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Environmental Remediation Costs and Financial Performance of Listed Oil and Gas Companies in Nigeria

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ABSTRACT

The neglect by oil and gas companies of the negative footprints and externalities arising from their economic activities along with various environmental abuses have led to severe harm on human lives and ecosystem. This study therefore examined the effect of environmental remediation costs on financial performance of listed oil and gas companies in Nigeria from 2013-2022. Specifically, the study examined the effect of waste management costs, environmental cleanup costs and environmental safety costs on return on assets of these companies. The research design adopted for this study was ex post facto and secondary data used were obtained from the annual reports of ten (10) listed oil and gas companies in Nigeria. The ordinary least square regression technique was used to analyze the data and the statistical package employed was E-views version 10. The results of the analysis showed that waste management costs have insignificant negative effect on return on assets; environmental cleanup costs and environmental safety costs have significant positive effect on return on assets of the companies under study. Therefore, it was concluded that environmental remediation costs can in the long run enhance the profitability of listed oil and gas companies in Nigeria. Based on this, it was recommended among others that management of oil and gas companies in Nigeria should invest in innovative waste management practices to remediate and restore the environment as this can benefit the company in the long run. Also that the management of oil and gas companies in Nigeria should develop comprehensive contingency plans and set aside reserves specifically earmarked for environmental cleanup activities to ensure prompt and effective response to any incidence of environmental emergencies.

Keywords: Environmental remediation costs, financial performance, profitability, return on assets, environmental safety cost

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1.1 INTRODUCTION

The issue of environmental remediation and environmental restoration has become a global concern to all countries in the world. Nigeria, as a prominent player in the global oil and gas industry, faces significant environmental challenges stemming from decades of petroleum exploration and production activities. These activities have led to widespread environmental degradation, including soil and water contamination, air pollution, and habitat destruction, particularly in the Niger Delta region. In response to growing concerns about the environmental impact of the oil and gas sector, regulatory bodies and international organizations have pushed for increased environmental remediation efforts to mitigate the adverse effects on local communities and ecosystems.

Environmental remediation, encompassing remedial actions taken to address contamination, pollution, and ecological damage caused by oil and gas operations, stands at the forefront of efforts to mitigate environmental risks and ensure long-term environmental sustainability (Abiola & Agboola , 2022). The cost of environmental remediation represents a substantial financial burden for oil and companies, often requiring substantial investments in waste management, cleanup and safety activities, habitat restoration, pollution control measures, and community engagement initiatives. However, the implementation of environmental remediation measures comes with substantial costs for oil and gas companies operating in Nigeria and any country in the world. These costs include expenses associated with waste management, cleanup technologies, environmental safety, rehabilitation of impacted areas, and compensation for affected communities, regulatory compliance, and potential legal liabilities.

The financial burden of environmental remediation can significantly impact the profitability and financial performance of oil and gas companies, thus affecting their ability to invest in exploration, production, and expansion projects. Waste management encompasses expenses associated with recycling, waste collection, transportation, processing, and disposal, including labor, equipment, facilities, and regulatory compliance. Initiatives like recycling, composting, and waste-to-energy technologies can mitigate costs and environmental impacts (EPA, 2021). In Nigeria, proper waste management is vital to mitigate health and environmental risks associated with improper wealth creation practices. Environmental cleanup cost are those expenses involved in remediation efforts to address oil spillage, contamination and environmental damage caused by the exploration, production, transportation, marketing and storage of oil and gas product. Oil spills are frequent events in Nigeria and it is estimated that 10- 13 million tons of oil have been spilled into the environment (Oraka, 2021). Environmental safety cost has to do with

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expenses associated with preventing, mitigating, and remediating environmental risks to ensure human health and environmental protection (EPA, 2021). These costs include implementing environmental management systems, conducting environmental impact assessments, monitoring environmental parameters, and implementing pollution control measures. Understanding the relationship between environmental remediation costs and the profitability of oil and gas companies in Nigeria is crucial for policymakers, industry stakeholders, investors, and the broader society.

Financial performance refers to the degree to which financial objectives have been achieved. It is monetary achievements attained by improved sales, improved efficiency, improved profitability and improve market value to its shareholders as a result of sound financial management (Adegboyegun & Igbekoyi, 2022). Profitability is a measure of a company's ability to generate earnings or profits relative to its costs and expenses. It indicates the effectiveness of a business in utilizing its resources to generate revenue and achieve financial success. Profitability is a key financial metric that investors, analyst and stakeholders use to evaluate the financial performance and sustainability of firms. The cost of environmental remediation can significantly affect the profitability of oil and gas companies (Egedegu et al., 2024). High remediation costs can eat into profits directly, impacting the bottom lines. Additionally, they can also lead to reputational damage and regulatory fines, which can further erode profitability. Moreover, increased scrutiny from investors and stakeholders on environmental practices can affect investors' confidence and access to capital, influencing long-term profitability. Therefore, managing environmental remediation costs effectively is crucial for maintaining profitability and sustainability in the oil and gas industry. However, while environmental remediation costs may initially appear as a financial burden, proactive efforts to address environmental issues can ultimately contribute to improved profitability through risk reduction, efficiency gains, reputation enhancement and access to capital.

Businesses for many decades have ignored the impact of their activities on the natural and social environment in which they operate because they regard sustainability strides as expenses that would erode their profit bottom lines. Despite the rising interest in environmental issues, there have been divergent views regarding the nature of the effect of waste management cost, environmental cleanup cost, and environmental safety cost on financial perfomance of companies in Nigeria. The empirical literature showed that most of the studies focused on the environmental cost (Kansilembo et al., 2023; Ibeanu, et al., 2023; Abiola & Agboola, 2022; Idowu & Agboola, 2021; Oraka 2021); environmental accounting (Egedegu et al., 2024; Ilelaboye et al., 2022); environmental cost disclosure (Samuel et al., (2020; Ayu et al., 2020); environmental liability (Majekobaje, 2024) and environmental degradation (Horsfall & Womenazu, 2022). It was also observed that other

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measures of performance were used such as return on equity (Horsfall & Womenazu, 2022); return on assets, (Abiola & Agboola, 2022); Iliemena, 2020); Tobin's Q (Oraka, 2021) and earnings per share (Nwaimo, 2020). Unfortunately, the findings of these studies were mixed and there was no consensus on the effect of environmental practices on financial performance of firms in Nigeria. In order to resolve the obvious research gap left by the literature in terms of unanimous outcomes from previous similar studies, this study was carried out to ascertain the effect of environmental remediation costs on profitability of listed oil and gas companies in Nigeria from 2013-2022.

2.0 Review of related literature

Environmental remediation costs

Environmental remediation is the process of cleaning up, restoring, and rehabilitating contaminated sites, polluted areas, hazardous waste sites, and degraded environments to protect human health, safeguard ecosystems, preserve natural resources, and prevent further environmental damage. Environmental remediation aims to reduce, remove, treat, contain, control, minimize, isolate, or neutralize pollutants, contaminants, toxins, chemicals, pathogens, radiations, wastes, emissions, discharges, spills, leaks, releases, exposures, impacts, risks, hazards, threats, disturbances, disruptions, and liabilities that pose risks to public health, safety, welfare, environment, biodiversity, ecosystems, habitats, water quality, soil quality, air quality, food safety, and quality of life (Egedegu et al., 2024). Environmental remediation is carried out by oil and gas companies to reduce the environmental impact of their economic activities. Therefore, all costs associated with environmental remediation is referred to as environmental remediation cost. According to Amahalu et al. (2018), environmental remediation costs means has significant effect on the performance of companies in Nigeria

Environmental remediation costs have significant effect on the financial performance of oil and gas companies in Nigeria. These costs are incurred to rectify damages caused by operations, such as oil exploration, drilling, pollution or habitat destruction, and can have both short-term and long-term effects on profitability. In the short term, higher remediation costs can lead to increased expenses, reducing net income and impacting net profit margin (NPM). Additionally, these expenses can negatively affect return on assets (ROA) by reducing the value of assets or increasing depreciation associated with environmental liabilities. However, in the long run, strategic investments in environmental remediation and restoration can contribute to improved financial

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performance by mitigating operational risks, enhancing corporate reputation, and reducing regulatory scrutiny.

Financial performance

Financial performance refers to the degree to which financial objectives have been achieved. It is a monetary achievement attained by improved sales, improved efficiency, improved profitability and improve market value to its shareholders as a result of sound financial management (Akpan et al., 2024; Adegboyegun & Igbekoyi, 2022). Company financial performance is the most important indicator of business growth because it demonstrates the companies' capacity to increase income levels (Ghazali et el., 2022).In this study financial objective was measured in terms of firm's profitability. Profitability is a measure of a company's ability to generate earnings or profits relative to its costs and expenses. It indicates the effectiveness of a business in utilizing its resources to generate revenue and achieve financial success.

Profitability is a key financial metric that investors, analyst and stakeholders use to evaluate the financial performance and sustainability of firms. Profitability is the primary goal of all business ventures. Without profitability the business will not survive in the long run. So measuring current and past profitability and projecting future profitability is very important. This study employed return on assets (ROA) as a measure of profitability. Return on assets (ROA) is a financial metric that measures a company's profitability by evaluating its ability to generate returns on the assets employed. A higher and stable ROA implies that the company has a competitive advantage, efficient operations, and effective capital allocation. It allows for comparisons between companies operating in different industries or sectors. Since it is a percentage measure, it standardizes performance assessment and helps identify companies with superior returns relative to their assets base. It is calculated as the ratio of net income to total assets thus;

$$\text{ROA} = \frac{\text{PAT}}{\text{Average total Assets}} \times 100$$

Waste Management Costs and Financial Performance

This encompasses expenses associated with recycling, waste collection, transportation, processing, and disposal, including labor, equipment, facilities, and regulatory compliance. According to EPA (2021), waste management cost encompasses expenses associated with waste collection, transportation, processing, and disposal, including labor, equipment, facilities, and regulatory compliance (EPA, 2022). In Nigeria, proper waste management is vital to mitigate health and environmental risks associated with improper practices

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(Federal Ministry of Environment, 2016). However, challenges such as inadequate funding, infrastructure, and public awareness contribute to the high cost of waste management in the country (Alao et al., 2021). To address these challenges, the Nigerian government has introduced initiatives like the Extended Producer Responsibility (EPR) program and the National Policy on Solid Waste Management (Federal Ministry of Environment, 2016). According to Amahalu et al., (2018) waste management costs has significant effect on the performance of companies in Nigeria while Majekobaje (2024) observed negative effect of waste management cost. Thus flowing from the above argument, it was hypothesized that;

$H_0$1; Waste management costs have no significant effect on return on assets of oil and gas companies in Nigeria.

2.1.3 Environmental cleanup costs and financial performance

Environmental cleanup costs refer to the expenses involved in remediation efforts to address oil spillage, contamination and environmental damage caused by the exploration, production, transportation and storage of oil and gas product. Oil spills are frequent events in Nigeria and it is estimated that 10- 13 million tons of oil have been spilled into the environment. The spill are caused by sabotage, oil exploration activities, equipment failure, pipeline corrosion and tanker accidents. The companies spend trillion on naira to clean up this spillage to safeguard the environment and the ecosystem. In Nigeria, factors influencing cleanup costs include contamination severity, site accessibility, resource availability, and legal frameworks (Olatunde et al., 2019; Osunyikanmi, 2021). While cleanup efforts offer benefits such as human health protection, environmental restoration, and economic and social advantages, challenges like limited resources and weak regulatory enforcement persist (Freedman & Shehadeh, 2019; Olatunde et al., 2019). Samuel et al., (2020) found a significant positive relationship between environmental cleanup costs and financial performance while Olatunde et al. (2019) found no relationship. The second hypothesis was formulated thus;

$H_0$2: Environmental cleanup cost does not have any significant effect on return on assets of listed oil and gas firms in Nigeria.

2.1.4 Environmental safety cost and financial performance

Environmental safety cost refers to expenses associated with preventing, mitigating, and remediating environmental risks to ensure human health and environmental protection

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(EPA, 2021). These costs include implementing management systems, conducting impact assessments, monitoring environmental parameters, and implementing pollution control measures (EPA, 2021). In Nigeria, environmental safety is crucial given challenges such as air, water, and soil pollution, as well as inadequate hazardous waste management (Ikpor et al., 2019). Although the government has enacted regulations like the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act, weak enforcement remains an issue, necessitating collaborative efforts to improve environmental safety (Adebayo et al., 2020). Nwaimo (2020) stated that prioritizing environmental safety safeguards the health and well-being of employees working in the oil and gas industry. Nwaimo (2020) observed a significant positive relation between environmental safety costs, while Ikpor et al., (2019) concluded a negative significant relationship. This the third hypothesis was developed for the study;

$H_0$3: Environmental safety cost has no significant effect on return on assets of listed oil and gas firms in Nigeria.

2.2 Theoretical framework

Stakeholder Theory by Edward Freeman (1984)

This theory was propounded by by Edward Freeman in his business literature entitled Strategic Management: A Stakeholder Approach (Freeman, (1984). Stakeholder theory emphasizes that beyond shareholders there are several agents that are interested in firms' actions and decisions (Akpan et al., 2024; Fadun, 2014). Stakeholder theory's normative stance exhorts managers to work for the interests of all stakeholders. In terms of the managerial perspective of stakeholder theory, it considers the interests of a small group of interested parties who have a considerable amount of control over the organization. The theory backs up the notion that management is encouraged to align company needs with their environment as expected by various stakeholder groups (Uwuigbe et al., 2013). The stakeholder theory argues that firms have a moral obligation to consider and appropriately balance the interest of all stakeholders (Freeman, 1984).

This study is anchored on this theory because it is premised on the notion that stakeholders expect companies to be socially and environmentally responsible so that there is a market premium in improved environmental sustainability practices which in turn boost the firms' financial performance.

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2.3 Empirical Reviews

There have been several empirical studies on the effect of environmental cost on the financial performance and some of these studies are reviewed below; Egedegu et al., (2024) investigated the relationship between environmental accounting and financial performance of Conoil. The regression analyses reveal that while environmental restoration costs do not have a significant negative impact on return on assets (ROA), ERC nor health, safety, and environmental expenses (HSE) significantly influence profit after tax (PAT). Majekobaje (2024) investigated the relationship between environmental liability and financial performance of listed oil and gas companies in Nigeria. The findings of the study showed that using the dimensions of Compensation obligation and profitability, and the dimensions of Remediation Obligation and Market Value, Environmental liability has a positive and significant relationship with financial performance of oil and gas companies in Nigeria. While environmental liability dimension of Remediation has no significant relationship with profitability of oil and gas firms in Nigeria.

Akpan et al. (2024) examined the effect of environmental disclosure on cost of equity of listed consumer goods firms in Nigeria. *Ex-post facto* research design was adopted, and panel data covering ten (10) years (2013-2022) were collected across eighteen (18) listed consumer goods firms in Nigeria which formed the sample size of the study. The data collected were analysed using panel multiple regression analysis via E-views 10.0 statistical package. The study findings revealed that environmental risk disclosure (Coeff. = -0.0269{0.0107}) and waste management disclosure (Coeff. = -0.0178{0.0009}) have significant negative relationships on cost of equity (COE) of listed consumer goods firms in Nigeria while greenhouse gas emission disclosure (GGED) has an insignificant negative effect (Coeff. = -0.0075{0.3966}) on cost of equity (COE) of listed consumer goods firms in Nigeria.

Kansilembo et al. (2023) explored the relationship between environmental costs and financial performance of two large national plastic manufacturing companies, namely Bowler Metcalf Limited (BML) and Nampak Ltd, between 2018 and 2019. The results showed a positive relationship between environmental costs and profits in the financial statements of these two companies during 2018 and 2019. Ibeanu, et al., (2023) determined the impact of environmental cost on corporate performance of selected oil firms in Nigeria with emphasis on determining the extent to which environmental remediation and pollution control cost, environmental law compliance and penalty cost, and employee health and safety cost affect corporate performance. The result of the analysis showed that environmental remediation and pollution control cost have

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significant and positive effect on return on assets of the sampled oil and gas firms in Nigeria. Horsfall and Womenazu (2022) investigated the relationship between the cost of environmental degradation and the financial performance of oil and gas companies in Nigeria. The findings indicated that EPRC is negatively related to ROE and has a negative insignificant relationship with ROA. Conservation costs have a positive non-significant relationship with ROE and ROA.

Ilelaboye et al., (2022) examined the effect of environmental accounting on the performance of family-owned companies in Nigeria using restoration cost, community development costs and health & security costs as surrogates. The findings showed that restoration cost has a negative and insignificant effect on the financial performance, and community development cost has a negative and significant effect, while health safety cost has a positive and insignificant effect on financial performance.

3.0 METHOD

The research design adopted for this study was ex-post facto design and this design was suitable for this study because the data employed were secondary. The population of the study comprised all 10 oil and gas companies listed on the Nigerian Exchange Group as of December 31, 2022 and all the population was studied. Secondary data source used were obtained from Nigerian Exchange Group fact book and annual financial statements of the studied companies for the period of ten years (2013 to 2022). This study employed the Ordinary Least Square regression technique to examine the interaction among the variables and estimate the relevant data. The econometric model used in establishing the relationship between environmental remediation costs and financial performance of listed oil and gas firms in Nigeria was adopted from the study of Kansilembo et al., (2023) and modified to suit this study as presented below:

Financial performance = f(environmental remediation costs) (1)

ROA = $\beta_0 + \beta_1 WMC_{it} + \beta_2 ECC_{it} + \beta_3 ESC_{it} + u_{it}$ (2)

Where
ROA = return on asset
WMC = waste management costs
ECC = environmental cleanup costs
ESC = environmental safety cost
β_0 = constant slope to be estimated
β_1 – β_3 = intercept to be estimated
u= error term

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Table 3.1: Operationalization of variables

S/N	Variable	Measurement	Sources	Apriori sign
1	Return on assets (Dependent variable)	Ratio of profit for the year to total assets.	Oraka (2021)	
2	Waste management costs	Log of waste management costs	Adeniyi & Adebayo (2020)	-
3	Environmental clean-up costs	Log of environmental clean up costs	Adeniyi & Adebayo (2020)	-
4	Environmental safety costs	Log of environmental safety costs	Oraka (2021)	-

4.0 Analysis and results

4.1.1 Descriptive statistics

Table 4.1 Descriptive statistics of the effect of environmental remediation costs on return on assets of oil and gas firms in Nigeria

	ROA	WMC (N'M)	ECC (N'm)	ESC (N'm)
Mean	0.070234	52.83967	19.84393	10.54920.
Median	0.035991	30.00000	11.876.00	15.30056
Maximum	6.174312	410.8000	39.84527.	98.09243
Minimum	-2.359907	5.00000	3.100000	3.600000
Std. Dev.	0.562481	310.2771	37.06007	191.3106
Skewness	7.603346	12.58201	2.534469	2.398816
Kurtosis	85.48086	164.0982	9.660038	8.656174
Jarque-Bera	52757.51	199393.9	525.3768	412.5719
Probability	0.000000	0.000000	0.000000	0.000000
Sum	12.64213	9511.140	35719082	1.90E+08
Sum Sq. Dev.	56.63282	17232667	2.46E+13	6.55E+14
Observations	100	100	100	100

Source: Author's computation (2024)

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From table 4.1 above, the average return on assets (ROA) of the pooled oil and gas firms from 2013-2022 was 7%, the lowest return was -236% and the highest was 617%. However, the standard deviation of 56% shows that profitability (return on assets) in the sector was on the high side. For waste management cost (WMC), the average was approximately 53 million naira, minimum was approximately 5 million naira and maximum was approximately 410 million naira. Environmental cleanup cost of the pooled oil and gas firms have a mean value of approximately 20 million naira with minimum and maximum values of approximately 3 million naira and 40 million naira respectively. Also, the mean of the environmental safety cost of the pooled oil and gas firms was approximately 11 million naira with minimum and maximum values of approximately 98 million and 4 million naira respectively.

Table 4.2 Correlation analysis of the relationship between environmental remediation costs and return on assets

	ROA	**WMC**	**ECC**	**ESC**
ROA	1.000000			
WMC	-0.013576	1.000000		
ECC	0.415091	0.313765	1.000000	
ESC	0.232702	-0.039899	0.362547	1.000000

Source: Author's computation (2024)

From table 4.2, there is no association between return on assets (ROA) and waste management cost (-0.013576). Conversely, there is a positive and moderate correlation between environmental cleanup costs (ESC) and return on assets (ROA) (0.415091). Finally, there is a weak and positive association between environmental safety cost and return on asset (ROA) (0.232702). Since the correlation coefficients are moderate, there is no room to suspect the presence of multicollinearity.

Table 4.3 Regression analysis of the effect of environmental remediation costs on return on assets of listed oil and gas firms in Nigeria

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.093638	0.096153	2.927838	0.0071
WMC	-2.48E-05	0.000137	-0.180690	0.8568
ECC	0.170631	0.018124	2.583814	0.0125
ESC	0.020983	24.09389	2.126166	0.0380

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R-squared	0.348158	Mean dependent var	0.070234
Adjusted R-squared	0.335012	S.D. dependent var	0.562481
S.E. of regression	0.568359	Akaike info criterion	1.735259
Sum squared resid	56.53069	Schwarz criterion	1.823953
Log likelihood	-151.1733	Hannan-Quinn criter.	1.771221
F-statistic	2.850158	Durbin-Watson stat	2.344795
Prob(F-statistic)	0.027942		

Source: Author's computation (2024)

Table 4.3 above shows an F-statistic of 2.850158 with p-value of 0.027942 indicating that overall, the environmental remediation cost has significant effect on profitability of oil and gas firms under study. The model gave an R-squared value of 0.348158 which means that 35% of the changes in the dependent variable can be explained by the independent variables of this study. However, the unexplained part is captured in the error term.

4.4 Discussion of findings

Waste management costs and return on assets

The OLS regression revealed that waste management cost has an insignificant negative effect (Coef-2.48E-05; p-value = 0.8568) on return on assets of listed oil and gas firms under study. This implies that a unit increase in the waste management cost cannot affect the profitability of these firms. It also implies that increase in waste management cost can potentially reduce profitability but this lacks statistical significance. This could be because oil and gas firms may have significant revenues and profits that outweigh the costs associated with waste management and thus the scale of their operations allows them to absorb waste management costs without a major impact on overall profitability. The outcome of this study is supported by the work of Nwaimo (2020) who noted that waste management costs have no significant effect on return on capital employed, earnings per share and return on equity.

The OLS regression revealed that environmental cleanup cost (ECC) have a positive significant (Coef 0.170631; p-value =0.0125) on return on assets of oil and gas companies in Nigeria. This implies that a unit increase in the environmental cleanup cost will improve return on assets of oil and gas companies by 17 percent. The cause of this

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finding could be because investing in environmental cleanup demonstrates a commitment to corporate social responsibility and sustainability. However, the findings of this study negates that of Okoye and Modebe (2020) who found a negative relationship between environmental costs and profitability, indicating that higher remediation costs may lead to reduced financial performance for firms.

The results obtained from OLS regression in table 4.3 revealed environmental safety cost has a significant positive effect (Coef. 0.020983;p-value =0.0380) on return on assets of listed oil and gas firms. This implies that a unit increase in environmental safety cost would improve the return on assets of oil and gas firms by 2%. This outcome is supported by Abiola and Agboola (2022) who found a positive and significant relationship between ROCE and environmental safety cost. However, the findings of this study negates that of Okoye and Modebe (2020) who found a negative relationship between environmental costs and profitability, indicating that higher remediation costs may lead to reduced financial performance for firms.

5.1 CONCLUSION AND RECOMMENDATION

The mixed findings implies environmental remediation if not managed effectively may enhance the wealth of shareholders and when not properly handled may deter further investments in the sector. Based on the empirical findings of this study, it was concluded that environmental remediation costs have significant effect on financial performance of oil and gas firms in Nigeria. Even though waste management cost does not have any significant effect on profitability in this study which could be in the short run, it is essential for the management of oil and gas companies in Nigeria to invest in innovative waste management practices to remediate and restore the environment as this can benefit the company in the long run. It was also recommended that the management of oil and gas companies in Nigeria should develop comprehensive contingency plans and set aside reserves specifically earmarked for environmental cleanup activities to ensure prompt and effective response to any incidence of environmental emergencies.

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