



CRUDE OIL POLLUTION AND HEALTH CHALLENGES OF THE OGO NI PEOPLE, NIGER DELTA, NIGERIA

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Crude Oil pollution has debilitating effect on the air quality within and around the environment surrounding the area under study. The extent of crude oil pollution on the air, aquatic organisms, crop productivity and human health and the strategies for coping with the negative impact of crude oil pollution were investigated in Ogoni land in Niger Delta of Nigeria. The population of the sample size is 1000. In carrying out this study, questionnaires were used for collection of data. Simple percentage and weighted mean statistics were employed to analyse the data collected, while chi-square was used for testing the hypotheses. Crude oil pollution has significant effect on devastating air quality of the environment, which consequently affects crop production, marine lives and health of humans. It is important to state that there are measures available to avert this plague. Government has significant roles in implementation of environmental laws to combat crude oil pollution. Crude oil pollution has a negative impact/effects in Ogoni land and environ of the Niger Delta, thereby resulting to a high rate of environmental pollution and negative effects on the air, crop productivity, aquatic organisms and on the health of humans inhabiting the communities.

Keywords: Crude Oil pollution, human health challenges, aquatic organisms, Ogoni land, air pollution

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Introduction

The Ogoni people (also known as Ogonis) are people in the Southern Senatorial district in Rivers State, Niger Delta of Nigeria. Over two million people live in a 1,050- square kilometre (404-square mile) home land which they also call Ogoni, or Ogoniland. They share similar oil-related environmental menace with the Ijaw people of Niger Delta. The Ogonis rose to international attention after a huge public protest campaign against Shell Oil, led by the movement for the survival of the Ogoni people (MOSOP) (Andrews, 2015). The Ogoni people are said to have been victims of human rights violation for several years.

In 1956, Royal Dutch in collaboration with the British government found a commercially viable oil field in Ogoni and in other parts of the Niger Delta region and began oil production in 1958 (Kadafa, 2006). Exploitation and production of crude oil persisted in Ogoni land up till 1993 when the people rose up in opposition with protests and agitation due to massive environmental pollution of the land and water bodies, thus endangering the health of the people (Bodo and David, 2018).

Crude oil is composed of between 50% and 97% hydrocarbons, and between 6% and 10% of oil is composed of nitrogen, oxygen, and sulphur. Less than 1% is made up of metals such as copper, nickel, vanadium, and iron. It is referred to as fossil fuel because of its origins. It was created 400 million years ago when the remains of prehistoric algae and plankton fell into the bottom of the ocean. It combined with mud and then was covered by layers of sediment. The intense pressure heated the remains over millions of years. It first became a waxy substance called

kerogen. It became liquid oil after more pressure and heat. Specifically Crude oil is composed of Benzene, butane, n-hexane, isopentane, pentane, and standard solvent. Benzene is a verified human carcinogen and is identified by NTP, OSHA and IARC as a Group 1 carcinogen. Chronic inhalation of minute levels of benzene leads to leukaemia and other types of cancers (Nriagu et al 2016).

Between 1976 and 1991, over two million barrels of oil polluted Ogoniland in 2,976 separate oil spills. While oil production has stopped, pipelines operated by Shell still traverse the land, creeks and waterways (Odisu, 2015). Leakages-caused by corroded pipelines as well as bandits mean that the area is still bedevilled by oil spills. It is a painful example of corporate impunity that even when the tireless work of communities, individuals and campaigners achieves some appearance of justice, it is rarely seen through (Bodo and David, 2019).

The people of Ogoni have really passed through some terrible situations. I am an eye witness to the oil pipelines passing through some of their compounds which is dangerous in terms of hazards of fire incidences which are common with petroleum products. Many renowned indigenes of Ogoni have lost their lives in the struggle to keep their environment within the environmental safe limit. They include; Ken Saro-wiwa, founder of the Movement for the survival of the Ogoni people (MOSOP) in 1990 (Saro-Wiwa, 1990). Eight other leaders who worked alongside with him. Saturday Dobe, Nordu, Daniel Gbooko etc. It is generally noted that Justice has clearly not been served in the Niger Delta Region.

Figure 1.1: Crude leakage



CRUDE LEAKAGE

SOURCE: Royalty free stock photos

A survey of the literature showed that limited data are currently available on the management of crude oil pollution in Ogoni land of the Niger Delta. The objectives of this study were; to determine the extent of air pollution as it affects crop productivity, aquatic lives and human health, with a view to providing information on alternative measures to avert the dangers of crude oil pollution.

Materials and Methods

Study Location

The study was carried out in Ogoni land, Niger Delta, Nigeria, from December 2020 to May 2021. The Rivers State map below indicate where Ogoni land is located. The Ogoni people are among the several ethnic minorities in Rivers State, Nigeria, that occupies a territory of approximately 404 square miles, which forms the part of the Eastern Niger Delta, between the Imo River on the East and North. The area lies between latitudes $4^{\circ}.05^1$ and $4^{\circ}.20^1$ North and Longitudes $7^{\circ}.10^1$ and $7^{\circ}.30^1$ East.



The Ogoni land is home to several oil producing communities. It is a source of on-shore crude oil production in Rivers State. The main economic activities is food crops farming backed up by some hunting activities which are dramatically influenced by crude oil pollution.

Sampling Technique

Stratified sampling techniques was used after which random sampling was taken. However, in the case of stratified sampling techniques, Ogoni community was grouped into four units which captured all the local government areas that made up the area referred to as Ogoni land. (See Table 1 below). The researcher then used simple random sampling method to select required sample size from each stratum. The researcher preferred simple random sampling because it gave equal chance for all the local government areas to be selected in which 250 people were selected from each stratum for the study. Then a total sample size of 1000

Figure 1: MAP OF OGONI LAND

person was selected for the study to represent the entire population of the area under study.

Table 1: Distribution of target population

S/N	Target Ogoni Community	Population	Sample	Percentage %
1.	Gokana Unit	1000	250	25
2.	Khana Unit	1000	250	25
3.	Eleme Unit	1000	250	25
4.	Tai Unit	1000	250	25
	TOTAL		1000	Calculation: (250 x 100)/ 1000

Source: Field Survey, 2021

Research Instrument

Instruments majorly used for the data collection are; questionnaires and oral interview. The questionnaire was developed by the researcher to gather information from the indigenes of the community. It was prepared in objective format. However, in order to determine the degree of agreement or disagreement in each of the scaling statement in the questionnaires, values were distributed to different scaling as follows:

Strongly agreed (SA) = 5
 Agreed (A) = 4
 Disagreed (D) = 3
 Strongly disagreed = 2
 Undecided (UD) = 1

The cut-off point was calculated as follows

$$\frac{(5+4+3+2+1)}{5} = \frac{15}{5} = 3.0$$

The response whose mean score is below 3.0 is not accepted as agreed and the responses whose mean score is 3.0 and above are accepted as agreed.

Validity of the Instrument

The face and content validity of the instrument was carried out by the project supervisor and some experts in environmental science and pollution control. All errors were corrected and certified fit for the research.

Reliability of the Instrument

The questionnaires were pre-tested on a population sample similar to the target population to determine their validity and effectiveness. A test-retest method was used to ensure reliability of the instrument. (The questionnaires were administered on the respondents

and after 3 weeks, the same was re-administered and the outcome of the two administrations were calculated using simple percentage.

Data Analysis Techniques

The data were presented in a tabular form. The statistical tool used in testing and analysing the data in order to arrive at valid conclusion is the Chi-square (X^2). This can be used to test more than two population proportions. The chi square (X^2) provides means of comparing a set of observed frequencies with a set of expected frequencies.

The formula is as follows:

$$\text{Chi-square, } x^2 = \sum \frac{(O-E)^2}{E} \quad (\text{Cochran, 1952})$$

Where:

X^2 = chi-square

\sum = summation

O = Observed frequency

E = Expected frequency

Simple Percentage

$$\% = \frac{F}{N} \times 100$$

$$N = 1$$

Where:

F = Frequency

N = Numbers of respondents

% = Percentage

Weighted Mean

$$X = \frac{\sum x}{\sum f}$$

Where:

$\sum x$ = Total Scores

$\sum f$ = Total Frequencies

X = Mean Scores

*Results and Discussion***The Extent of Air Pollution Within /Around Ogoni Land****Table 2:** The extent of air pollution in Ogoni land

S/N	Responses	SA	A	D	SD	UD	No. Of Resp.	Mean Score	Remarks
1	It leads to breathing contaminated air	600	200	0	0	0	800	4.8	Accepted
2.	It produces offensive odour within and around the communities	720	150	0	0	0	870	4.8	Accepted
3.	It leads to health hazards for workers	260	530	0	0	0	790	4.3	Accepted
4.	It causes eye irritation as a result of fumes from gases	400	210	0	0	0	610	4.7	Accepted
5.	It causes dust particles to float in the air thus leading to stains on textiles and houses	500	300	0	0	100	900	4.2	Accepted
6.	It causes the loss of hectares of farmland due to fires caused by air polluted with volatile fumes	350	400	0	0	100	850	4.1	Accepted
7	It gives room to global warming	600	200	0	0	100	900	4.3	Accepted

Source: Field Survey, 2021

Table 2 above shows that out of 610-900 inhabitants in the area under study, 600 persons strongly agreed that crude oil pollution of Ogoni land leads to breathing contaminated air, 720 inhabitants strongly agreed that it causes offensive odours to the communities, 530 respondents agreed that it leads to health hazards of workers in the communities, while 400 strongly agreed that it causes irritation of the eyes as evidence of environmental pollution. However, 500 people strongly agreed to the fact that it causes dust particles to float in the air leading to stains on textiles and houses, while 400 respondents agreed that it causes the loss of hectares of farmland due to fires caused by air polluted with volatile fumes, and finally, 600 elites in the communities strongly agreed that it gives room to global warming. The various opinions

from the respondents is in line with the findings of Otu, (2018) who discovered that crude oil pollution poses high adverse environmental and health implications such as climate change, acid rain, agricultural loss, physiological effects, air pollution caused by burning of petrochemical products resulting in the destruction of zinc roof, depletion of ozone layer, decay of concrete walls foundation and economic loss". The opinion of Johnson, (2000) who found out that human beings face the hazards of fumes emitted from vehicles which uses the by-products of crude oil leading to eye irritation, plant damage, and even fatalities. These views confirmed that crude oil pollution which is from the class called hydrocarbon causes pollution to the environment.

The Impact of Crude Oil Pollution on Crops Production

Table 3: The Impact of Crude Oil Pollution on Crop Productivity

S/N	Responses	SA	A	D	SD	UD	No. of Responses	Mean score	Remarks
1	Crude oil does much damage to the land	720	150	0	0	20	890	4.7	Accepted
2	Crops planted on polluted soils are prone to suffer adverse conditions	110	800	0	0	0	910	4.1	Accepted
3	Pollution leads to environmental degradation	630	170	0	0	100	900	4.4	Accepted
4	It leads to reduced crop production.	100	640	0	0	90	830	3.8	Accepted
5	Leads to direct physical injury	820	0	0	0	50	870	4.8	Accepted
6	Superficial damage makes crop unappealing to consumers	400	450	0	0	85	935	4.4	Accepted
7	Crop damage leads to reduction in value	630	190	0	0	100	920	4.4	Accepted
8	Crude oil pollution may cause a range of subtle physiological, chemical or anatomical changes in crops	240	600	0	0	91	931	4.0	Accepted
9	Yield loss is the ultimate result	88	720	0	0	76	884	3.8	Accepted
10	Nigerian soils are rich in nutrients except in crude affected areas	360	450	90	0	0	900	4.1	Accepted

Source: Field survey 2021

The findings on the impacts of crude oil pollution on crop production, (Table 3) showed that 720 individuals strongly agreed that crude oil pollution on crop production does much damage to the land, while 800 residents of the area agreed that crops planted on polluted soils are prone to suffer adverse conditions. 630 inhabitants believed strongly that pollution leads to environmental degradation. On the fact that crude oil pollution leads to reduced crop production, it was agreed by 640 indigenes of ogoniland and a total of 820 inhabitants strongly agreed that it leads to direct physical injury to the plants while 450 dwellers agreed that superficial damage makes crops unappealing to consumers. On the observation that crop damage leads to reduction in value, 630 people were strongly in agreement whereas 600 persons agreed with all their minds that crude oil pollution may cause a range of subtle physiological, chemical or anatomical changes in crops. Also to crown it all on the problem caused by crude oil pollution, 720 unhappy inhabitants unanimously agreed that yield loss is the ultimate result of this pandemic; while 450 put their pens in

paper agreeing to this truth of Nigerian soils being richer in nutrients except in crude oil affected areas. The above findings are in line with the works of the following authors; Ekundayo, (2001) who found that growth was poor in polluted soils using parameters such as plant height, stem girth, ear height, and leaf area at four weeks after planting, leaf area at maturity and average length of primary roots as growth indicators. Okonwu et al. (2010) also discovered that the percentage of germination of maize (zea mays) decrease with increase in concentration of crude oil equilibrated with water. Ojimba, (2012) joined the other authors to say categorically that there was an increase of 0.051 units per unit of output experienced in non-polluted crop farms when farmland was doubled. Hence when amount of farmland available was doubled, there was an increase in output in non-polluted farms, and a decrease in farm output in crude oil polluted farms. He also found out that crude oil pollution on crop farms reduced crops output significantly, hence detrimental to crop production in Rivers State, Nigeria.

The Effects of Crude Oil Pollution on Aquatic Organisms

Table 4: The Effects of Crude Oil Pollution on Aquatic Organisms

S/N	Responses	SA	A	D	SD	UD	No. of Responses	Mean Score	Remarks
1	Renders water unfit for aquatic organisms to dwell	600	210	0	0	100	910	4.3	Accepted
2	Alters the ecology of aquatic habitats	400	300	0	0	100	800	4.1	Accepted
3	Alters the physiology of marine organisms	700	0	0	0	100	800	4.5	Accepted
4	It affects marsh grasses, marine worms, and other aquatic life forms	500	100	0	100	0	700	4.3	Accepted
5	Polycyclic aromatic hydrocarbons (PAH) are toxic to marine lives	500	300	0	0	0	800	4.6	Accepted
6	Affects development of marine organisms	410	350	0	0	90	850	4.2	Accepted
7	Increase susceptibility to diseases	200	600	0	0	85	885	3.9	Accepted
8	Jeopardize normal reproductive cycles in many marine species	500	200	0	0	70	770	4.4	Accepted
9	Poisoning drinking water	300	400	0	100	0	800	4.0	Accepted
10	Can kill aquatic life	620	210	0	0	0	830	4.7	Accepted
11	Accumulation of marine debris is also dangerous to aquatic lives	200	600	0	0	100	900	3.9	Accepted
12	Increases the temperature of water bodies	300	430	0	0	110	840	4.0	Accepted
13	Leads to thermal shock	300	400	0	0	100	800	4.0	Accepted
14	Warmer temperatures lower the dissolved oxygen content of water	440	360	0	100	0	900	4.2	accepted

Source: Field survey 2021

The results on the effects of crude oil pollution on aquatic organisms (Table 4) reveal that out of 700-910 inhabitants, 600 individuals strongly agreed that it renders water unfit for aquatic organisms to dwell while 400 indigenes strongly agreed that it alters the ecology of aquatic habitats. On the proposal that it alters the physiology of marine organisms, it was strongly agreed by a total of 700 well enlightened members of the community .500 people strongly agreed that it affects marsh grasses, marine worms and other life forms while 500 villagers also strongly agreed that polycyclic aromatic hydrocarbons (PAHs) are toxic to marine lives while 410 adults of the area strongly agreed that it affects the development of marine organisms. This issue also increases plants susceptibility to disease as agreed by 600 inhabitants of the affected communities. It was strongly agreed by 500 people that it jeopardizes normal reproductive cycles in many marine species. The poisoning of drinking water as part of crude oil problem was agreed by 400 city dwellers while 620 learned elites of the environment strongly agreed

if it were possible with an oath that it leads to poisoning of drinking water. In another development, 600, 430, and 400 inhabitants unanimously agreed to the issues of accumulation of marine debris, increase in the temperature of the water bodies, and the case of thermal shock respectively. The last and not the least is that 440 most agitated youths of the communities strongly agreed that warmer temperatures lowers the dissolved oxygen content of water, which might be dangerous to marine lives. The above findings are in line with the works of Salako, (2012) who discovered that the pollution of marine habitats has caught the attention of researchers and environmentalists. This is due to the serious impact of oil spills (pollution) on marine life, as well as on people whose career relies on the exploitation of the sea resources. This is also in line with the findings of Osuagwu, (2018) who found out that crude oil spills (pollution) endanger fish hatcheries in coastal waters and also contaminate valuable fish.

The Health Challenges/ Sicknesses Common with Crude Oil Pollution

Table 5: The Health Challenges/ Sicknesses Common with Crude Oil Pollution.

S/N	Responses	SA	A	D	SD	UD	No. Of Resp.	Mean Score	Remarks
1.	Dermatitis is the result	250	500	0	0	150	900	3.7	Accepted
2.	Depression of the central nervous system due to exposure to n-alkane	450	360	0	0	190	1000	3.9	Accepted
3.	Loss of myelin due to alkene exposure	200	400	100	0	150	850	3.6	Accepted
4.	Muscle weakness and impaired sensory function	300	500	0	0	160	960	3.8	Accepted
5.	Irritation of the eyes, respiratory system and mucous membrane	500	300	0	0	0	800	4.6	Accepted
6.	Headache, dizziness and gastric disturbances	540	350	0	50	0	940	4.5	Accepted
7.	Skin redness, burning sensation and fluid accumulation	500	360	0	0	90	950	4.2	Accepted
8.	Acute poisoning due to inhalation of benzene	290	450	0	0	110	850	3.9	Accepted
9.	Death due to inhalation of 60g/m ³ of benzene	240	560	0	0	120	920	3.9	Accepted
10.	Blood abnormalities caused by acute exposure to aromatic hydrocarbon	520	300	0	0	0	820	4.6	Accepted
11.	Damage to bone marrow	300	400	80	0	0	780	4.3	Accepted
12.	Anemia and reduction in red blood count	360	380	0	0	70	810	4.2	Accepted

Source: Field survey, 2021

The findings on the health challenges/ sicknesses common with crude oil pollution (Table 5) reveal that 500 people agreed to the fact that dermatitis is one of the health challenges associated with crude oil pollution, 450 inhabitants strongly agreed that it leads to depression of the central nervous system due to exposure to n-alkane. Loss of myelin is one of the problems with crude oil exposure precisely alkene, was agreed to by 400 dwellers of the affected communities, 500 people equally agreed to the issue of muscle weakness and impaired sensory function, while 500 members of the communities strongly agreed that it causes irritation of the eyes, respiratory system and mucous membrane malfunctioning. Another challenge to health of humans include; headache, dizziness and gastric disturbance which was strongly agreed to by 540 respondents, while 500 people also strongly agreed that skin redness, burning sensation and fluid accumulation are health condition associated with crude oil pollution. Acute poisoning

due to inhalation of benzene was simply agreed to by 450 personnel of the locality, and 560 people nodded in agreement to the issue concerning blood abnormalities as a result of exposure to aromatic hydrocarbon. Blood abnormalities caused by acute exposure to aromatic hydrocarbon, bone marrow damage, and anaemia and reduction in red blood count were evidently agreed to by 520, 400 and 380 indigenes of the affected area respectively. The above findings are in line with the discoveries of Okoro, (2006) who found that when the haematotoxic implications of exposure to petroleum fumes through inhalation in humans were investigated, the results obtained showed that in males and females, red blood cell count ($10^6/\text{mm}^3$) was significantly reduced. This is also in line with the work of Lloyd and Cackett (2001) who found that, prolonged exposure and high oil concentration may cause the development of liver or kidney disease, possible damage to the bone marrow and an increased risk of cancer.

The Alternative Measures to Employ to Avert the Dangers of Crude Oil Pollution

Table 6: Alternative Measures to Employ to Avert Crude Oil Pollution

S/N	Responses	SA	A	D	SD	UD	No. Of Resp.	Mean Score	Remarks
1.	Environmental protection agencies should assist in fighting against crude pollution	520	280	0	0	20	820	4.6	Accepted
2.	Surveillance and compliance with all existing environmental legislation	180	800	0	0	0	980	4.2	Accepted
3.	Detection and monitoring of marine pollution using remote sensing technologies	110	810	0	0	70	990	3.9	Accepted
4.	Sampling techniques should be used in measuring marine pollution frequently	560	180	0	0	120	860	4.2	Accepted
5.	Illegal oil refining should be prohibited	500	400	10	0	0	910	4.5	Accepted
6.	Human errors during crude oil processes should be avoided	440	550	0	0	0	990	4.4	Accepted
7.	Oil flow lines should be periodically maintained and inspect	720	180	0	0	0	900	4.8	Accepted
8.	Damaged pipelines and flow lines should be replaced immediately.	900	0	0	0	0	900	5.0	Accepted
9.	Pipe security services should be provided at the site of oil well and pipelines against crude oil sabotage	200	700	0	0	10	910	4.2	Accepted
10.	SPDC should endeavor to follow environmental laws and policies in relation to oil pollution	100	810	0	0	15	925	4.1	Accepted

Source: Field Survey, 2021

The results on alternative measures to employ to avert crude oil pollution (Table 6) reveal that out of 820-990 respondents, 520 people strongly agreed that environmental protection agencies should assist in fighting against crude oil pollution while surveillance and compliance with all existing environmental legislation was agreed to by 800 respondents. 810 inhabitants agreed to the use of remote sensing technologies in detecting and monitoring of marine pollution, 560 respondents strongly agreed that sampling techniques should be used in measuring marine pollution frequently. The issue of Illegal oil refining seeking prohibition was strongly agreed by 500 respondents while 550 people agreed that human errors during crude oil processes should be avoided. However, 720 indigenes strongly agreed that oil flow lines should be periodically maintained and inspected while 900 respondents strongly agreed that damaged pipelines and flow lines should be replaced immediately. 700 people agreed that pipe security services should be provided at the site of oil well and pipelines against crude oil sabotage, and the need for SPDC to endeavour to follow environmental laws and policies in

relation to oil pollution was with no equivocation agreed by overwhelming majority of 810 responses. These findings above agree with Daura, (2000) who suggested ways of arresting the menace of spilt oil to include the protection of resources. He further stated that protection of resources implies the development and use of different methods e.g. booms to combat and avert crude oil pollution. Hafeez et al. (2018) suggested the use of remote sensing can provide spatially synoptic and near real time measurements. This confirms the fact that there are measures that could be used to combat crude oil pollution.

From the findings above: Hypothesis one indicated that crude oil pollution has a significant effect on aquatic life and crop production. Hypothesis two showed that crude oil pollution has a significant effect on the health of the people; and hypothesis three reveal that there are measures to avert the dangers of crude oil contamination.

Conclusion

It can be concluded that crude oil pollution has a negative impact/effects in Ogoni land and environ of the Niger Delta,

thereby resulting to a high rate of environmental pollution and negative effects on the air, crop productivity, aquatic organisms and on the health of humans inhabiting the communities.

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Significance Statement

This study will x-ray the anthropogenic involvement in the contamination of air, land and water bodies, which will help in creating rural and urban area awareness of crude oil pollution in order to discover the relationship between pollution and human health. This study will also help the researcher to uncover the censorious areas, of creating awareness on the relevance of individual hygiene and sanitary conditions, enlightening the people on the needs and significance of peaceful coexistence amongst the host community and organizations wielding the area and also provide data to other researchers studying crude oil pollution problems that many researchers were not able to traverse.

Running Title

Crude Oil Pollution /Health Challenges of Ogoni People

Author Contribution

Peter M. Eguvbe supervised the research, Sunday H. Umoh did the research, Joy O. Obielumani did the write up, Excellence A. Ibiam prepared the Tables and Augustine Ogonegbu designed the research.

Conflict of Interest

There is no conflict of interest

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