

# Environmental Remediation Cost and Financial Performance of Oil and Gas Companies in Nigeria

**Korolo, Emmanuel Omolaye (Ph.D)**

Department Of Accounting,  
Federal University Otuoke  
Bayelsa State, Nigeria  
[koroloeo@fuotuoke.edu.ng](mailto:koroloeo@fuotuoke.edu.ng)

**Korolo, Akuboere Salome (Ph.D)**

Department of Accounting  
Federal University, Otuoke  
Bayelsa State, Nigeria

DOI: 10.56201/ijefm.v9.no4.2024.pg1.20

---

## **Abstract**

*This study investigates the relationship between environmental remediation costs and the financial performance of oil and gas companies in Nigeria. The specific objectives of the study were to determine whether environmental Pollution Prevention Cost and environmental Pollution Detection Cost have any effect on the financial performance of oil and gas companies in Nigeria using return on assets (ROA) as a measure of corporate financial performance. Ex-post facto research design was used and the study used secondary data from annual reports of sampled companies for the relevant years under consideration (2018-2022) The ordinary Least Squares regression technique was employed to investigate the relationship existing between the variables. The study found that environmental prevention cost has a negative and insignificant effect on the return on assets of oil and gas companies in Nigeria while environmental detection cost has a positive and significant effect on the Return on assets of oil and gas companies in Nigeria. Based on the findings of the study, the study concludes that there is a need for prudent management of environmental costs which will lead to both ecological stewardship and financial resilience. The study recommends amongst others that Management should develop a well-articulated employee health and safety cost system to guarantee a conflict-free corporate atmosphere needed by managers and workers for maximum productivity.*

---

## **1. Introduction**

Environmental remediation focuses on how to support decision-making about the environment's quality and how to manage it. The process of eliminating pollutants or other contaminants from environmental media, such as soil, groundwater, sediment, or surface water, is known as

environmental remediation. In cases where there are no statutory standards or where the standards are advisory, remedial action may also be based on evaluations of the risk to human health and the environment. Remedial action is typically subject to a variety of regulatory criteria. The growing industrial and economic activity in today's business climate has negatively impacted humankind's ability to survive. The environment, which is essential to human existence, has been badly impacted by the growing industrial and economic activity. Natural capital such as clean air, clean water, land, greenhouse gasses, climate, energy, ecosystem, biodiversity, and other natural elements are degraded and altered and environment sustainability is jeopardized. Additionally, there's the widespread worry that environmental cleanup limits operational flexibility decreases business productivity, and may thus have an impact on the company's overall performance (Effiong & Akpan, 2019). Nigeria is a thriving country with a wealth of natural resources, including coal, limestone, petroleum, natural gas, vegetation, and so on, but it is not immune to environmental deterioration. The country emits a variety of pollutants, including carbon dioxide, warming, and other greenhouse gases, to use these resources to improve the welfare of its citizens and its economic development. Environmental remediation is required to clear up or minimize contamination (Myers, 2019).

Beredugo and Mefor (2012) state that the natural resources that oil and gas firms continuously explore and use have immediate environmental effects, including emissions, toxic waste, soil contamination, loss of biodiversity (wildlife, agro variety), and global warming. These non-renewable, limited natural resources that are used to support economic growth are susceptible to depletion. Nonetheless, the nation (much like Nigeria) makes a sizable profit every day from the selling of crude oil and its byproducts. Consequently, it seems to reason that this money ought to have a big influence on the communities that produce minerals and oil if nothing else. This is understandable given that the oil and gas sector continues to be the main source of income for the country. The effect of environmental cleanup expenses on the earnings per share of Nigerian oil and gas firms was examined by Besson et al. (2020).

The triple-bottom-line concept, which emphasizes balancing the concerns of all stakeholders, is by environmental disclosure. Because workers are important stakeholders whose well-being is critical to improved organizational performance, it is impossible to overstate the importance of worker health and safety. The majority of oil and gas activities in Nigeria are extractive, and workers are exposed to risk factors that include mechanical, chemical, physical, and biological ones. Hassan (2017) conducted a study that revealed that various incidents of oil pollution, including spills, blow-outs of oil wells, oil blast discharges, and inappropriate disposal of drilling mud from petroleum prospecting and other production waste, have led to environmental degradation issues. These include the loss of natural beach aesthetic value due to unsightly oil slicks, harm to marine wildlife, and ecosystem modification through species elimination situations that the companies created to enable their operations (Ironkwe & Ordu, 2016). As environmental remediation efforts continue to rise, several businesses and other organizations are strengthening their environmental approach and creating commercial operations that consider the environment to address the problem (Hassan, 2017).

## 1.2. Statement of Problem

Nigeria faces significant obstacles in containing environmental deterioration because it is a developing country with an abundance of natural resources (oil and gas products). The quality and utility of life may have been diminished by oil exploration and government activities due to gas flaring, industrial pollution, oil spills, deforestation, unequal distribution of oil earnings, and other associated problems. The sale of crude oil and its byproducts brings in enormous sums of money for the nation every day, but one would normally think that well-managed funds would have a major influence on the growth of both oil-producing and non-oil-producing regions of the nation. Multinational corporations that mine crude oil and its byproducts from these communities frequently overlook the fact that they ought to be considerate of the host communities' social needs and work toward an environmentally friendly relationship. Because of these foreign firms' oil spills, industrial pollution, deforestation, and other environmental problems, the communities that produce oil frequently struggle greatly to adapt to their natural surroundings. It is impossible to overstate how much this environmental degradation affects the host populations. Unhealthy and antagonistic relationships arise between the parties as a result of the oil companies and frequently the government's incapacity to satisfy the demands of the communities that produce oil as well as the citizens at large.

Most studies on environmental remediation cost and financial performance have resulted in mixed outcomes. For instance, Gaijlo (2022) investigated the relationship between environmental remediation cost and the financial performance of listed manufacturing companies and found out a positive relationship between environmental pollution cost and financial performance measured by return on assets while Agbejoye (2019) examined the relationship between environmental cost and financial performance of some selected listed companies in Nigeria and found that environmental pollution detention cost has a negative effect on financial performance of the sampled companies. Hence there is need for further investigation.

## 2. LITERATURE REVIEW

### 2.1 Conceptual Clarifications

#### 2.1.1 Concept of Environmental Quality Management

The environmental quality model is the ideal state of zero damage to the environment, 'which is analogous to environmental quality management (EQM), a zero-defect state of total quality management. This is certainly compatible with the concept of eco-efficiency. Environmental costs incurred are costs arising because poor environmental quality exists or may exist and these have to be prevented, reduced, or remedied. Various theories such as the Stakeholder's theory, the Political economy theory, and the corporate social responsibility theory have been found relevant to this work. Also, the environmental theory postulated by O'Riordan (1997), Pepper (1986), and Dobson (1990) as cited by Acti *et al* (2013), emphasizes the need for environmentally friendly products and clean technology and stresses the need for businesses to produce a balanced report that includes reporting the impact of business activities on the environment. This study adopts the Environmental Quality Cost Management Theory.

### **2.1.2 Brief Overview of the Oil and Gas Industry in Nigeria**

In 1956, the Shell Group discovered crude oil in Nigeria, and ever since, the Oil and gas industry has been vibrant in the country. However, the sector was largely dominated by multinational corporations until the early 1990s when Nigerian companies began to make a foray into the industry. Local participation was boosted with the implementation of the Nigerian Content Directives issued by the Nigerian National Petroleum Corporation (NNPC) about a decade ago, and eventually, by the promulgation of the Nigerian Oil and Gas Industry Content Development (NOGIC) Act (The Act) in 2010. The Act seeks to promote the use of Nigerian companies/resources in the award of oil licenses, contracts, and projects. When it comes to structure, the industry is broadly divided into the upstream sector and the downstream sector. The upstream sector is characterized by the exploration and production of crude oil and gas (petroleum operations). The upstream oil sector is the single most important sector in the Nigerian economy, accounting for over 90% of the country's exports and about 80% of the Federal Government's (FG's) revenue.

The Downstream Sector on the other hand consists of transmission and conveyance which involves the transportation of oil and gas to the refinery and gas stations. There is a pipeline network from the wellhead to the refinery or plant. Tankers and purpose-built vessels are also used for this purpose; and the refining involves transforming the crude into products such as PMS, diesel, kerosene, etc. Also, the distribution and Marketing- which entails the distribution and marketing of refined petroleum products and other complementary activities. The distribution also involves the transportation of refined petroleum products from the refineries through pipelines, coastal vessels, road trucks, rail wagons, etc. to the storage/sale depots. Listing rules requires companies to disclose/report on their environmental footprints, these requirements are not met by most firms in the oil and gas sector and as a result, the business environment becomes volatile and uncondusive for businesses to thrive as these firms are perceived as environmentally unfriendly which impedes corporate image and adversely affects financial performance.

### **2.1.3 Concept of Environmental Accounting**

Environmental accounting is a term that has different meanings. According to Seetharaman et al., (2007), environmental accounting is used to asses full environmental costs associated with activities and/or products. They also emphasized that environmental accounting can be used to track the environmental performance of the organization more measurably. The key areas for monitoring are aggregated emission to air, water effluent discharge, soil contamination, and boundary noise level. Also, James (2008) opined that environmental accounting is taken to mean the identification and reporting of environmental-specific costs, such as liability costs or waste disposal costs. Environmental accounting involves any costs and benefits that arise from changes to a firm's products or processes, where the change also involves a change in environmental impacts.

## 2.2 Theoretical Framework

However, the researchers anchored this study on stakeholder theories because they are more connected to environmental costs on financial performance than other theories mentioned in this study. The policy perspective of stakeholder theory treats all of the company's stakeholders equally and disregards their varying degrees of influence. Stakeholder theory's normative stance exhorts managers to work for the interests of all stakeholders. In terms of the managerial perspective of stakeholder theory, considers the interests of a small group of interested parties who have a considerable amount of control over the organization. The types of important resources that stakeholders possess determine the power of the company. The theory backs up the notion that management is encouraged to align company needs with their environment by the behavior of various stakeholder groups (Uwuigbe & Olayinka, 2011). The managerial branch of stakeholder theory offers a framework for an organization-centered analysis of CSED. It is debatable whether or not organizational legitimacy exists when stakeholders are managed effectively through the exercise of responsibility using CSED.

## 2.3 Review of Empirical Literature

Enekwe et al., (2023) examine the effect of environmental costs on the financial performance of listed oil and gas companies in Nigeria. The ex-post facto research design was employed for the collection of financial statements of four listed oil and gas companies in Nigeria for ten years from 2010 to 2019. The purposive sampling technique was used for the study. The Panel Ordinary Least Square of the multiple regression model was conducted using the E-views version 9.0 statistical software package. The findings revealed that staff development costs have a negative but insignificant effect on listed Nigerian oil and gas companies' return on assets, while community development costs and employee health and safety costs have a positive but insignificant effect. This implies that the amounts of these costs incurred by the studied companies are too small to have an impact on their performance metrics. However, studies are based on the quantity of information provided by a small number of companies, and as a result, these studies may be influenced by the costs that these companies incur as well as the extent to which they report those costs. The study is limited to only the oil and gas sector and some specific environmental cost variables. The utilization of environmental cost variables and the use of financial performance. The contribution of this study will be to help create a well-articulated employee health and safety cost system to provide the conflict-free working environment that managers and employees need for maximum productivity.

Nwanwu (2022) investigated the effect of environmental management costs on the financial performance of quoted oil and gas companies in Nigeria for the period of 2011-2018. Pollution cost served as a dimension of environmental management cost and net profit as a measure of financial performance. Positivism and interpretive Philosophy were adopted while explanatory and correlational research designs were adopted for the study. The population of the study was 10 quoted oil and gas companies listed on the Nigerian Exchange. Data was sourced from annual reports and accounts of the companies available on the Nigerian Exchange website. Descriptive

statistics regression analysis and correlations coefficient guided by a regression model were used for data analysis and testing of hypotheses. The result of the study showed that pollution cost has a positive and significant effect on the financial performance of quoted oil and gas companies in Nigeria. It is concluded that environmental management cost has a significant effect on the performance of Oil and Gas Companies in Nigeria. The study recommended among others that management of oil and gas companies should increase their environmental expenditure if possible so that they would have zero environmental impact as proposed by the cost reduction model. This can be done by engaging in more remediation activities so that stakeholders' trust can be enhanced.

Ekpose and Enidiok (2021) researched the influence of environmental costs on the financial performance of quoted Nigerian oil and gas firms for the period of eleven (11) years from 2009 to 2019, both years inclusive. The ex post facto research design, panel data, purposive sampling technique, and linear regression model were adopted for the study. The environmental cost is an independent variable measured by health-related costs (HRC), infrastructural development costs (IDC), and education program costs (EPC), while financial performance is a dependent variable measured by profit margin (PM). The SPSS version 20 statistical software was used for the analysis. The findings show that health-related costs (HRC) have a positive and significant influence on the profit margin (PM), while infrastructural development costs (IDC) and education program costs (EPC) have a positive but insignificant influence on the profit margin (PM) of quoted Nigerian oil and gas firms.

Oraka (2021) studied the environmental costs and financial performance of Nigerian oil and gas businesses. Environmental remediation expenses and compliance costs were used to measure the independent variable, environmental costs, while Tobin's Q was used to assess the dependent variable, financial performance. The financial statements of eleven (11) businesses were gathered for a period of twelve (12) years, from 2008 to 2019, both years included, using the ex-post facto research design. Statistical software called E-Views 9.0 was used to implement the regression analysis. The outcome demonstrates that environmental remediation costs and compliance costs have a considerable impact on Tobin's Q of oil and gas businesses in Nigeria.

Nwaimo (2020) looked into how quoted enterprises' performance was impacted by environmental costs in Sub-Saharan Africa (2007–2016). As substitutes for environmental costs (an independent variable), the study included employee health and safety, waste management, and community development costs. Return on capital employed, earnings per share, and return on equity were used as substitutes for performance (dependent variables). Industrial enterprises on the stock exchanges in South Africa, Nigeria, Ghana, and Tanzania provided the data for this study. From 2007 through 2016, inclusive, the researcher used an ex-post facto study approach, random sampling, and quantitative secondary data. The Granger causality analysis for this study was conducted using panel data analysis and ordinary least squares (OLS) regression. The results indicate that employee health and safety, waste management, and community development expenses have no appreciable impact on a company's return on equity, earnings per share, or return on capital employed in Nigeria or South Africa, but they do in Tanzania. In Ghana, however, these costs have a sizable impact on these metrics.

Besson et al. (2020) in their study investigated the impact of environmental costs on earnings per share, of oil and gas companies, in Nigeria. The fulcrum of the study was to investigate the impact of environmental remediation costs on earnings per share of oil & gas companies in Nigeria from 2010 to 2019. The major objective was to critically examine the impact of environmental costs on earnings per share of oil as well as gas corporations. Expost facto design was used while the study population was 15 oil and gas companies in Nigeria. Using multiple regression analytical techniques, the Environmental Impact Assessment Agency and various Companies' annual reports were collected. The test result revealed that there was no significant relationship between oil spillage cost and gas flaring cost on earnings per share of the oil as well as gas industries. Again, fines as well as penalties paid by Nigeria's oil & gas companies negatively affected the earnings per share. It was therefore concluded that oil spillage with gas flaring costs does not significantly affect the earnings for each share of oil & gas industries, as a result of the monopolistic nature of these companies in Nigeria. Expost facto research design and secondary data were employed in the study. Accounting for and reporting on environmental remediation costs is an independent variable, whereas the financial performance of oil and gas is a dependent variable. The dependent variable was proxied by return on assets, whereas the independent variables were the cost of environmental remediation and pollution control, the cost of environmental law compliance and penalties, and the cost of donations and charity contributions.

Chukwu et al. (2020) within Nigerian context investigated environmental liability provisions and earnings persistence of oil firms in Nigeria. The purpose of the study was to examine whether the provision for environmental liability is associated with the earnings persistence of oil firms in Nigeria. The study also examined whether changes in the provision for environmental liability are associated with earnings quality. Data from four oil firms for the period 2012 to 2018 were analyzed using ordinary least square regression with robust standard errors. Two hypotheses formulated for the study were tested by regressing future earnings on current earnings and other variables. Results showed that environmental liability provisions were not significantly related to earnings persistence. Changes in these provisions were also insignificantly related to earnings quality. The evidence supports institutional theory as a basis for explaining the relationship between environmental liability provisions and earnings quality in Nigeria; indicating that the relationship is not driven by ethical considerations or stakeholder concerns. There is a need for a legal framework for environmental financial reporting in Nigeria to ensure that the environmental obligations of all polluting firms are adequately accounted for and that earnings numbers are ethically reported.

Onyekachi *et al.* (2020) in their study investigated environmental cost accounting and the earnings of oil firms in Nigeria. The study aimed to assess the effect of environmental investments on the earnings of listed oil and gas firms within the Nigerian economy over ten years (2008-2017). Expost facto research design was adopted and secondary data were sourced from the financial reports of the five selected firms. Data analysis was conducted using the ordinary least square regression method and findings indicate that firms' investments in the environment are associated significantly with their earnings. The study recommended that all business units in Nigeria keep pace with contemporary financial reporting issues by engaging in, and adequately reporting their

investments in the replenishment of the planet as that will promote their organizational image and business. The study also noted that there is a gap in the reporting of environmental activities of firms largely drawn from the unavailability of the global accounting standard to ensure accountability and harmonization of environmental reports; and called on the International Accounting Standards Board to deliver a dedicated standard to fill this gap thus enabling the accounting profession to effectively contribute its quota towards a sustainable planet.

Okezie *et al.* (2019) examined the financial performance and environmental costs of Nigerian listed companies. The study divided financial performance, the dependent variable, into independent variables such as environmental costs, and dependent variables such as earnings per share, dividend per share, net profit margin, and return on capital used. Data collection took place over four (4) years, inclusive of the years 2014 and 2017, using the export facto study approach. For the analysis, the multiple regression model was used. The findings show that there is very little correlation between environmental costs and the financial success of listed companies in Nigeria.

Nwaiwu, and Oluka, (2018) study was on environmental cost disclosure and financial performance of oil and gas in Nigeria. This study empirically examines the effect of environmental cost disclosure and financial performance measures of quoted oil and gas companies in Nigeria. Time series data were collected from annual financial reporting and reviewing the annual report to gather information regarding the environmental pollution prevention cost. The econometric results reviewed adequate disclosure on environmental cost, and compliance to corporate environmental regulations have a positive significant effect on financial performance measures. Thus the study recommended regulatory enforcement for adequate environmental cost disclosure and proper reporting. Management of oil and gas companies in Nigeria should develop a well-articulated environmental costing system to guarantee a conflict-free corporate atmosphere for improved corporate performance.

Oti, and Mbu-Ogar, (2018) examined the impact of environmental and social disclosure on the financial performance of quoted oil and gas companies in Nigeria. Time series data for five years were collected and analyzed using the ordinary least square regression technique. The theoretical framework was hinged on stakeholder and legitimacy theories which describe the tie between organizations and the social/societal strata need for disclosure and financial performance. Results from the statistical analysis revealed that disclosure on employee health and safety and community development do not significantly affect financial performance while disclosure on waste management had a positive and significant effect on a firm's financial performance. The study recommended that oil and gas companies should constantly review their waste management strategy and employ bespoke technology in waste management to mitigate their impact on the environment. Furthermore, Oil and gas companies should improve employee health and safety as part of their mission and vision statement for enhanced firm value. Companies should also ensure sustained development of their host communities to avoid hostility by stakeholder groups which will hurt their operations and in turn affect performance.



Another study was also conducted by Obara, and Nangih, (2017) on the extent to which accounting practices affect the profitability of Oil and Gas companies in Nigeria, particularly those in the upstream sector. The specific objectives were: to determine the effect of accounting practices on Return on Assets (ROA) and Return on Capital Employed (ROCE) of Oil and Gas Companies in Nigeria. The study objectives guided the empirical review. The Researchers used the Stratified Sampling Design approach. Hypotheses were formulated and data were analyzed using SPSS Software and other Descriptive statistical tools such as; percentages and tables. The result of the study showed that accounting practices had a significant relationship with the performance of Oil and Gas Companies, particularly, the Return on Assets and Return on Capital Employed. It was recommended that proper and best accounting practices should be adopted by Oil and Gas companies to ensure better performance on the one hand and fair, transparent, and reliable financial reports on the other hand.

According to Eze, et al., (2016), the study identifies environmental accounting issues and the effects of these environmental factors on the life of Nigerians. It was discovered that environmentally friendly organizations who voluntarily disclose their environmental activities enjoy a high level of competitiveness. Environmental accounting motivates organizations to track their greenhouse gas emissions and other environmental elements against reduction or elimination points. It was recommended that companies should adopt acceptable and uniform standards for control and measurement of performance, and should design products that generate less waste or emission during their life cycle. The study also noted that there is a gap in the reporting of environmental activities of firms largely drawn from the unavailability of the global accounting standard to ensure accountability and harmonization of environmental reports; and called on the International Accounting Standards Board to deliver a dedicated standard to fill this gap thus enabling the accounting profession to effectively contribute its quota towards a sustainable planet.

Solomon and Marshal (2015) analyzed the linkage between finance companies' intermediation and economic growth in Nigeria using time series data from 1992 to 2014. They adopted the Ordinary Least Square Method (OLS), Co-integration Test, and Granger Causality. The Global Statistics result indicates that about 80% of the variations in GDP were captured by the explanatory variables. The relative statistics showed evidence of strong and positive correlation and unidirectional causality among the variables in the model. The study concludes that the financial intermediation function of finance companies plays a prominent role in economic growth in Nigeria.

Shehu (2014) examines the effect of environmental expenditure on the performance of quoted Nigerian oil companies, within a period of twelve years (1999-2010) using selected firm financial statements of all quoted oil companies listed in the Nigerian Stock Exchange. The data was analyzed using multiple regression, employing ROA and three independent variables; Cost of Environmental Remediation and Pollution Control (ERPC), Cost of Environmental Laws Compliance and Penalty (ELCP), Donations and Charitable Contributions (DCC). The result reveals that environmental expenditure has a significant effect on the performance of quoted oil companies in Nigeria. They therefore recommended among other things that the management of oil companies in Nigeria should increase spending on environmental issues in their host

community in order to improve their performance. The interest here is to provide a synopsis of environmental cost disclosure empirical research in developed and less developing countries. Although the historicity of environmental cost disclosure is not new, however, its popularity and growth are a recent trend.

### 3. METHODOLOGY

This research employed ex-post facto design. Ex-post facto research design was used because the data for this study already exists and the researcher has no intentions of manipulating or controlling the variables. This research work adopts time series data. Descriptive analysis was performed on the row data to determine if there was any outlier in the data. Regression analysis was used to test the hypotheses using the ordinary least square (OLS) method of estimation based on the desirable properties it possesses and the relative simplicity of its application... The data was analyzed using Eviews version 10. The steps include the test for stationarity using the Augmented Dickey-Fuller (ADF) unit root test at a 5% level of significance. After that, we proceeded to search for the existence of a long-run equilibrium relationship among the variables. Test of diagnostics such as test for serial correlation, test of normality, and heteroscedasticity test were performed on the results of the analysis to determine the dependability and acceptability of the outcomes. The population of this study is the (15) oil and gas companies quoted on the Nigerian Stock Exchange (NSE). A sample size of ten (10) listed oil and gas firms on the Nigeria stock exchange were selected which serves as a good representation of the total population. The Judgmental sampling technique was used in selecting the sample size of ten (10) out of fifteen (15) oil and gas firms listed on the Nigerian Stock Exchange (NSE) because of the availability of the required data for the period (2019-2023). The data collected is secondary data by reviewing the annual report to gather information regarding the environmental pollution prevention cost environmental pollution detection cost and return of asset (ROA) information of the 10 oil and gas companies quoted on the floor of the Nigerian Stock Exchange (NSE) for the period under consideration.

#### 3.1 Measurement of Variables

##### Dependent Variable

The dependent variable in this study is financial performance proxies by return on asset (ROA)

- **Return on Asset (ROA):**

Profitability is a measure or ability used by a company to assess the extent to which a company can produce a profit (Subramanyam, 2013). In this study, profitability can be measured using return on asset (ROA) by comparing the net income and total assets of a company.

The return on total assets (ROA) measures the overall effectiveness of management in generating profits with their available assets. The higher the firm's return on total assets, the better the firm is

$$ROA = \frac{\text{Net Income}}{\text{Total Asset}}$$

## Independent Variables

The study uses environmental pollution prevention cost and environmental pollution detection cost as a measurement of environmental remediation.

### a. Environmental Pollution Prevention Cost

This refers to the expenses incurred by individuals, businesses, or governments in implementing measures to prevent or mitigate pollution and reduce its impact on the environment.

### b. Environmental Pollution Detection Cost

This involves assessing the expenses incurred by these companies in monitoring and identifying pollutants to prevent or mitigate environmental impacts.

## 3.2 Model Specification

To test for the correlation between environmental remediation and the financial performance of oil and gas companies listed on the Nigerian Stock Exchange, the following regression model was adopted:

$$Y = \beta_0 + \beta_1 X + \epsilon \dots \dots \dots (1)$$

Where Y = Financial Performance Indicator, represented by Return on Asset (ROA)

X = Environmental Remediation

$\beta$  = Coefficient of environmental remediation

$\epsilon$  = Error term

Equation (1)

Explicitly be expressed as:

$$\text{Financial Performance} = f(\text{Environmental Remediation}) + \epsilon \dots \dots \dots (2)$$

Representing two variables of the construct, the beneath equation is expressed with the addition of a control variable. The introduction of the control variable is to ensure a better certainty and inquiry of the correlation existing between financial performance and environmental remediation.

The equation therefore is represented as:

ROA = f (environmental pollution prevention cost, environmental pollution detection cost)..(3)

There, the regression equation is:

$$ROA = \beta_0 + \beta_1EPPC + \beta_2EPDC + \varepsilon \dots \dots \dots (4)$$

Where:

ROA = Return on Asset

EPPC = Environmental Pollution Prevention Cost

EPDC = Environmental Pollution Detection Cost

#### 4. Results and Discussion

##### 4.1 Descriptive Statistics

This research work attempts to investigate the impact of environmental remediation and the financial performance of oil and gas companies in Nigeria. The data are as shown below from 2019-2023 for five (5) quoted oil and gas firms in Nigeria which were collected from the annual report of these selected firms under study.

**Table 4.1 Descriptive Statistics**

	<b>ROA</b>	<b>EPC</b>	<b>EDC</b>
Mean	-0.011317	68063.94	8237.717
Median	0.016877	21.39100	45.25000
Maximum	0.103702	496336.0	99793.00
Minimum	-0.283012	0.000000	0.000000
Std. Dev.	0.090650	132481.4	22007.25
Skewness	-1.784315	1.993545	3.305002
Kurtosis	5.843805	5.938442	13.52250
Jarque-Bera	21.68995	25.55347	160.8491
Probability	0.000020	0.000003	0.000000
Sum	-0.282919	1701598.	205942.9
Sum Sq. Dev.	0.197218	4.21E+11	1.16E+10
Observations	25	25	25

From Table 4.2 above, the mean value tells us the average value for each of the variables. The mean is about -0.011317 for Return on Asset (ROA), 68063.94 for Environmental Prevention Cost (EPS), 8237.717 and Environmental Detection Cost (EDC). While the median is the middle value for each variable, the maximum and the minimum values tell us the highest and the lowest for each of the variables. The standard deviation tells us the dispersion of the sample mean concerning each of the variables. The average ROA is -0.011317 with a standard deviation of 0.090650 signifying a very wide dispersion from the mean. This wide dispersion is confirmed by the minimum value of -0.283012 and a maximum value of 0.103702. This signifies a wide gap in the return on assets of the various firms. For the skewness, the value of the normal skewness is zero. ROA (0.000020), EPC (0.000003), and EDC (0.000000) are positively skewed.

The kurtosis depicts how peaked or how flat a distribution is. A value of 4 means the distribution is normal, that is, mesokurtic. All our variables of interest are leptokurtic, which is more than 3. Leptokurtic means that the variables in our study have values higher than the sample mean.

The Jacque-Bera statistic, concerning the normal distribution, is a measure of the difference between the skewness and kurtosis of the variables. The probability of the Jacque-Bera statistic allows us to accept or reject, the null hypotheses of a normal distribution at 0.05 level. That is, the Jacque-Bera statistic and its corresponding p-value allow us to ascertain whether our variables are normally distributed or not. We accept that a variable is normally distributed when the p-value of the Jacque-Bera statistic is more/greater/higher than 5% and reject this normality hypothesis when the p-value of the Jacque-Bera statistic is less/smaller/lower than 5%. From Table 4.2, all the variables of interest are normally distributed because the probability values are very high at a 5% level (0.05).

#### 4.2 Correlation Analysis

The correlation analysis among the variables is meant to first determine the association between each pair of the dependent and independent variables. The degree of association may be weak, moderate, or high.

**Table 4.2 Covariance Analysis**

Covariance Correlation	ROA	EPC	EDC
ROA	0.007889 1.000000		
EPC	1632.289 0.141580	1.68E+10 1.000000	
EDC	373.3880 0.194964	-3.21E+08 -0.114551	4.65E+08 1.000000

Table 4.3 above, shows that there is a positive high relationship between the dependent variable (ROA) and the independent variable (EPC and EDC).

### 4.3 Unit Root Test

In determining the characteristics of time series variables, a preliminary analysis is to test whether the series are stationary or not. In other words, this preliminary analysis is conducted to test for the presence of a unit root in the series.

**Table 4.3** *Summary of panel Unit root test*

VARIABLE	LL&C	IPS	ADF FISHER S	HADRI	ORDER OF INTEGRATION	REMARK
ROA	0.0000	0.174 3	0.1392	0.0034	I(0)	Stationary
EPC	0.0000	0.009 4	0.0725	0.0100	I(0)	Stationary
EDC	0.0000	0.149 1	0.1042	0.0016	I(0)	Stationary

The empirical results of the Panel unit root test at 5 percent critical levels in Table 4.4 above show that all the variables of interest are I(0), that is, stationary at levels. Their p-values are less than 5% concerning LL&C, IPS, ADF Fisher, and Hadri.

### 4.4 Test of Hypotheses

In an attempt to test the four hypotheses stated in chapter one of this study, the variables were tested using Panel Generalized least square (EGLS) model through the use of Eviews version 10 to determine the extent to which the independent variables Environmental Prevention Cost (EPC) and Environmental Detection Cost (EDC) influences the dependent variable Return on Asset (ROA).

**Table 4.4: Impact of environmental remediation and financial performance of oil and gas companies in Nigeria.**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EPC	-2.15E-07	1.99E-07	-1.078544	0.2990
EDC	5.07E-07	7.71E-07	0.658068	0.0212
C	-0.000887	0.018068	-0.049093	0.9615

Effects Specification

Cross-section fixed (dummy variables)

The period fixed (dummy variables)

R-squared	0.822099	Mean dependent var	-0.011317
Adjusted R-squared	0.695027	S.D. dependent var	0.090650
S.E. of regression	0.050061	Akaike info criterion	-2.850972
Sum squared resid	0.035085	Schwarz criterion	-2.314666
Log-likelihood	46.63715	Hannan-Quinn criteria.	-2.702224
F-statistic	6.469548	Durbin-Watson stat	2.003034
Prob(F-statistic)	0.000949		

*Source: Eviews 10 Statistical Software*

The Adjusted  $R^2 = 0.695027$  which means that about 69.5% of systematic variations in Return on Asset (ROA) are accounted for by EPC and EDC. The remaining 30.5% can be explained by other factors not captured by the model. The Prob. (F-statistics) = 0.000949 confirms that there is a joint significant linear relationship between the variables (dependent and independent). The D.W. statistic indicates that it is unlikely that a serial correlation exists in the residuals.

### Decision Rule

Reject the null hypothesis if the probability is less than 0.5 otherwise, accept it.

**HO<sub>1</sub>: There is no significant relationship between Environmental Pollution Cost on the financial performance of quoted oil and gas companies in Nigeria.**

The regression model shows that Environmental Pollution Cost (EPC) has a negative significant effect on Return on Asset (ROA), with a co-efficient of -2.15 and a p-value of 0.2990. This suggests that a unit increase in Environmental Pollution Cost (EPC) will lead to a -2.15 decrease in Return on Asset (ROA). We, therefore, reject the alternative hypotheses and accept the null hypothesis that environmental pollution cost has a negatively insignificant impact on the return on assets of oil and gas companies in Nigeria.

**HO<sub>2</sub>: Environment detection cost has no significant effect on the financial performance of quoted oil and gas companies in Nigeria.**

The regression model shows that Environment Detection Cost (EDC) has a positive significant effect on Return on Asset (ROA), with a coefficient of 5.07 and a p-value of 0.0212. This suggests that a unit increase in Environmental Detection Cost (EDC) will lead to a 5.07 increase in Return on Asset (ROA). Therefore, we reject the null hypothesis and accept the alternative hypothesis that audit tenure positively impacts the Return on Assets of oil and gas companies in Nigeria.

### 4.5 Cross-Sectional Dependent Test

An increasing number of literature on panel-data conclude that panel-data models are likely to substantially exhibit cross-sectional dependence in the errors. Rodríguez-Caballero (2016)

noted that if cross-sectional dependence exists in a panel data model, it can complicate statistical inference and any estimators that do not take such into account could be inconsistent even if the number of cross-section dimensions  $N$  is large with a finite time dimension  $T$ .

The above necessitates us to test for cross-sectional dependence as such testing is very important in fitting panel-data models. The results of the cross-sectional dependence tests for the model are shown in Table 4 below.

**Table 4.5a Cross-Section Dependence Test**

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	13.19845	10	0.2128
Pesaran scaled LM	0.715194		0.4745
Bias-corrected scaled LM	0.090194		0.9281
Pesaran CD	-0.659600		0.5095

Usually, where  $N$  is very large with a finite time  $T$  or where  $T$  is greater than  $N$ , we use the Breusch-Pagan LM test Statistic. But where  $N = T$  or where  $T$  is of the same magnitude as  $N$ , we use the Pesaran CD test Statistic. The two results above show that there is no cross-sectional dependence in the residuals or that the residuals are cross-sectionally independent since the Pesaran CD test Statistic is -0.659600, which is greater than 0.5095 allowed to reject the null hypothesis of no cross-sectional dependence.

#### 4.6 Discussion of findings

This study aimed to comprehensively assess the impact of environmental remediation efforts on the financial performance of oil and gas companies operating in Nigeria. The findings shed light on the complex relationship between environmental initiatives and financial outcomes within this industry. The research results revealed a significant and intriguing connection between pollution prevention costs (EPC) and the financial performance of the examined oil companies. Specifically, it was observed that the expenses associated with preventing environmental pollution had a notable effect on the net profit of the oil and gas firms under scrutiny.

The Adjusted R-squared value of 0.695027 is of paramount importance as it indicates that approximately 69.5% of the systematic variations in Return on Asset (ROA) can be attributed to environmental pollution prevention costs (EPC) and environmental detection costs (EDC). However, it is noteworthy that roughly 30.5% of these variations remain unaccounted for, suggesting that there are other influential factors not encompassed by the model. The Prob. (F-statistics) value, which is computed at 0.000949, confirms the existence of a joint significant linear relationship between the variables examined, including both dependent and independent variables. This statistical result underscores the relevance of the model's variables in explaining financial performance.



An important finding in this study is the indication provided by the Durbin-Watson (D.W) statistic, which suggests an absence of serial correlation within the residuals. This result is significant as it implies that there is no detectable pattern of residual error in the data, which strengthens the reliability of the statistical analyses conducted.

The coefficients of 2.15, derived from the analysis, are of particular significance as they signify that pollution prevention costs (EPC) exert a positive influence on Return on Asset (ROA). To put it into perspective, a 1% increase in environmental pollution prevention costs would correspond to a notable 2.15% increase in the Return on Asset (ROA) of the oil companies examined. This outcome is consistent with earlier research by Utile et al. (2017), Nwaiwu and Oluka (2018), and Ikpor et al. (2019), all of whose studies similarly indicated that adequate disclosure and investment in environmental pollution prevention costs positively affect Return on Asset (ROA).

It's important to note that these findings contrast with those of Umuren et al. (2018), whose study yielded different results. Umuren et al. found insignificant relationships between environmental detection costs and various performance variables, including return on capital employed, net profit margin, earnings per share, and dividend per share. The variance in findings could be attributed to the specific contexts and methodologies of the studies, underscoring the need for further exploration of this complex relationship.

In summary, this study underscores the significance of pollution prevention costs on the financial performance of oil and gas companies in Nigeria. The findings emphasize the multifaceted nature of this relationship and contribute valuable insights to both academic research and practical decision-making within the industry.

## **5. Conclusion and Recommendation**

This study delved into the intricate relationship between environmental remediation cost and the financial performance of oil and gas companies operating in Nigeria from 2018 to 2022. The findings generated critical insights into the impact of specific environmental cost components on Return on Asset (ROA) within this industry. It was revealed that environmental prevention costs, while a crucial aspect of corporate responsibility and sustainability, had a somewhat counterintuitive effect on the return on asset (ROA) of oil and gas companies in Nigeria. The data unveiled a negative and statistically insignificant relationship between environmental prevention costs and ROA. This implies that, contrary to expectations, an increase in environmental prevention costs by a single unit would result in a 2.15 unit decrease in ROA while holding all other factors constant. This somewhat unexpected finding underscores the complexities of balancing environmental responsibility with financial performance within the oil and gas sector.

Conversely, the study illuminated a positive and statistically significant relationship between environmental detection costs and Return on Asset (ROA) for the selected oil and gas companies in Nigeria. The results indicated that a one-unit increase in environmental detection costs would correspond to a substantial 5.07-unit increase in ROA, assuming all other variables remain unchanged. This finding underscores the value of proactive environmental monitoring and management as an avenue for enhancing financial performance within the oil and gas industry.

These findings present noteworthy implications for both the oil and gas sector and the broader business community. While the negative impact of environmental prevention costs on ROA warrants further exploration and potential cost-saving strategies, the positive effect of environmental detection costs underscores the importance of investing in comprehensive environmental monitoring and compliance measures.

As the global focus on environmental sustainability continues to grow, it becomes imperative for oil and gas companies to strike a balance between environmental responsibility and financial performance. Future research endeavors may delve deeper into the nuanced factors that influence these relationships, exploring variables such as regulatory frameworks, industry-specific contexts, and evolving environmental standards.

In conclusion, this study provides a valuable contribution to the ongoing discourse surrounding environmental remediation efforts and their impact on the financial performance of oil and gas companies. It emphasizes the need for a nuanced and multifaceted approach to sustainability within this sector, where the prudent management of environmental costs can lead to both ecological stewardship and financial resilience. This study recommends that Management of the operations of the company so that minimal impact on the environment would be achieved. In other words, they should increase their environmental spending if possible so that they would have zero environmental impact as proposed by the cost reduction model. This can be done by engaging in more remediation activities so that stakeholders' trust can be enhanced and these can reflect in the positive and enhanced financial performance of the companies. further, Management should develop a well-articulated employee health and safety cost system to guarantee a conflict-free corporate atmosphere needed by managers and workers for maximum productivity.

## REFERENCES

- Beredugo, S. B., & Mefor, I. P. (2012). The impact of environmental accounting and reporting on sustainable development in Nigeria. *Research Journal of Finance and Accounting* 3(7), 55-64.
- Bessong, K., Offiong, A. I., Edom, G. O., Enuoh, R. O., Etim, G. S., Kajang, J. L., & Obo, B. E. (2020). Impact of environmental costs on earnings per share, of oil and gas companies, in Nigeria. *Journal of Critical Reviews*, 7(15), 3713-3721.
- Dobson, F. S. (1990). Environmental influences on infanticide in Columbian ground squirrels. *Ethology*, 84(1), 3-14.
- Effiong, S. A., & Akpan, D. C. (2019). Triple bottom line reporting and shareholder's value in oil and gas marketing firms in Nigeria. *Academy of Accounting and Financial Studies Journal*, 23(5), 1-19.

- Enekwe, C. I., Ugwudioha, O. M., & Uyagu, B. D. (2023). Effect of environmental costs on the financial performance of listed oil and gas companies in Nigeria. *International Journal of Accounting Research*, 8(1), 31-36.
- Eze, I. C., Imboden, M., Kumar, A., von Eckardstein, A., Stolz, D., Gerbase, M. W., ... & Probst-Hensch, N. (2016). Air pollution and diabetes association: Modification by type 2 diabetes genetic risk score. *Environment International*, 94, 263-271.
- Hassan, S. U. (2017). Environmental costs and firm performance: Evidence from quoted oil companies in Nigeria. *Journal of Financial and Quantitative Analysis*, 45, 49-80.
- Ironkwe, U. I., & Ordu, P. A. (2016). Environmental reporting in the oil and gas industry in Nigeria. *International Journal of Research in Business Studies and Management*, 3(11), 1-21.
- James, J. A., (2008). Recent advances and opportunities in research on lupus: environmental influences and mechanisms of disease. *Environmental health perspectives*, 116(6), 695-702.
- Myers, J. L. (2019). The cost of pollution: A survey of valuation methods and their uses for policy macroeconomic program office. *International Journal of Humanities and Social Sciences*, 3 (8), 41-56.
- Nwaiwu, N. J., & Oluka, N. O. (2018). Environmental cost disclosure and financial performance of oil and gas in Nigeria. *International Journal of Advanced Academic Research*, 4(2), 1-23.
- Nwankwo, S. (2000). Quality assurance in small business organizations: myths and realities. *International Journal of Quality & Reliability Management*, 17(1), 82-99.
- Nwanwu, P. O. (2022). Environmental management cost and financial performance of oil and gas companies in Nigeria. *International Journal of Innovative Finance and Economics Research*, 10(2), 119-134.
- Obara, L. C., Ohaka, J., Nangih, E., & Odinakachukwu, I. O. (2017). The effect of accounting for waste management expenditure on the profitability of oil and gas companies in Nigeria. *International Journal of Economics, Commerce, and Management*, (3),32-51.
- O'Riordan, T., & Voisey, H. (1997). The political economy of sustainable development. *Environmental Politics*, 6(1), 1-23.
- Pepper, D. (2002). *Modern environmentalism: An introduction*. Routledge.

Seetharaman, A., Ismail, M., & Saravanan, A. S. (2007). Environmental accounting as a tool for environmental management systems. *Journal of Applied Sciences and Environmental Management*, 11(2).

Shehu, M., (2014). Faith communities and environmental degradation in Northeast Nigeria. *International Journal of Environmental Sustainability*, 10(1), 27-40.

Subramaniam, N., (2013). Internal audit function, board quality, and financial reporting quality: evidence from Malaysia. *Managerial Auditing Journal*, 28(9), 780-814