lives, killings, money loss, fire outbreaks, shut down in the oil production and community disturbances are traced to crude oil spillage [1].

The environment is a main determining factor of health. Human health is influenced by many ways, through physical exposure, biological and chemical risk factors. Because of permanent interaction between human and environment, our health is significant to determine by environmental quality. The World Health Organization (WHO) describes health as a state of whole mental, physical and social wellbeing [3]. Oil is composed of both volatile chemicals that quickly escape into the air, and denser chemicals that are made of chains of carbons. Some of the volatile chemicals are associated with increased cancer risk. The quality of environment affects humans, influencing his actions while humans' actions and inactions influence his environment [4]. The most common and important environmental problem in Niger Delta is gas and oil exploration and exploitation, which has made most of the environment to be polluted [5]. This study focused on the influence of crude oil spillage on human health and envi-

ronment of Niger Delta, especially on Oporoma community.

2. Problem Statement

Oil spill has become a major menace to the environment in Niger Delta. If not efficiently managed, it could lead to total destruction of the ecosystem, Oporoma community inclusive. Crude oil spills have become prevalent in the Niger Delta, as population get increases, life becomes more unbearable due to the high impact of crude oil spills on human health and the environment. Crude oil spill also has an adverse effect on the marine lives, by consuming these contaminated seafood, drinking contaminated water and farm produce, it causes different kinds of strange illness on the people. Farmlands, rivers, creeks, and leaks are destroyed, which has also cause major drawback in their farming and fishing business.

3. Objectives of the Research

The primary object is to examine the impact of crude oil spill on human health and the environment of Oporoma community, while the specific objectives include;

- 1) To examine the impact of crude oil spill on human health and the environment.
- 2) To find out the primary reasons behind strange illness and frequent death occurrences in the community.
- 3) Recommend possible solutions to lessen the harmful effect of crude oil spill on human health and the environment of Oporoma community.

4. Statement of Hypothesis

The issue of impact of crude oil on human health and the environment cannot be easily solved permanently.

5. Oil Spillage

Oil spillage is the bane of environmental degradation in the Niger Delta. Oil spill is the leakage of crude oil or oil distilled products (e.g. gas, diesel or kerosene, oil fluids etc.) that lead to pollution on land, air and water environment [6].

Oil spillage is also defined as the pollution of land and water because of leakage of oil as a result of human error or accident. It can occur during extraction and drilling of the earth's crust, the breakage of pipelines, transportation, and during transfer process into oil containers. A report says, approximately 706 gallons of oil leaks into the ocean yearly, which jeopardizing the aquatic lives and poisoning the environment. This is mainly caused by human activities, and it has caused severe environmental degradation that calls for concern [7].

Factors that Contributes to Oil Spill in Nigeria:

The major cause of oil spill is human activities, either by accident, error or deliberate effort. The following are some of the sources of crude oil spill in Nigeria;

- 1) **Vandalization:** Vandalization of oil pipelines by local militants has contributed significantly to oil spills. The history of vandalization could be outlined to the grievances and frustration of the people of the region owing to the fact that the huge revenue generated from oil exploitation has not been of benefit to them. Nigeria is the seventh largest producer of petroleum and it generates 70 percent of the nation's income. Considering how crucial oil is to the Nigerian people, it is rather pitiful to see its extraction has brought nothing but poverty, underdevelopment, environmental degradation and poor infrastructure to the people of Niger Delta. Vandalization and sabotage have been carried out for about two decades by some prominent militant groups acting as local actors in the tussle for the oil wealthy states. Some of these groups include; Movement for the Emancipation of the Niger Delta (MEND), and Niger Delta Avengers, and amongst others [8].
- 2) **Oil Bunkering:** This refers to the loading of petroleum products by licensed operators in storage systems such as ships and containers. However, in the Delta region, the word has come to mean an illegal act. Stealing of crude oil has become rampant with ships filling oil and transporting it through illegal channels or even bypassing oil pipelines. It accounts for perhaps 10 percent of Nigeria's daily production and is an unauthorized yet highly organized operation [9].
- 3) **Corrosion Due to Aging Pipes:** There are 3 major types of petroleum pipeline systems; refined products pipelines, crude oil pipeline, and gathering system. Pipelines are a major conveyance for crude oil, hence the integrity of pipelines must be high. A water analysis carried out on creek water produced from failed Niger Delta pipelines revealed a high concentration of chloride and also the presence of sulphate-reducing bacteria on interior parts of pipes can lead to corrosion that causes perforation and eventually leakage [10]. In a report released by Shell Petroleum Development Company (SPDC) in 1995 and 2004, they inadvertently revealed that nearly 50 percent of incidents of oil spill came from the flow lines.
- 4) **Oil Blowouts:** Oil blowouts from fuel tankers are caused by unrestrained discharge of crude oil or natural gas after pressure control systems have failed. Lack of appropriate equipment and monitoring while drilling can bring about a change in pressure when combustible hydrocarbon to flow at unchecked levels that can ignite large fires, leading to oil blowouts [11].
- 5) **Disposal of Used Oil:** Used oil is disposed into the sea or drainage systems which contaminates the water bodies [12]. The washing of oil transporters at the high seas

when not properly done can release petrochemicals and deposited sediments that cause pollution to marine life and contaminate water.

5.1. Incidents of Crude Oil Spill in Nigeria

Occurrences oil spill has happened in different parts of Nigeria, at different periods in the coast of Niger Delta area. Most of the crude oil spills that occurs in the region is assumed to be minor spills, and serious attention is not given to it. According to National Oil Spill Detection and Response Agency (NOSDRA), a government run satellite tracker, between January 2019, and April 2021, about twelve states in Nigeria documented 881 circumstances of oil spillage [13]. About 77% of the spills occurred in only 3 oil producing states; Rivers, Bayelsa, and Delta. These 3 states are amongst Nigeria's main oil producers for that period. Rivers State had 352 spills, Bayelsa was third with 89, and Delta State had 233 cases. These 3 states recorded a total of 674 oil spills cases out of the total number of 881 cases in the region at that period [13].

There are some major crude oil spills that occurred in the Niger Delta that are recorded includes; the GOCON's Escravos spill in 1978 of roughly 300,000 barrels (bbl), SPDC's Forcados Terminal tank failure in 1978 of roughly 580,000 bbl, and Texaco Funiwa-5 blowout in 1980 of about 400,000 bbl, Abudu pipe line in 1982 of about 18,818 bbl, Jesse fire incident which claimed about a thousand lives and the Idoho oil spill of January 1998, of roughly 40,000 bbl. The most broadcasted oil spills in Nigeria happened in January 17, 1980, about 37.0 million litres (mml) of crude oil leaked into the environment. This transpired because of a blow-out at Funiwa-5 offshore station that estimated about 200,000 bbl of oil (8.4 million US gallons) leaked into the Atlantic Ocean, and it contaminated about 340 hectares of mangrove [12]. According to the Department of Petroleum Resources (DPR), from 1976 to 1996, the sum of 4647 cases of oil spill occasioned and approximately 2,369,470 bbl of oil leaks into the environment. Out of this quantity, an estimated 1,820,410.5 bbl (77%) were lost to the environment. A total of 549,060 bbl of oil representing 23.17% of the total oil spilt into the environment was recovered. The heaviest recorded spill so far occurred in 1979 and 1980 with a net volume of 694,117.13 barrels and 600,511.02 bbl respectively.

5.2. Effect of Crude Oil Spill on Human Health

The effect of oil spills on humans may be due to direct and indirect contact with the spill. The main effects of oil spill on humans include a variety of health effects;

- 1) **Direct exposure to oil spill:** Somebody can be exposed to the substances in crude oil either by touching, breathing, or swallowing them. Many studies have shown proof of poisonous effects mainly neurological, ocular and respiratory of persons living in communities that are ex-

posed to crude oil, and those doing clean-up [14]. Ingestion and inhalation of the constituents of the spilled oil have serious and lasting health consequences. Exposure to these constituents in the two-year-old child could turn into a serious renal failure [15], hepatotoxicity [16], and herm toxicity [17].

- 2) Indirect Exposure to Oil Spill: Indirect exposure to oil and their constituents through consumption of contaminated food and water especially in the consumption of fish and other sea foods. This is because some compo-

nents of oil have ability to bioaccumulate in these organisms [18]. Consumption of such polluted animals is exposing oneself to higher concentrations of oil components. ATSDR, [19], reported that high exposure results to fatigue, headache, transient nausea, possible vomiting, self-limiting diarrhea and drowsiness. Prolong exposure may damage the nervous system such as peripheral neuropathy. Table 1 shows some petroleum products and their effects.

Table 1. Petroleum Products and Their Effects [18].

Petroleum Product	Source	Effects
Benzene	Crude oil, Coal, Natural gas	1) Carcinogenic 2) Causes leukaemia, breast and urinary tract cancer. 3) It reduces red and white blood cell production in bone marrow. 4) Decreases function of T-cell and B-cells. 5) Causes chromosome aberration.
Sulfur Dioxide	Crude oil, Coal, Natural gas	1) Causes lung cancer and other pulmonary diseases. 2) Causes asthma and heart diseases.
Formaldehyde	Natural gas	1) Carcinogenic 2) Causes leukaemia and nasopharyngeal cancer. 3) Causes genotoxicity and infertility.
Polycyclic Aromatic Hydrocarbons (PAH)	Oil and Coal	Damage lungs leading to chronic lung diseases
Hydrofluoric Acid	Oil and gas	Damage lungs leading to chronic lung diseases.

5.3. Effect of Oil Spill on Environment

Oil spills have contaminated the environment of Niger Delta e.g, air, water and soil. There are 2 major kinds of oil, light oil and heavy oil. Fuel oil such as gasoline and diesel are light oil and it is volatile in nature, they can evaporate quickly into the environment [18]. Heavy oils stick in the environment for longer time (months or even years). These 2 kinds of oil behave differently in the environment. Light oils can kill animals and plants faster, and they also very toxic to humans who breathe their fumes or get contact on their skin. While heavy oils are significantly less toxic than light oils. It has long-term impact with some chronic health effects like tumors in some organisms. Majority of birds that are affected by oil spills die from complications without human intervention [20]. Hairy aquatic creatures that are exposed to oil spills are affected in numerous ways, the oil penetrates into the hair of the animals and it reduce the insulation and leading to fluctuations on body temperature and hypothermia. The spill oil reduces the oxygen content in both terrestrial and aquatic

environment, thereby limiting the amount of oxygen available to living organism, hence resulting to the death of organism [21]. The death of these organisms reduces their population size, which in turn affects the food chain. The implication is food shortage and then starvation, and maybe malnutrition [21].

5.4. Economic Implications of Oil Spillage

Nigeria happened to be one of the major producer of crude oil in African Continent. Crude oil, the main source of energy was first discovered in commercial capacity in Oloibiri community in present Bayelsa State, Niger Delta Region, Nigeria in 1958 by Shell. Since from that moment, oil exploitation has continued in Nigeria especially in the Niger Delta. Therefore, oil industry became a back bone for the Nigerian economy because oil contributing about 95% for export earnings, and about 80% of the nation's Gross Domestic Product (GDP) [18]. Though this sector has an important role for the Nigerian economy, but due to oil spills, it has also become a challenge for the economy itself. By tradi-

tion, the people of Niger delta depends majorly on farming and fishing for their lively-hood, but due to crude oil spills, it has affected their local economy. Therefore, the poverty rates in this region has increase rapidly. Oil spill has also created shortages of food in Niger Delta region, because oil spill has destroyed many wild life, fisheries, and farm lands [18].

Ogbogbo, [22], stated that the effects of oil spill in the Niger Delta have enormous effects on the ecosystem. Thus, making the coastal land and other vegetation incompatible for agricultural production and fishing, and therefore, the livelihood of the people of the region is threatened. Oil facilities such as pipelines are laid beneath the earth across oil producing communities where such lands are used for agricultural purpose. Crude oil spills can occur through pipeline damage by vandals, poor maintenance culture, and illegal refining of crude oil may even result to explosion and fire outbreak. During rain, spills are washed into rivers, streams, lakes, creeks, and ocean, thereby causing pollution on them. Crude oil spills also affect the water quality and creates imbalance in the ecosystem [23], which reduces the standard of living, causing unemployment, and economic deterioration [24].

6. Gas Flaring

The Energetic Solution Conference (2004), estimates that the Niger Delta area has about 123 gas flaring sites. Adati, [25], also stated that about 45.8 billion kilo watts of heat is discharged into the atmosphere from 1.8 billion cubic feet of gas every day in the Niger Delta, leading to temperatures that render large areas inhabitable. Complete utilization of produced associated gas, reduction of flaring and production greenhouse gas is one of the policies that oil companies are expected to comply, with the stoppage of gas flaring completely by 2004 or 2008. Still 84.60% of total gas produced is still flared, 14.86% only is being used locally [26]. From 1970 - 1986 in Niger Delta, approximately 125.5 cubic meters of gas was produced, 102.3 (81.7%) million cubic meters (MCM) was flared, 2.6 MCM was used as fuel by the oil producing companies, and about 14.6 MCM domestically consumed [27, 25]. Acid rain is another problem in the Niger Delta caused by gas flaring which has led to loss in biodiversity, with forest and economic crops being destroyed. The dominance, the grasslands and vegetation in some parts of the region is indication of loss of natural forest, this may be due to acid rain but other factors maybe the cause such as agricultural activities and the exploration and exploitation of oil companies [28, 29]. The concentration of the acid in rain water appears to be higher in the Niger Delta and decreases further away from the region [28].

7. Methodology

Data's were collected in two different ways; the primary

data's were obtained by engaging participants in one on one interview bases in the Oporoma community. They were requested to offer free information on their health, families, and the environment on how crude oil spill has affected their lives, community and its environment. The secondary data were obtained through desk review of existing literatures online on crude spill in Niger Delta, crude oil spill trend, and impact of crude oil spill on human health and the environment. This research was conducted in Oporoma community, SILGA, Bayelsa State. About 635 persons (both males and females, names not mentioned) from different groups e.g farmers, fisher men and women, community representatives, and youth leaders, were interviewed between the age of 18 and 90 years old. About 25 persons representing farmers, and 25 persons representing fisher men and women from each of the twelve compounds that made up Oporoma community, 25 persons were randomly selected for community representatives, and 10 youth leaders were interviewed. Their responses to the interview on impact of crude oil spill on human health, and its environment were evaluated. The justification for this study is to establish a trustworthiness of the findings on the impact of crude oil spill in Oporoma communities.

7.1. The Study Area

The Niger Delta Region

The Niger Delta occupies a land mark of about 70,000 km² (27,000 square meter) and 7.5% of Nigeria's territory mass. Typically, it includes the present Delta, Bayelsa, and Rivers States of today [30]. In the year 2000, the region's Abia, Edo, Ondo, Akwa-Ibom, Cross River, and Imo States were included by Obasanjo's administration making it to nine states [30]. Figure 1 is showing the nine states that make up the Niger Delta region. Nearly 31 million individuals representing more than 40 diverse ethnic groups, including the Bini, Ijaw, Efik, Esan, Yoruba, Ibibio, Igbo, Annang, Oron, Ikwerre, Abua/Odual, Ogba, Urhobo, Itsekiri, Isoko, Ukwuani, Kalabari, Ogoni, Epie-Atissa, Kalabari, Okrika, Obolo, and Epie-Atissa people are among the occupants of the political Niger Delta, with over 250 unique vernaculars [30]. The nine states that constitute the Niger Delta is shown in Figure 1, with more than 37 million residents, or 22% of Nigeria's total [31]. Over 1500 towns that serve as hosts for the oil industry [32]. The area is primarily made up of rural villages, but includes some important Nigerian towns such as Port Harcourt, Warri, Yenagoa, Calabar, and Akwa-Ibom. The majority of locals depend on fishing and agriculture to exist, and they typically live below the poverty level [33]. The oil wealth that has made Nigeria the greatest producer of petroleum in Africa, and the sixth greatest oil producer in the globe is found in the Niger Delta [34]. Oil spills are frequent in the region and have been associated with infrastructure decay, refinery processing spills, pipeline corrosion, and inadequate maintenance, human error, and vandalism committed on purpose or oil theft [35]. According to the United

Nations Development Programme, [33], there were roughly 6800 oil spills totaling 3,000,000 bbl between 1976 and 2001. Likewise, according to reports, in the earliest part of 2008, there were 419 cases, 2007 had 588 oil spills [36]. SPDC 2014 reported that, between 2007 and 2013, its facilities

leaked roughly 324,000 bbl of crude oil in about 1500 incidents. According to SPDC, of the overall amount of oil that spilled from SPDC installations in 2013, about 75% is due to sabotage/theft, and 15% due to operational spills resulting from corrosion, equipment failure, or human error.



Figure 1. The Nine States that Made up of Niger Delta Region [37].

Chukwuma *et al.*, [38], collected soil samples from 3 different sites using soil auger to investigate zinc availability in designated soil properties in a crude oil contaminated Eutric Tropofluent in Egbema, South-eastern Nigeria. The outcome showed that zinc distribution is more common in an oil polluted site than non-oil impacted sites and its distribution depends on certain soil properties including clay contents, pH, and organic matter contents.

Edwin and Nkang, [39], studied the physicochemical properties of soil by changing amounts of crude oil contamination in Qua-Ibo, Brass River and Bonny area of Niger Delta region. The results showed an increase in the values of some selected physico-chemical properties of the soil with increase in both absorption and adsorption period, concentration of the level of hydrocarbon of different crude samples, as well as the volumes of crude oil used during sorption process.

Akpan and Nwadinigwe, [40], studied on clay polluted with crude revealed a decline on some of its geotechnical properties, such as specific gravity, density index, consistency limits, particle size analysis, compaction, consolidation, permeability and shear strength. This apparent reduction in strength, stiffness and permeability of the clay was partly due to formation of open structure emanating from crude oil contamination. The insidious nature of oil spills in the Niger Delta has deleterious effects on the physical, biological and chemical properties of the soil which negatively affect the growth of farm produce and causes food shortages due to reduction of nutrient contents of the soil [40].

7.2. The Case Study Oporoma Community

The head quarter of Southern Ijaw Local Government Area (SILGA), is located at Oporoma community, and it's known as one of the places that has population in Bayelsa State, Niger Delta region, Nigeria [41]. Figure 2 is showing the 8 local government headquarters that make up Bayelsa State. Oporoma community is situated in an altitude 215 meters higher than the sea level. Its coordinated at 4°48'17" N and 6°4'44" E in Degrees Minutes Seconds (DMS), or 4.80472 and 6.07889 (in decimal degrees). The environment has a shoreline of roughly 60 km on the Inlet of Benin [42]. Oporoma is a significant oil producing community in the region of Niger Delta, in which SPDC is the major operator of oil exploration activities in the area [43]. It is occupied by Ijaw ethnic group. Oporoma community have twelve compounds; Obabiri, Adegbe polo, Opubiri, Kupolo, Ogumoipolo, Korobiri, Agibebiri, Ogboinama, Ogboinbiri, Koliama, Alama, and Osokama. Oil production and gas flaring take place at Shell facility known as Nun River Flow Station since 1965 [41]. Oporoma community have about 24 onshore oil wells owned by SPDC within their land, and several crude oil pipeline that passes in their land that is owned by Nigeria Agip Oil Company (NAOC). The major occupation of the people of Oporoma are farming, fishing, and hunting. The natives that live in Oporoma community have very few conventional and legal employment opportunities. About 90% of the natives living in the community are jobless.

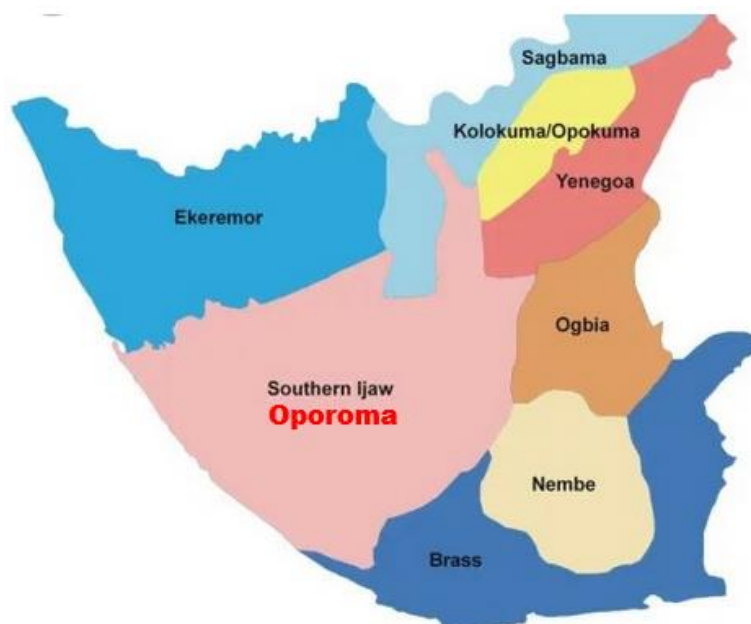


Figure 2. Bayelsa State Map Showing all the Local Government Headquarters including Oporoma.

8. Discussions

All the information collected in this study from the farmers, fisher men and women, community representatives, and youth leaders, will enable the oil and gas industries to improve on their strategies of operations. The findings from the study show significant influence of oil spills on their health, environment, and the entire sources of livelihood structure.

Health Influence of Crude Oil Spills in Oporoma Community: Crude oil exposure causes numerous and significant health issues for children, pregnant women, and adults. Exposure occurs through inhalation, ingestion (of liquid droplets in the air), and direct skin contact. Some of the health effects will be long-term diseases and may last for a lifetime, and it can even affect the future generations [44]. Crude oil has benzene, that is recognized as carcinogen. There are several health impacts associated with breathing crude oil vapors, including headaches, nose irritation, dizziness, sleepiness, throat, fatigue, nausea, labored breathing, lungs, chemical pneumonia, as well as coordination problems. Chronic exposure can result in irregular heartbeats, convulsions, and coma [44]. According to UNEP report, water that is contaminated with BTEX (Benzene, Toluene, Ethylbenzene, and Xylene), and PAHS (Polycyclic Aromatic Hydrocarbons) is not fit to drink, because benzene is an agent known to cause cancer in humans. The people of Oporoma community complained about health issues including, breathing problems, skin diseases, headaches, dizziness, and sleepiness, people dying frequently.

The common man in the village rely on the creeks, leaks, and river for drinking, cooking, and to do every domestic work, and the water was severely polluted with the crude oil. Not everybody can afford to buy sachet water to drink, so

some people still drink from the crude oil polluted water source, its putting the lives of such people in real danger. Some people fall ill shortly after drinking such water, especially children and pregnant women, and they started experiencing frequent deaths in the community. The people also believed that some strange sicknesses and diseases they are experiencing are due to the crude oil spill e.g cancer, birth defects, diabetes, hypertension, respiratory problems, kidney diseases, headache, dizziness, sleepiness, lungs, nose, throat irritation, fatigue, nausea, laboured breathing and cardiovascular diseases as well as loss of coordination, especially children and the pregnant mothers. The water, air, and land is constantly mixed with oil spills. This is not healthy for humans, fishes and other sea/river creatures.

Environmental Influence of Crude Oil Spills in Oporoma Community: Crude oil spills have occurred in several cases in Oporoma, which often spread out over a wide area, destroying crops and aquacultures through contamination of the groundwater, soils, rivers, creeks, and leaks. Some of the undesirable environmental influence on the people of Oporoma community includes; damages to farmlands, swamps surface and ground waters, animal diversities, and vegetation. Crude oil spill has destroyed most of their farmlands and the water bodies, which has led to habitat loss, decreasing arable land for cultivation, and it has affected their fishing business so much. Oil spill that occurs sometime in 2018, caused by vandals in one of the oil pipelines owned by Agip in Oporoma community, cleanup was down, but even as of today in 2023, there are still some evidence of crude oil floating in the swamp water of that environment. Fishing activities cannot take place in the whole of that area. Some of the interviewed persons said, during that period of Agip pipeline spill incident, some people were coming back home

from farm, and they were trapped in the bush, because there was a fire outbreak, what caused the fire was not known. Thank God, no live was lost in that fire incident.

The farmers and those into fishing business said, fishing, farming, and hunting is our main occupations in this community. They were really sad because after planting the crops, and with full expectations to get a good harvest, they were denied of their harvest because of crude oil spill, which kills all the crops, e.g coco yam, okro, sugarcane, yam, plantain, and some other vegetables. They also said, when there was a fire outbreak in one of the crude oil spill site, farm lands with crops and trees (small and big) were burnt down. The rivulets and creeks were seriously affected by the crude oil slick, and their banks showed signs of the effects of fire.

The community representatives said, there is a general impact of the oil spill and fire, but some of them are more affected, because their farm lands and fishing nets were also burnt or damaged by the crude oil slick on the creeks and rivulets. All expenses, sweet, energy, time, labour, money spent on hiring people during planting season, and robust hope of harvest are gone like that. The entire family have to go through starvation in this period. Therefore, their fishing business is being rendered useless, and their farm land has also been badly polluted, that it is no longer suitable for agriculture.

The youth leaders said, Agip told them when they were laying the pipeline (the OB/OB-Ogboinbiri 24 inches pipe), that the pipeline is to transport gas to their terminals in order to stop gas flaring. But when vandals tempered with the so called gas pipeline, what comes out was crude oil, not the gas they talked about. They were transporting crude oil in the name of gas. The pipeline construction commenced 2005, and was handled by Daewoo oil servicing company, and the job was completed in 2008. Figures 3-10 shows some impact of crude oil spills on land and water bodies in Oporoma community.



Figure 3. Crude oil spills polluted fishing lake.



Figure 4. Crude oil spills polluted stream.



Figure 5. Crude oil spills killed fishes.



Figure 6. Fisher men carrying out their fishing business in a crude oil contaminated river.



Figure 7. Crude oil spills destroyed plantain farm land.



Figure 8. Crude oil spills destroyed cassava farm land.



Figure 9. Children bathing on crude oil spills contaminated river.



Figure 10. A child drinking from crude oil spills contaminated water.

Figures 3-10: Some Impacts of Crude Oil Spills both on Land and Water Bodies in Oporoma Community.

Impact on Gas Flares

Gas flaring actually have dangerous impact on the livelihood and health of the people of Oporoma community, as it releases poisonous chemicals into the environment, including; nitrogen, sulphur dioxide, volatile organic compounds e.g benzene, toluene, xylene, hydrogen sulphide, and carcinogens e.g benzopyrene and dioxins. Exposure to these substances can lead to respiratory problems. These chemicals can magnify asthma, cause breathing difficulties and pain, as well as chronic bronchitis. Benzene, known to be emitted from gas flares in undocumented quantities, is well recognized as it causes leukemia and other blood related diseases. A research carried out by Climate Justice, reveals that exposure to benzene can lead to eight new cases of cancer annually in Bayelsa State only (Gas flaring in Nigeria).



Figure 11. Air pollution from gas flaring.

The people of Oporoma community complained that they are experiencing different kinds of strange sickness and diseases. The long-time gas flaring has affected their fishing business, and their farm lands has also been badly polluted. The indigence also complained that gas flaring has contributed to acid rain, and that the rain has cause corrosion on their building roofs, and they do drinks from that same rain water during rainy session. Those that have farm lands around the SPDC flow station also complain about the roaring noise and the intense heat from the flares, that they live and work alongside with no protection. The roaring noise and the intense heat from the

flares has also driven away the animals they normally hunt in the bus. They believed that most cases of respiratory problems they are facing, such as asthma, breathing problems, lung disease, heart attack, miscarriage, and skin disease they are facing are because of dinking contaminated water, and exposure to heat from oil exploration related activities. **Figure 11** shows gas flaring activities in Oporoma community.

Recommendations for Possible Solutions to Restrain Crude Oil Spill Impact on the People of Oporoma Community:

The following recommendations will practically curtail the influence of crude oil spill disasters in the community and its connected influences.

- 1) Youth empowerment programmes should be carried out through vocational training.
- 2) Incorporate the indigents of Oporoma community into the SPDC employment structure.
- 3) Government and the oil companies should carry out proper clean-up on the degraded sites.
- 4) The oil companies that operate in the land should pay monthly allowance for aged people within the community.
- 5) Infrastructural compensations such as; centres for youth training and development, good roads, 24 hours electricity supply, and good hospitals for healthcare services.
- 6) Youth participations in decision making and community involvement in the oil exploration services.

9. Conclusions

Crude oil has been the main source of energy all over the world. Crude oil spill is the major issue in almost all the oil producing countries, including Nigeria. It affects both the nation and local economy. Majority of the crude oil spills in Niger Delta are caused by humans. Oporoma community has faced great negative impact from crude oil spills and gas flaring. Crude oil spill has destroyed most of their farmlands and the water bodies, which has led to habitat loss, decreasing arable land for cultivation, and it has affected their fishing business too. The common man in the village rely on the water from the creeks, leaks, and river for drinking, cooking, and to do every domestic work, and the water is severely polluted with the crude oil. Not everybody can afford to buy even sachet water to drink, so some people still drink from the crude oil contaminated water source, and its putting the lives of such people in real danger. Some people fall ill shortly after drinking such water, especially children and pregnant women, and they started experiencing frequent deaths in the community. The people also believed that some strange sicknesses and diseases they are experiencing are due to the crude oil spill e.g cancer, birth defects, diabetes, hypertension, respiratory problems, kidney diseases, headache, dizziness, sleepiness, lungs, nose, throat irritation, fatigue, nausea, laboured breathing, and cardiovascular diseases as well as loss of coordination, especially children and the pregnant mothers. Some recommendations for possible solutions have been made to curtail the impacts of crude oil spill disasters in the

community and its connected influences if adopted.

Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
bbl	Barrels
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
DMS	Degrees Minutes Seconds
DPR	Department of Petroleum Resources
GDP	Gross Domestic Product
MCM	Million Cubic Meters
MEND	Movement for the Emancipation of the Niger Delta
mml	Million Litres
NAOC	Nigeria Agip Oil Company
NOSDRA	National Oil Spill Detection and Response Agency
PAH	Polycyclic Aromatic Hydrocarbons
SILGA	Southern Ijaw Local Government Area
SPDC	Shell Petroleum Development Company
UNEP	United Nations Environment Programme
WHO	World Health Organization

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Author Contributions

Ozogu A. N., Chukwurah N. C., and Olabimtan O. H., designed the research work and methodology. Ozogu A. N., Modebe L. U., and Daniel S. D., collected most of the data's (primary and secondary) needed for this research. Ozogu A. N. and Olabimtan O. H., wrote majority of the manuscript. All authors participated in the discussion of results, writing and proof reading of this research article. All authors have given their consent for the publication of this manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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