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Effect of Petroleum Effluents on Eleme River in River State Nigeria

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Abstract

The study is aimed at effect of petroleum effluents on Eleme River in River State, Nigeria. The objectives of the study are to carryout questionnaire and field investigation to know what lead to the petroleum contamination of Eleme River, to carryout person moment correlation calculation and T-distribution Test to know if these problem found out in field investigation and questionnaire are actually in existence, to prepare Bill of Engineering Measure and Evaluation (BEME) for the Eleme River water resource development projects, etc. The study investigated the following problem:- Mismanagement of petroleum exploration disaster management funds allocated to Rivers State Ministry of Environment, Lack of government control measures on petroleum exploration and exploitation in Eleme community of River state Nigeria, Social unrest due to petroleum effluent degradation of the environment etc. In the methodology two sets of questionnaire were obtained, one was questionnaire distributed to the local government workers and staff of River State Ministry of Environment and the other for residents in the study area. The work recommends that State Government should place a law that Industrial waste must be treated adequately before disposing it to the receiving waters so as not to contaminate the water bodies which the host community uses for domestic purposes, etc. The contribution to knowledge is such that this work provides an organized baseline for future work, mainly in providing solution to petroleum effluent contamination of rivers as it regards to Eleme Local Government of River State, Nigeria.

Keywords: *Petroleum effluent, Crude oil, Water pollution, Environmental impacts.*

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1. Introduction

Eleme Local Government of Rivers State, Nigeria is faced with a petroleum effluent contamination of its receiving water which the host residents uses for domestic purposes. The objectives of the study are: to carryout questionnaire and field investigation to know what lead to the petroleum contamination of Eleme River, to carryout person moment correlation calculation and T- distribution Test to know if these problem found out in field investigation and questionnaire are actually in existence, to prepare Bill of Engineering Measure and Evaluation (BEME) for the Eleme River water resource development projects (Mmonwuba et al., 2023). The history of petroleum effluent contamination of Rivers in Nigeria goes back Nigeria's oil exploration in 1903, when the Nigerian Bitumen Corporation conducted exploratory work in the country. At the onset of World War I, the firm's operations were stopped. Due to lack of technological and financial resources of small oil companies, large and strong other oil companies took over the exploration of commercial oil in the country. Thereafter, licenses were given to D'Arcy Exploration Company and Whitehall Petroleum, but neither of the companies found oil of commercial value and they returned their licenses in 1923. A new license covering 920,000 square kilometers (357,000 square miles) was given to Shell D'arcy Petroleum Development Company of Nigeria, a consortium of Shell and BP (then known as Anglo-Iranian). The company began exploratory work in 1937.

Oil was discovered in the Niger Delta Region of Nigeria in 1956. This resulted in an inflow of several multinational oil companies (MNOCs) to the region to prospect for petroleum and natural gas. With the oil boom of the 1970s, disproportionate exploitation of the region's environmental resources began. These exploration and exploitation of crude petroleum, has become the mainstay of the nation's economy. The impact of the oil boom gradually created a shift of focus by the Nigerian government from Agriculture to crude oil exploration, which created more wealth for the country and more environmental and socio-economic crisis for the NDR. Claims by the MNOCs suggest that most spillages in the NDR is as a result of vandalization/sabotage. However, there have been counter accusation by the public, blaming spill accidents on the corroded pipelines, negligence and poor maintenance by the MNOCs. The 2011 UNEP environmental assessment of oil spill and gas flaring of Eleme Local Government stated that, since the discovery of crude in the region, about 600

million gallons of crude oil have been spilled, which have been either ignored or poorly managed by the oil companies (Mmonwuba et al. 2013). These spills, have contaminated vast number of lands, damaging farmlands, affecting fisheries and causing food scarcity and suffering of the people. UNEP found the hydrocarbon contamination levels to be over 1000 times higher than the country's standard for drinking water and benzene contamination of about 900 times higher than the WHO level guideline. Kadafa (2012) carried out an investigation on oil exploitation and spillage in the Niger Delta Region of Nigeria. In this study it was observed that crude oil was discovered in Nigeria in the year 1956 by shell British Petroleum (Royal Dutch Shell) at Olobin village Bayelsa state located within Niger Delta Region of Nigeria hence, commercial production of the crude oil began in the year 1958 i.e. 2 years after discovering crude oil in Nigeria. Nkwocha et al (2017) carried out a study on crude oil efficient on receiving water. In the study, it was observed that oil and gas companies, refineries and petrochemical industries discharge chemical effluent containing heavy metals such as, iron, zinc, chromium, copper, manganese, lead, mercury and cadium at high concentration beyond to erase limits into the river in which the people in the communities use for domestic purposes.

Ibama and Eygenghe (2015) carried out a study on the effect of petroleum exploration and exploitation activities on the social environment in Ogoni land Rivers State. In the study the researchers conducted site investigation to know the impact of the oil and gas exploration by oil and gas companies in the lives of people living in the study area. The data generated from the field investigated was processed and the result obtained shows that there has been a serious adverse effect of oil and gas exploration in the lives of the resident community such as; Air pollution, General unemployment, youth militancy, poor health due to water pollution, rusting of roof sheets due to acid rain, contamination of drinking water by oil spills and poor farm yields.

Knapp et al (2021) carried out a study on environmental fate of toxic volatile organics from oil spill in the Niger Delta region of Nigeria. In the study, it was observed that the researchers developed an environmental modeling tool which is used for Environmental impact assessment for oil and gas projects, the results obtained from the model is used to make policies and assist the government in environmental disaster management planning.

Bolaji et al (2015), carried out a study on the impact of palm oil mill effluent (POME) on the water quality, the results obtained shows that the samples collected have high PH value, high alkalinity value, high phosphate, high potassium value, high lead value etc., which are above WHO standards which make the Ayanyan River usage unsuitable to both human and Aquatic life.

2. Materials and Methods

Questionnaire Survey methods were used to provide an adequate solution to petroleum effluent contamination of Eleme River in River State Nigeria and they are;

Questionnaire Survey: questionnaire survey was conducted to know the causes of petroleum effluent contamination of Eleme River.

Research Design:

The research was a questionnaire experimental descriptive survey aimed at obtaining opinions of the local government of the area of study and people living in the area of study. The design was used to obtain relevant information by use of questionnaire; dictionary and other were based on the published works that were relevant. Data collected were analyzed and interpolation of the findings were based on research questionnaire and tables were draft to answer the research question.

Sample and Sampling Techniques:

The sample which comprised of the 5% of the 1000 people within the project area and 5% of the 1000 people in the local government area were derived from the above population. In drawing the people sample, I got the 5% of 1000, which is 50 each for both the project area and the local government. The sample was also considered adequate source according to Nwana (1981) which highlighted that if the population of the study is in thousands 5% or less sample is adequate.

Instrument of the Study:

Two sets of questionnaire formed the instruments of study – one of the questionnaires, which collected data from the people within the project area, had thirty-three items with not less than three items research questions. The other questionnaire which collected data from the people in the Eleme Local Government Area, it had thirty three items with three items that collected data on the eleven research questions as well. The items in the questionnaire have a structured response pattern of

Strongly Agree
Agree
Disagree
Strongly Disagree

Method of Data Analysis

In analyzing the data the researchers made use of mean scores to answer the research questions that guided the study. In doing this a cut off mean score of 2.5 was regarded as not being a problem. In calculating the four point rating scale was given the following value by the researchers.

Strongly Agree	4 values
Agree	3 values
Disagree	2 values
Strongly Disagree	1 value

using the formular X=(fx)/N, the mean was calculated

Where X = mean
f = Frequency of observation
x = Individual occurrence
N = Sample number

Decision Rule

The mean score determined the cutoff point, which is 2.50. Any responsible mean that is equal to or greater than 2.5 was agreed while response less than 2.5 was regarded as disagreed.

3. Results and Discussion

Data Analysis and Discussion of the Questionnaire

The data were analyzed using mean scores. The analyses are presented in the tables under the research questions that guided the study. A brief interpretation of data and discussion of result thus follows each table.

Research Question 1

Does mismanagement of petroleum exploration disaster management funds contributes to the problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?

Table 1: analysis to know if mismanagement of petroleum exploration disaster management funds contributes to the problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria as responded by the people.

Item no	Description	Score
1	Does mismanagement of petroleum exploration disaster management funds contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
2	Does embezzlement of petroleum exploration disaster management funds contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
3	Does misappropriation of petroleum exploration disaster management funds contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
	Grand mean (x)	3.50

Discussion of Result in Table 1

Data in table 4.1 shows item 1, 2 and 3 with a grand mean of 3.50 which is higher than the cut off mark of 2.50, therefore it can be deduced mismanagement of petroleum exploration disaster management funds is a serious factor contributing to petroleum exploration problems in Eleme community, Rivers State, Nigeria.

Table 2: Analysis to know if mismanagement of petroleum exploration disaster management funds contributes to the problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria as responded by the local government.

Item no	Description	Score
1	Does mismanagement of petroleum exploration disaster management funds contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
2	Does embezzlement of petroleum exploration disaster management funds contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
3	Does misappropriation of petroleum exploration disaster management funds contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
	Grand mean (x)	3.50

Discussion of Result in Table 2:

Data in table 2 shows item 1, 2 and 3 with a grand mean of 3.50 which is higher than the cut off mark of 2.50, therefore it can be deduced mismanagement of petroleum exploration disaster management funds a serious factor contributing to petroleum exploration problems in Eleme community, Rivers State, Nigeria

Research Question 2

Does lack of good government control measures on petroleum exploration and exploitation contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?

Table 3: Analysis to know if lack of good government control measures on petroleum exploration and exploitation contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria as responded by the people.

Item no	Description	Score
4	Does lack of good government control measures on petroleum exploration and exploitation contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
5	Does Absence of government control measures on petroleum exploration and exploitation contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
6	Does improper government control measures on petroleum exploration and exploitation contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
	Grand mean (x)	3.50

Discussion of Result in Table 3:

Data in table 3 shows item, 4, 5 and 6 with a grand mean of 3.50 which is higher than the cut off mark of 2.50, therefore it can be deduced that bush burning is a serious factor contributing petroleum exploration problems in Eleme community, Rivers State, Nigeria.

Table 4: Analysis to know if lack of good government control measures on petroleum exploration and exploitation contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria as responded by local government.

Item no	Description	Score
4	Does lack of good government control measures on petroleum exploration and exploitation contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
5	Does Absence of government control measures on petroleum exploration and exploitation contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
6	Does improper government control measures on petroleum exploration and exploitation contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
	Grand mean (x)	3.50

Discussion of Result in Table 4:

Data in table 4 show items shows item, 4, 5 and 6 with a grand mean of 3.50 which is higher than the cut off mark of 2.50, therefore it can be deduced that bush burning is a serious factor contributing to petroleum exploration problems in Eleme community, Rivers State, Nigeria

Research Question 3

Does social unrest due to petroleum effluent degradation of the environment contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?

Table 5: Analysis to know if social unrest due to petroleum effluent degradation of the environment contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria as responded by the people.

Item no	Description	Score
7	Does oil theft by residents contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
8	Does oil theft by residents contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
9	Does attack on petroleum pipeline residents contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
	Grand mean (x)	3.50

Discussion of Result in Table 5:

Data in table 5 show items shows item, 7, 8 and 9 with a grand mean of 3.50 which is higher than the cut off mark of 2.50, therefore it can be deduced that miss apportionment of climate change control project funds allocated to Anambra State Ministry of Environment by the Federal Government of Nigeria is a serious factor contributing to petroleum exploration problems in Eleme community, Rivers State, Nigeria

Table 6: Analysis to know if social unrest due to petroleum effluent degradation of the environment contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria as responded the local government.

Item no	Description	Score
7	Does oil theft by residents contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
8	Does oil theft by residents contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
9	Does attack on petroleum pipeline residents contributes to problems of petroleum effluent contamination of Eleme River in Rivers State, Nigeria?	3.50
	Grand mean (x)	3.50

Discussion of Result in Table 6:

Data in table .6 show items shows item 7, 8 and 9 with a grand mean of 3.50 which is higher than the cut off mark of 2.50, it can be deduced that that miss apportionment of climate change control project funds allocated to Anambra State Ministry of Environment by the Federal Government of Nigeria is a serious factor contributing to petroleum exploration problems in Eleme community, Rivers State, Nigeria.

4. Conclusion

Based on the analysis, discussion and interpretation of result, the following conclusion are presented: The data obtained from the questionnaire survey was subjected to Pearson product moment correlation and the result obtained is equals to 1, meaning a 100% level of performance in the experiment. To check for error in the questionnaire survey, the data obtained from the questionnaire survey is subjected to test of hypothesis I and the t-distribution test and the result obtained shows that neither type I nor type II error was committed in the experiment.

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