

Socio-Economic Characteristics, Causes, Effects, and Relationships of Oil Spillage in Delta State, Nigeria

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ABSTRACT

This study examined the socio-economic characteristics, causes, effects, and relationships of oil spillage in Delta State, Nigeria. A multi-stage sampling technique was employed to select 116 respondents from Ughelli North and Isoko North Local Government Areas, communities. Data were collected using structured questionnaires and analyzed through descriptive statistics, Pearson Product Moment Correlation (PPMC), and Chi-square tests. The results showed that the majority of respondents were young (20–30 years), male (51.7%), and possessed low levels of formal education (60.3%). The major perceived causes of oil spillage included unemployment (mean = 4.19), poverty (mean = 4.10), and illiteracy (mean = 3.93), while effects were destruction of assets (mean = 2.55), loss of natural resources (mean = 2.53), poor agricultural yield (mean = 2.62), and increased unemployment (mean = 2.66). The correlate on analysis revealed a strong and positive relationship ($r = 0.734$, $p < 0.01$) between the causes and effects of oil spillage. Educational status and religion were found to have significant associations with how respondents perceived the effects of oil spillage ($p < 0.05$). The study concluded that oil spillage in Delta State was both an environmental and socio-economic crisis, driven by poverty and poor governance. It emphasized the urgent need for government and corporate intervention through policy reform, environmental restoration, and livelihood empowerment.

Keywords: Correlation crude oil, Environment, Natural resources, Rural livelihood.

INTRODUCTION

Oil spillage has remained a global environmental and socio-economic issue since the inception of crude oil exploration and exploitation. Worldwide, between 1.7–8.8 million tons of petroleum are released into the environment annually due to human and industrial activities (Loyeh and Mohsenpour, 2020). The Niger Delta region of Nigeria recognized as one of the world's most important wetland and marine ecosystems has suffered severe degradation resulting from decades of unsustainable petroleum activities. Studies estimate that approximately 9–13 million barrels of oil have been

spilled in the region over a 50-year period, an amount equivalent to 50 Exxon Valdez disasters (Ewim *et al.*, 2023).

The discovery of oil in Oloibiri, Bayelsa State, in 1956 by Shell British Petroleum (now Royal Dutch Shell) heralded Nigeria's entry into the global oil economy (Albert *et al.*, 2018). By 2006, the Niger Delta hosted 11 oil companies operating across 159 oil fields and 1,481 wells (Amnesty International, 2020). However, while oil exploitation has fueled national economic growth, it has simultaneously unleashed extensive environmental degradation manifested through deforestation, flooding, coastal erosion, and particularly oil spillage (Adebangbe *et al.*, 2025). These environmental changes have undermined rural livelihoods, compromised biodiversity, and intensified poverty among local populations. The Niger delta of Nigeria is among the ten most important wetland and marine ecosystem in the world. The oil industry located within this region has contributed immensely to the growth and development unfortunately unsustainable oil exploration activities has rendered the Niger delta region one of the five (5) most severely petroleum damaged ecosystem in the world (Ewim *et al.*, 2023).

The vulnerability of the Niger Delta stems largely from its dependence on natural resources such as land, water, and forests, which are directly impacted by oil contamination. Oil spillage in Nigeria had several environmental consequences on the indigenous people and caused serious health problems of rural livelihood in the rural community. It has been established that unsustainable oil exploitation resulted into death of fishes in the water disrupt farming and other livelihood activities, leading to food insecurity in the affected communities (Elum *et al.*, 2016). Furthermore, oil pollution has been linked to increased health risks, youth militancy, and social unrest (Adiele, 2025). A lot of literature on oil spillage in the Niger delta of Nigeria has been written, just a little has been mentioned on effect of oil spillage on rural livelihood activities in the area. The oil spillage in delta state has caused a lot of damages

DOI: 10.21608/asejaiqsae.2025.466809

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Received, October 9, 2025, Accepted, November 18, 2025.

like contamination of water bodies which makes the river to be un-conducive for the aquatic lives (fishes) and reduction in the soil nutrient thereby leading to poor yield in the agricultural produce etc. Oil spillage usually occurs near the sea region or coastal belts where various types of oil including crude oil, gasoline, and other oil waste get released. Although a substantial body of literature has examined oil spills and their environmental consequences, few empirical studies have explored how the socio-economic characteristics of rural residents influence their perceptions of oil spillage, its underlying causes, associated risks, and impacts on their livelihoods.

This study sought to address this gap by investigating how the socio-economic characteristics of respondents relate to their experiences with oil spillage in Delta State, Nigeria. Specifically, it examined the effects of oil spillage on livelihood activities, identified the major factors contributing to these spillages, and analyzed the statistical relationships between their underlying causes and resulting impacts.

MATERIALS AND METHODS

Area of Study:

The study was carried out in Delta state, Nigeria. Delta State is one of the thirty-six states of the Federal Republic of Nigeria, situated within the South-South geopolitical zone and forming a major part of the Niger Delta region. Geographically, the state lies approximately between latitude 5°00' and 6°30' N and longitude 5°00' and 6°45' E, placing it within the humid tropical belt of West Africa (Delta State Government, n.d.). It occupies a total land area of about 17,698 square kilometers, characterized by low-lying terrain and an intricate network of rivers, creeks, and estuaries that drain into the Atlantic Ocean through the Bight of Benin (Delta State Government, n.d.).

Population of the Study:

The study population comprised rural households residing in villages where oil spillage was widespread.

Sampling Procedures and Sampling Size:

Multi stage sampling techniques was used to carry out the study.

First stage: Delta state consists of 25 Local Government Areas (LGA). Ughelli North and Isoko North LGA were purposively selected based on the presence of more than 9 oil wells in each of the LGA. The two LGA were selected because of their distinctive characteristics and the presence of active oil wells within the communities. In the second stage, villages within each LGA that had oil wells were identified, while the third stage involved the

random selection of households from these rural communities.

Second stage: Random selection of villages less than 2 km to oil wells. The selected villages included Ekiugbo, Oteri, Otovwodo, Afiesere (Ughelli North) and Ogini, Oleh, Ozoro, Iyede (Isoko North). These communities had experienced repeated oil spill incidents, making them suitable for studying the socio-economic and environmental consequences of oil contamination.

Third stage: Systematic sampling techniques was used to select rural households in the area. Every third households were systematically selected resulting in 19 in Oleh, 16 in Oteri, 16 in Ogini, 15 in Ekiugbo, 14 in Afiesere, 13 in Ozoro and 9 in Iyede, and 18 in otovwodo. A total of (116) questionnaires out of 120 questionnaires were recovered from the field. The difference in the number of respondents selected per oil well is due to variation in the number of households in the affected areas. In all, a total of 116 respondents were selected for the study.

Measurement of Variables:

The study examined both dependent and independent variables. The dependent variable was the effect of oil spillage, which represented the extent to which oil contamination influenced livelihood activities and environmental conditions in the study area.

The causes of oil spillage were measured using a five-point Likert-type scale, where respondents indicated their level of agreement with various identified causes. The response options ranged from strongly disagree (1) to strongly agree (5). Mean scores were computed for each item, and an index of causes was generated by summing the individual mean scores and dividing by the total number of items. Items with mean values of 3.0 and above were categorized as major causes, while those below 3.0 were regarded as minor causes.

Similarly, the effects of oil spillage on livelihood were measured using a three-point rating scale of yes (3), partially (2), and no (1). The mean score for each item was calculated, and an effect index was generated through aggregation. Mean scores equal to or greater than 2.5 indicated high perceived effects, while values below 2.5 denoted low perceived effects.

The livelihood impact index was derived from the overall mean scores of livelihood-related variables. Respondents whose mean scores were above the computed grand mean were categorized as having a high level of livelihood impact, whereas those below it were classified as having a low level of livelihood impact.

Analytical Techniques:

Descriptive statistics (frequency, percentage and mean) and inferential statistics such as Pearson Product Moment Correlation (PPMC) and Chi-square (χ^2) were the analytical techniques used for the study. The PPMC for determining the relationship between causes and effects as well as χ^2 for the relationship between selected socio-economic characteristics and effect of oil spillage on livelihood in the study area.

Model Specification:

Pearson Product Moment Correlation (PPMC) Analysis:

The PPMC model was specified to determine the relationship between the perceived causes and effects of oil spillage in the study area. The mathematical model is given as:

$$r = \frac{\sum(X - \bar{X})(Y - \bar{Y})}{\sqrt{[\sum(X - \bar{X})^2 \sum(Y - \bar{Y})^2]}}$$

Where:

r = correlation coefficient between causes (X) and effects (Y) of oil spillage,

$\bar{X}$ = mean score of identified causes of oil spillage,

$\bar{Y}$ = mean score of identified effects of oil spillage,

X = mean of causes variable, and $\bar{Y}$ = mean of effects variable.

The model tested whether increases in the perceived causes of oil spillage were associated with increases in the severity of its effects across respondents in Ughelli North and Isoko North Local Government Areas (LGA) of Delta State.

Chi-square (χ^2) Test:

The χ^2 statistical test was employed to determine the relationship between selected socio-economic characteristics of respondents (such as age, sex, marital status, educational level, religion, and source of labour) and the perceived effects of oil spillage on livelihood activities in the study area.

The model is mathematically expressed as:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Where:

χ^2 = Chi-square value

O = Observed frequency

E = Expected frequency

RESULTS AND DISCUSSION

Table (1) presents the socio-economic profile of respondents from the study area. The data reveal that 50% of respondents were single, suggesting lower household responsibilities and possibly greater mobility for livelihood diversification. The gender distribution showed a slight male dominance (51.7%), implying that

men were more engaged in activities directly affected by oil spillage, such as farming and fishing. The age distribution indicated that 56% of respondents were within the 20–30-year bracket, the most economically active population segment (Abay *et al.* 2021). This youthful dominance implies high adaptability but also vulnerability to economic shocks resulting from oil-related environmental damage. In terms of education, the majority (60.3%) had no formal education, while only 13.8% attained tertiary education. Low literacy levels reduce awareness about environmental conservation and alternative livelihood strategies (Mustofa and Sueb, 2023). Religiously, 65.5% were Christians, while 20.7% and 13.8% practiced Islam and traditional religions, respectively. Religion often influences ethical perceptions of environmental stewardship (Shin and Preston, 2021). Regarding sources of labour, 34.5% relied on hired labour, while family and contractual labour accounted for 32.8% each, suggesting the use of mixed labour systems for rural production. In summary, the dominance of young, uneducated, and single individuals indicates a population that may engage in risky economic behaviour, including pipeline vandalization and illegal refining. Research has shown that low literacy and limited education reduce rural households' opportunities for non-farm and formal employment, which in turn increases their dependence on natural resource extraction and other environmentally harmful coping strategies (Fagariba *et al.*, 2018; Do *et al.*, 2022 and Wale *et al.*, 2022). Policies targeting vocational education, entrepreneurship training, and youth empowerment would therefore be essential for reducing oil spillage-related livelihood crises in the Niger Delta.

The second objective examined the perceived effects of oil spillage on the livelihood activities of people in the study area using mean analysis. The results, as presented in Table (2), summarize respondents' views regarding several possible impacts. The data show that the effects of oil spillage, with mean values above 2.5, included destruction of assets, loss of forest and natural resources, contamination of water bodies, poor agricultural yield, and rising unemployment. These findings corroborate the work of Sutormin *et al.* (2024), who found that oil contamination alters soil physical and chemical indicators and lowers productivity across multiple soil type. The highest mean score (2.66) was observed that oil spillage led to a rise in unemployment. This suggests that frequent spills disrupt farming, fishing, and small-scale enterprises, leading to loss of livelihood and migration of youths to urban centers. Similarly, the high mean score for "negative impact on agriculture" (2.62) indicates that soil contamination diminishes crop yield and food availability.

Respondents also confirmed that oil spillage reduces the number of people involved in farming (mean = 2.57) and lowers soil fertility and crop growth (mean = 2.57). These impacts are consistent with Morris (2024), who observed that persistent contamination reduces the productive capacity of agricultural lands.

Although some respondents disagreed that oil spills directly cause road damage (mean= 2.29), they acknowledged that communal conflicts sometimes arose from disputes over oil well ownership or compensation

claims (mean = 2.10). These conflicts align with Iwok (2021), who emphasized that resource control disputes are major triggers of rural unrest in the Niger Delta.

The categorization of responses in Table (3) further shows that a majority (55.2%) of respondents perceived the effect of oil spillage on livelihood as high, compared to 44.8% who considered it low. The findings highlight the devastating socio-economic consequences of oil spillage on rural livelihoods.

Table 1. Socio-economic characteristics of respondents

Variables	Frequency	Percentage (%)
Marital Status		
Single	58	50.0
Married	49	42.2
Divorced	9	7.8
Gender		
Male	60	51.7
Female	56	48.3
Age (Years)		
<20	9	7.8
20–30	65	56.0
31–40	31	26.7
41–50	7	6.0
≥50	4	3.4
Educational Level		
No formal education	70	60.3
Primary	30	25.9
Tertiary	16	13.8
Religion		
Christianity	76	65.5
Islam	24	20.7
Traditional	16	13.8
Labour sources		
Hire labour	40	34.5
Family labour	38	32.8
Contractual labour	38	32.8
Total	116	100

Source: Field Survey 2024

Table 2. Perceived effects of oil spillage on livelihood

Statements	No (%)	Partially (%)	Yes (%)	Mean	Std. Dev.
Destruction of assets	10.3	24.1	65.5	2.55	0.68
Forest/natural resources destruction	10.3	26.7	62.9	2.53	0.68
Water bodies destruction	10.3	22.4	67.2	2.57	0.68
Agricultural produce affected	9.5	19.0	71.6	2.62	0.65
Fire outbreak	17.2	28.4	54.3	2.37	0.76
Crime rate high	9.5	35.3	55.2	2.46	0.66
Unemployment increases	6.0	21.6	72.4	2.66	0.59
Reduced farming participation	6.9	29.3	63.8	2.57	0.62
Soil fertility/crop growth reduced	5.2	32.8	62.1	2.57	0.59
Road damage (machines)	51.7	9.5	38.8	2.29	0.63
Conflict in communities	25.9	37.9	36.2	2.10	0.78

Source: Field Survey 2024

Table 3. Category of respondents on perceived effect of oil spillage on livelihood

Level	Frequency	Percentage (%)
High	64	55.2
Low	52	44.8
Total	116	100

Source: Field Survey, 2024

The reduction in agricultural productivity and the increase in unemployment exacerbate poverty, food insecurity, and migration pressures (Everest *et al.*, 2022). The destruction of water bodies and forests also undermines biodiversity and traditional economic activities such as fishing and hunting.

The causes of oil spillage in the study area as presented in Table (4) was examined using mean analysis. The analysis indicates that the top three factors contributing to oil spillage were unemployment (mean = 4.19), poverty (mean = 4.10), and illiteracy (mean = 3.93). Respondents attributed these to the lack of economic opportunities and poor education, which drive youths to engage in oil theft, illegal bunkering, and pipeline vandalization (Ozogu *et al.*, 2023). Government negligence (mean = 3.56) and greed (mean = 3.61) were also recognized as contributing factors, particularly due to inadequate monitoring and corruption within enforcement agencies (Sunday-Ayegba, 2025).

The categorization Table in (5) showed that half of the respondents (50.9%) classified the level of causes of oil spillage as high, while 49.1% considered them low (Table 5). This implies that the predominance of poverty, unemployment, and illiteracy as key drivers of oil spillage implies that economic deprivation and lack of awareness are major catalysts of environmental degradation. This finding suggests that oil spillage is not merely an environmental issue but a socio-economic crisis rooted in systemic inequality and governance failure.

The PPMC in Table (6) tested whether increases in the perceived causes of oil spillage were associated with

increases in the severity of its effects across respondents in the selected LGA of Delta State. The computed Pearson correlation coefficient between the mean indices of causes and effects of oil spillage was $r = 0.734$, which was statistically significant at the 0.01 level ($p < 0.01$). The positive and relatively high magnitude of the coefficient indicated a strong, direct relationship between the causes and effects of oil spillage across the sampled communities. The strong positive correlation obtained corroborated earlier findings by Albert *et al.* (2018) and Orisakwe (2021), who emphasized that socio-economic deprivation and governance failures were critical drivers of environmental degradation in the Niger Delta. This meant that as the intensity or prevalence of the underlying causes increased, there was a corresponding and significant rise in the magnitude of the adverse effects experienced by residents.

The Chi-square test in Table (7) established relationship between socio-economic factors such as education and religion and respondents' perceptions of the effects of oil spillage on their livelihoods in Delta State, Nigeria. The results revealed that educational status ($p = 0.001$) and religion ($p = 0.011$) were significantly related to the perceived effects of oil spillage. The implication is that education and moral consciousness influence how individuals perceive and respond to oil spillage. Educated respondents were more aware of environmental risks and therefore less likely to engage in vandalism or other activities that could lead to spills. Similarly, religious adherence may promote ethical environmental behavior and discourage sabotage.

Table 4. Causes of oil spillage in the study area

Statement	Strongly Agree (%)	Agree (%)	Undecided (%)	Disagree (%)	Strongly Disagree (%)	Mean	Std. Dev.
Poverty	57.8	12.9	17.2	6.0	6.0	4.10	1.24
Government negligence	19.8	39.7	23.3	6.0	11.2	3.56	1.11
Unemployment	60.3	12.9	16.4	4.3	6.0	4.19	1.18
Illiteracy	41.1	31.0	10.3	3.4	13.8	3.93	1.18
Greed	12.9	48.3	30.2	4.3	4.3	3.61	0.92
Zeal for power	6.0	21.6	56.0	10.3	6.0	3.07	0.97
Source of income	18.1	24.1	26.7	25.9	5.2	3.03	1.43
Belief as birthright	12.9	14.7	37.1	26.7	8.6	2.78	1.34

Source: Field Survey 2024

Table 5. Category of respondents on the causes of oil spillage

Level	Frequency	Percentage (%)
High	59	50.9
Low	57	49.1
Total	116	100

Source: Field Survey 2024

Table 6. Pearson product moment correlation (PPMC) between causes and effects of oil spillage

Variables	Mean (X ⁻)	Standard Deviation (SD)	N	r	p-value	Decision
Causes of Oil Spillage	3.42	0.63	116	0.734	0.000	Significant
Effects of Oil Spillage	3.57	0.68	116	—	—	—

Note: S = Significant at $p < 0.05$; NS = Not Significant.

Table 7. Chi-square test showing the relationship between socio-demographic variables and dependent variable

Variables	χ^2 -value	p-value	Decision
Marital status	2.912	0.233	NS
Sex	4.742	0.096	NS
Age	7.872	0.096	NS
Educational status	13.630	0.001	S
Religion	8.963	0.011	S
Source of labour	4.765	0.190	NS

Note: S = Significant at $p < 0.05$; NS = Not Significant.

CONCLUSION

The study concluded that oil spillage had far-reaching consequences on the livelihood activities of rural dwellers in Delta State. It destroyed farmland and water bodies, reduced agricultural productivity, and increased unemployment and poverty levels. The strong positive relationship between the causes and effects of oil spillage revealed that as socio-economic problems such as unemployment and poverty worsened the severity of oil spill impacts also increased. Educational status and religious inclination significantly shaped perceptions and responses toward oil spillage, indicating that enlightenment and moral values played key roles in promoting environmental responsibility. Overall, the findings demonstrated that oil spillage in the Niger Delta was not merely an ecological issue but a deep-rooted socio-economic problem that required integrated and sustained responses.

RECOMMENDATIONS

Based on the findings, the following recommendations were made: First, government agencies and oil companies should prioritize environmental remediation and provide fair compensation to affected communities. Second, educational programmes and skill development initiatives should be introduced to empower youths and reduce the tendency toward illegal oil activities. Third,

stricter monitoring mechanisms should be established to prevent pipeline vandalism, coupled with community policing strategies that encourage local participation in protecting oil infrastructure. Fourth, faith-based and civil organizations should promote ethical environmental behavior through awareness campaigns. Finally, comprehensive livelihood diversification programs should be implemented to provide sustainable alternatives for rural dwellers, thereby reducing dependence on environmentally destructive practices.

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