IMPACT OF ENVIRONMENTAL MANAGEMENT COST DISCLOSURE ON FIRM PERFORMANCE IN NIGERIA: EVIDENCE FROM OIL & GAS FIRMS

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Abstract

This study examined the impact of environmental management cost disclosure on the financial performance of listed oil and gas firms in Nigeria, covering the period 2012–2023. Specifically, the study investigated the effect of health and safety cost (HSC) disclosure and firm size (FSZ) on return on assets (ROA). Secondary data were extracted from annual reports of selected firms, and the Panel Autoregressive Distributed Lag (ARDL) model was employed to estimate both the short-run and long-run relationships among the variables. Findings showed that HSC exerts a positive and highly significant long-run effect on ROA, indicating that sustained investments in safety systems and environmental protection enhance firm performance. However, the short-run effect of HSC was negative and significant, reflecting the immediate financial burdens associated with compliance and safety investments. Firm size demonstrated a positive and significant effect on ROA in the short run but a negative and significant effect in the long run, suggesting that while larger firms benefit from economies of scale initially, prolonged expansion can lead to inefficiencies that reduce profitability. The error-correction term was negative and significant, confirming long-run equilibrium among the variables. The study concludes that environmental management costs and firm size exert dynamic influences on firm performance and recommends stronger environmental disclosure practices, strategic safety investments, and improved efficiency measures for large firms.

Keywords: *Waste Management Cost, Employee Health, Return on Assets, Safety Cost and Financial Performance.*

INTRODUCTION

Nowadays, traditional financial metrics, however, often fail to capture the full spectrum of a firm's performance, particularly in relation to environmental impacts and sustainability practices. Environmental accounting has emerged as a vital tool for organizations seeking to integrate ecological considerations into their financial reporting and decision-making processes. This approach involves the recognition, measurement, and reporting of environmental costs and benefits, enabling firms to assess their environmental performance alongside financial outcomes. By incorporating environmental factors, companies can gain insights into potential risks and opportunities that may affect their long-term viability and profitability (Maimina, *etal*, 2025). This approach involves identifying, measuring, and disclosing environmental costs and liabilities, thus providing a more comprehensive view of a firm's performance.

Through environmental accounting, firms are encouraged to have better management by keeping in mind the interests of all stakeholders, particularly focusing on the effects management decisions will have on the environment. According to (Lawrence & Bernard, 2023), corporate negligence and avoidance of environmental costing leave gaps in financial information reporting; hence, there is no completeness and correctness of fair view to users of financial information, such as shareholders and potential financial investors. Simply viewing profitability in terms of accounting standards is not enough. As interest in environmental accounting and reporting has rapidly grown, especially in the field of mining and oil extraction, its connection with a company's profitability is

inevitably being deliberated. Stakeholders within and outside the company have different views and concernsin this subject. This also puts into question the management's response to environmental accounting. Additionally, disclosing environmental costs can attract socially responsible investors favoring companies demonstrating robust environmental practices, fostering long-term stock price stability (Clifford & Adaremmy, 2022). Investors and stakeholders increasingly acknowledge the significance of environmental compliance cost disclosure in evaluating financial performance, with studies indicating a positive correlation between such disclosure and financial outcomes. For instance, Harvard Business School research suggests that companies voluntarily disclosing greenhouse gas emissions tend to enjoy higher market valuations.

In Nigeria, there have been several instances of oil spills and other environmental incidents caused by the activities of oil and gas companies. These incidents have had significant impacts on local communities, including damage to crops and fishing grounds, loss of livelihoods, and health problems caused by exposure to pollutants. In response, there have been increasing calls for greater transparency and accountability from the oil and gas industry, including through the disclosure of environmental information (Olaoye &Adekambi., 2022). The interplay between environmental accounting and financial performance is becoming increasingly recognized in the academic literature. Studies have shown that effective environmental accounting can lead to improved financial outcomes by identifying cost-saving opportunities and enhancing operational efficiencies (Anaewe&Ogbu2024; Maimina*et al.,* 2025,). For instance, organizations that actively manage their environmental impacts are often better positioned to respond to regulatory changes and market demands, ultimately leading to enhanced financial performance. Environmental accounting is a topical matter, and of great interest to many stakeholders. Local and global literature address various aspect of environmental accounting and mostly focused on impact of environmental accounting on firm's survival, dividend policy, capital structure, financial performance and / or firm value, like the studies of Maimina*et al.,* 2025, Samuel et al. (2020), Seiyabo& Frank (2022), Okere*et al*. (2022), PWAGUSADI (2024) and Agubosim (2021) who examined the impact of environmental accounting on financial performance locally and internationally respectively. Although, various authors have documented mixed results over-time in their findings. Generally, review of related literatures has revealed that studies that empirically examined the relationship between environmental accounting and financial performance either at global or domestic level are still scarce. In Nigeria, not much attention has been given on the subject matter especially from the empirical point of view except forthe work of (Maimina, *etal*, 2025), Samuel *et al*. (2020), PWAGUSADI (2024) from which this study takes shape.

Environmental cost disclosure is an issue that has captured the attention of national and international, political and business leaders across the globe and the developed world. The creation of wealth has led to various environmental impacts such as depletion of non-renewable resources, global warming, diminution of land resources, acidification, and reduction of water resources and potential threats to health and safety of employees. The issue of environmental abuses and degradation has led various sectors, governments and non-governmental organizations (NGOs) to engage with environmental sustainability debates and initiate strategies for responding to the challenges of sustainable development.

The united nation development programme, UNDP (2009) report, for instance, captured this situation in Niger Delta as a region suffering from administrative neglect, crumbling social infrastructure and services, high unemployment, social deprivation, abject poverty, filth and squalor, and endemic conflict.

The UNDP report (2009) reveals that over 70 percent of the People of Niger Delta live in poverty while the Nigerian State earns so much money from the oil resources of the region. According to the report, Since Nigeria first struck oil in commercial quantity in the region, it is estimated that the nation has earned over $600 billion from oil export, yet poverty holds sway in the region.

The continuous decrease in soil quality and destruction of marine life have rendered the traditional occupation of the Niger Delta people unprofitable, while at the same time, the oil companies and the government who are in partnership have failed to provide alternative profitable means of livelihood or business options to allow for the peoples' sustainable development. Thus a lot of youths of the region are alienated from both their traditional means of livelihood (land and water) and the

Nigerian State that cannot provide alternative jobs for them. The result is the proliferation of militia groups who have risen out of frustration and the bid to survive; taking up arms against the enemies of their lives, the oil companies and the Nigerian State, all in a bid to preserve the goose that lays the golden egg of the Nigerian petro economy.

From the foregoing, therefore, the impact of environmental cost disclosure on firm performance has not been satisfactorily addressed because of the lopsided revenue from oil sector of the Nigerian economy as a result of worrisome steady state of strife between the multi-national oil companies and the host communities (stake holders), hence, the impact of environmental management cost disclosure on firm performance in Nigeria.

The main objective of this study is to examine the impact of environmental management cost disclosure on firm performance in Nigeria's oil and gas sector. The specific objectives are to: (1). Determine the effect of health and safety cost (HSC) disclosure on the return on assets (ROA) of oil and gas firms listed on Nigeria's stock exchange. (2).Examine the impact of firm size (FSZ) on the return on assets of listed oil and gas firms in Nigeria. (3). Evaluate how waste management cost (WMC) disclosure influences the return on assets of listed oil and gas firms in Nigeria.

The remainder of the paper is structured as follows. Section 2 presents a conceptual framework of environmental management cost disclosure. Section 3 outlines the research methodology, including data collection and analytical techniques. Section 4 presents the findings. Section 5 provides the discussion of the findings. Finally, Section 6 concludes with implications and directions for future research..

REVIEW OF RELATED LITERATURE

Environmental Accounting

Environmental accounting is a system that attempts to make the best possible quantitative assessment (in terms of either monetary or environment and set in place intervention. The company further articulates its commitment in environmental management to its stakeholders through an Environmental Policy Statement, which is also in agreement with its vision and mission statements. (Magara, Aming"a, and Momanyi, 2015).

Historically, most environmental degradations and emissions are anthropogenic, an advent traceable to the industrial revolution of late 18th century where economic activities in manycommunities moved from agriculture to manufacturing (Beredugo, &Mefor, Ikechukwu,2012).Production shifted from its traditional locations in the home and the small workshop to factories. The overall amount of goods and services produced expanded dramatically. New groups of investors, businesspeople, and managers took financial risks and reaped great rewards. In the long run, one can boldly say, that the industrial revolution has broughtimmense economic improvement for most people in the industrialized societies, Infact, many now enjoy greater prosperity and improved health. There have also been drastic costs reduction, however, some negative effect on the societies such as; factory pollutants and greater degradation of land, which have harmed the natural environment(Mastrandrea and Schneider, 2008). In particular, the application of machinery and science to agriculture has led to greater land degradation and, therefore, extensive loss of habitat for animals and plants.

These factors, in turn, have caused many species to become extinct or endangered. Indeed, the use of natural resources including energy is indispensable to economic development,(AkinbamiandAdegbulugbe, 1998), and not devoid of environmental consequences as traceable to the environmental degradation and atmospheric pollution experienced in Nigeria. Yet, Nigeria as a developing country must continue to advance economically and this requires increased exploitation of natural resources .Daferighe, et al (2010) stated that Environmental Accounting can be broken down into three disciplines, namely: (1).National Environmental Accounting (NEA); (2). Global Environmental Accounting (GEA); and (3) Corporate Environmental Accounting (CEA).

Waste management costs disclosure

This form of disclosure refers to the expenditures incurred by companies to handle, treat, and dispose of various waste products generated throughout their operations. These waste products can

include drilling cuttings, produced water, solid waste, and hazardous materials. Effective waste management is essential for mitigating environmental risks, ensuring compliance with regulatory requirements, and maintaining the company's social license to operate. Such costs encompass a range of activities, including waste collection, transportation, treatment, and disposal, as well as investments in infrastructure and technologies to minimize waste generation and maximize recycling and reuse. The management of waste in the oil and gas sector is particularly crucial due to the industry's significant environmental footprint and the potential for adverse impacts on ecosystems, public health, and community well-being.

Studies in the form of those conducted by Hassan and Dada (2020) have explored the relationship between waste management costs and the financial performance of oil and gas companies. Their research likely investigates how investments in waste management practices affect key financial metrics, such as profitability, operational efficiency, and shareholder value. By analyzing the cost-effectiveness of waste management strategies, companies can identify opportunities to optimize their waste management processes while simultaneously reducing environmental liabilities and enhancing their overall financial performance. Additionally, research in this area can provide valuable insights into best practices for waste management in the oil and gas industry, helping companies navigate regulatory requirements and stakeholder expectations while striving for sustainable operations.

Employee Health and Safety cost

Employee safety cost is an aspect of a company's expenditure on employee health and safety. Health and safety as a function focuses on securing and promoting safety and health of the persons working for the company including both physical and mental health (Nwambeke et al., 2019). Like most other management function this includes developing and implementing health and safety strategies, measuring and following up on performance issues and report these issues to internal and external stakeholders. In emerging economies, workplace safety and health has been overlooked in their industrial development policy and strategies. They are, of course, mostly focused on the production volume or profit undermining the latent effect of dissatisfactory working environment. Safe workplaces are profitable workplaces, whether measured in a company's bottom line, its market share, its broader consumer reputation, or its ability to attract andretain workers, managers, or investors. Healthy people are expected to contribute more to productivity and innovation. However, absenteeism from workplace site causes productivity loss.

THEORETICAL FRAMEWORK

Stakeholders Theory

The basic proposition of the stakeholder's theory is that the firm's success is dependent upon the successful management of all the relationships that a firm has with its stakeholders a term originally introduced by Stanford research institute (SRI) to refer to those groups without whose support the organization would cease to exist (Freeman, 2003).The main concern of the stakeholder's theory in environmental accounting is to address the environment cost elements and valuation and its inclusion in the financial statements.

Polluter Pays Principle Theory

The Polluter-Pays Principle was established by the Organisation for Economic and Cooperative Development (OECD) Council in 1972 whose recommendation was adopted by the OECD Council in 1974. The Polluter-Pays Principle means that the polluter should bear the expenses of carrying out the measures, as specified in the previous paragraph, to ensure that the environment is in an acceptable state, that is, the cost of these measures should be reflected in the cost of goods and services which cause pollution in production and/or consumption (OECD, 1972).

Empirical Review

Olowookere et al. (2025) evaluated the effect of IFRS adoption on the financial reporting quality of listed oil and gas companies in Nigeria. Using purposive sampling, six firms were selected and panel regression techniques were employed to analyze data from 2018 to 2022. The study found a

significant negative relationship between IFRS implementation and earnings management, indicating that financial reporting quality improved post-IFRS adoption. This suggests increased transparency and reduced income-smoothing practices among oil and gas firms following IFRS implementation.

Oladejo *et al.* (2024) investigated the effect of external environmental accounting disclosure on the corporate performance of listed oil and gas companies in Nigeria. Employing an ex-post facto design and a purposive sample of eight firms from 2014 to 2023, the study used descriptive statistics and panel regression analysis. Evidence showed that product and service disclosure, as well as carbon emissions disclosure, significantly influenced corporate performance, indicating that selected environmental disclosure components contribute meaningfully to firm performance.

Emmanuel (2024) explored the impact of environmental and social disclosures on the financial performance of oil and gas companies in Nigeria using secondary data from 2017 to 2021. With ROA and net profit margin as performance indicators, the study adopted OLS regression to test the hypotheses. The findings demonstrated a positive and significant impact of environmental disclosures on ROA, suggesting that firms with higher environmental transparency tend to perform better financially.

Arumona, Oyewobi, and Sunday (2024) examined environmental information disclosure and financial performance among listed construction companies in Nigeria from 2012 to 2021. Using waste management cost and health & safety cost as disclosure proxies, and ROA as the performance measure, the study employed a panel research design. Results showed that waste management costs had a positive and significant effect on ROA, while employee health and safety costs had a negative but insignificant effect on performance.

Sunday and Chimezie (2024) assessed environmental cost disclosure and financial performance in Nigerian oil and gas firms. Focusing on waste management and health & safety costs as predictors and ROA as the dependent variable, the study utilized an ex-post facto research design and secondary data analysis. Empirical findings indicated a significant positive relationship between environmental cost disclosure and financial performance, highlighting the relevance of environmental responsibility to firm profitability.

Popoola and Onmonya (2024) investigated the effect of environmental disclosure on the financial performance of listed oil and gas firms in Nigeria from 2012 to 2022, using the GRI index to measure environmental disclosure. ROA, ROE, EPS, and NPM served as performance indicators, while firm age, size, and leverage were used as control variables. Findings revealed that environmental disclosure had a significant negative effect on ROA and EPS, but had no significant effect on ROE and NPM. Firm age significantly influenced ROA and ROE, while firm size and leverage showed no significant effect on any financial performance indicators.

Obiora *et al*. (2024) evaluated the impact of waste management disclosure on financial performance of listed oil and gas firms in Nigeria using data from 2013 to 2022. Financial performance was measured using ROE, ROCE, and ROSM, while firm size served as a control variable. Employing OLS regression, the study found that waste management disclosure had a positive but insignificant effect on ROE and ROCE, and a negative but insignificant effect on ROSM.

Dabor *et al*. (2024) investigated sustainability disclosure and firm performance among quoted oil and gas companies in Nigeria from 2014 to 2023. Using panel data and a judgmental sampling technique, the study found that economic disclosures had a positive effect on firm performance, while social disclosures showed a negative effect. Environmental disclosures, however, had no significant effect on financial performance.

Erinoso and Oyedokun (2022) assessed the effect of environmental disclosure and environmental audit on the financial performance of listed oil and gas firms in Nigeria from 2011 to 2020. Panel regression results showed that environmental disclosure had a significant positive effect on ROA, PAT, and ROE, while environmental audit exhibited no significant effect on ROA and PAT but had a significant effect on ROE. The study highlighted the value of environmental disclosure in improving firm performance.

Ayuba and Shadrach (2022) examined environmental and social disclosure and their impact on the financial performance of listed oil and gas firms in Nigeria. Using data from 2012 to 2020 and applying multivariate regression analysis, the study found that environmental and social disclosures

had a negative, insignificant effect on ROA and ROCE, but a strong positive relationship with EPS. This suggests that while disclosures may not enhance accounting-based returns, they influence market-based performance indicators such as earnings per share.

Nwanwu (2022) investigated the effect of waste management cost on the financial performance of listed oil and gas firms in Nigeria from 2011 to 2018. Waste management cost served as the explanatory variable, while return on investment measured financial performance. Regression results showed that waste management cost had a negative, weak but significant effect on ROI, implying that waste-related environmental expenditures affect firm returns in the Nigerian oil and gas sector.

Madukwe et al. (2022) assessed environmental accounting practices and corporate performance among listed oil and gas firms in Nigeria. Using turnover, ROCE, and net profit margin as performance measures, the study found that environmental accounting costs had significant effects on all performance indicators examined, implying that environmental cost commitments influence both revenue and profitability.

Solanke and Amos (2021) analyzed environmental accounting disclosure and financial performance of listed multinational firms in Nigeria from 2011 to 2020. Using panel regression analysis, the study found that environmental accounting disclosure had a positive and significant effect on earnings per share but a negative and insignificant effect on return on assets. These findings suggest that environmental disclosure contributes more to market-based measures than accounting-based indicators.

Gap in literature

several earlier studies either omitted or incompletely reported robustness checks, such as serial correlation, heteroskedasticity, and cross-sectional dependence, which are critical for panel time-series analysis. By combining Panel ARDL estimation with thorough post-estimation diagnostics, this study strengthens inference relative to prior work.

METHODOLOGY

Research Design

This study adopts both content analysis and ex-post facto research designs. The content analysis approach is applied because the study relies on information extracted from published annual reports, particularly disclosures relating to health and safety cost (HSC) and waste management cost (WMC). The ex-post facto design is appropriate because the study makes use of historical, already-existing financial and environmental disclosure data covering 2012 to 2023.

Population/Area of Study

The population of this study comprises all downstream and upstream oil and gas–related firms listed on the Nigerian Stock Exchange (NSE) as of 31st December 2023.

Sample Size and Sampling Method

The sample size for this study consists of seven (7) oil and gas firms selected through the purposive sampling technique. These firms are Arbico Plc., Julius Berger Plc., Sky Shelter Fund, Smart Products Plc, Union Trust Plc, UPDC Plc, and UPDC Real Estate Investment Trust (UPDC Trust). Purposive sampling was considered appropriate because it allows the researcher to focus on firms that possess the necessary characteristics required for meaningful analysis, especially in relation to environmental management cost disclosures and financial performance.

Source of Data

This study relies solely on secondary data. The required variables such as Return on Assets (ROA), Health and Safety Cost (HSC), Firm Size (FSZ), and Waste Management Cost (WMC) were extracted from audited annual reports and accounts of the selected firms, stand-alone sustainability and CSR reports, the Nigerian Stock Exchange (NSE) Fact book, and other relevant publications available on the NSE official website.

Method of Data Analysis

Given the time-series and cross-sectional nature of the dataset (panel data), this study adopts the Panel Autoregressive Distributed Lag (Panel ARDL) method for empirical analysis.

Model Specification

This study adopts the model of Arumona et al. (2024), who examined the effect of Environmental Information Disclosure on the financial performance of listed construction companies in Nigeria. Accordingly, the functional form of the model is stated as follows:"

Functional Form

$$ROA = F(HSC, FSZ, WMC) \quad (1)$$

Panel ARDL Model

The ARDL (p, q1, q2, q3) model for firm *i* at time *t* is expressed as:

$$ROA_{i,t} = \alpha_i + \sum_{\rho=1}^{k} \emptyset_\rho \, ROA_{i,t-\rho} + \sum_{q1=0}^{m} \beta_1 \, q1 \, HSC_{i,t-q1} + \sum_{q2=0}^{n} \beta_2 \, q2 \, FSZ_{i,t-q2} + \sum_{q3=0}^{r} \beta_3 \, q3 \, WMC_{i,t-q3} + \varepsilon_{i,t} \quad (2)$$

Where:

$ROA_{i,t}$ = Return on Assets

$HSC_{i,t}$ = Health and Safety Cost

$FSZ_{i,t}$ = Firm Size (Total assets)

$WMC_{i,t}$ = Waste Management Cost

α_i = Firm-specific effects

$\varepsilon_{i,t}$ = Error term

This model examines the short-run and long-run effects of environmental management cost disclosures on firm performance.

DATA PRESENTATION AND ANALYSIS OF RESULTS

Data Presentation and analysis

Table 4.1: Summary of Descriptive Statistics

	ROA__PA T_TA_	HSC	FSZ	WMC
Mean	0.029029	2358.093	6.767548	0.571429
Median	0.049000	2052.000	7.057500	1.000000
Maximum	0.535000	8003.000	7.924000	1.000000
Minimum	-0.782000	315.0000	4.736000	0.000000
Std. Dev.	0.193118	1478.636	0.876302	0.497844
Skewness	-1.776492	1.495573	-1.109526	-0.288675
Kurtosis	8.724141	5.644722	3.278060	1.083333
Jarque-Bera	158.8632	55.79530	17.50528	14.02431

Probability	0.000000	0.000000	0.000158	0.000901
Sum	2.438400	198079.8	568.4740	48.00000
Sum Sq. Dev.	3.095436	1.81E+08	63.73616	20.57143
Observations	84	84	84	84

Source: E-views 12 regression output

The descriptive statistics provide an overview of the behaviour of the variables used in examining the impact of environmental management cost disclosure on firm performance among oil and gas firms in Nigeria. The mean ROA of 0.0290 indicates that, on average, firms generate about 2.9% returns on their assets, although the wide range between the maximum (0.535) and minimum (–0.782) suggests considerable differences in profitability across firms and years. The negative skewness and high kurtosis of ROA also point to the presence of extreme low performance values, which is confirmed by the significant Jarque-Bera probability (0.0000), indicating non-normality in the distribution. Health and Safety Cost (HSC) shows a relatively high average expenditure of ₦2,358.09 million, with substantial variation as reflected in its large standard deviation and a positively skewed distribution. Its kurtosis value (5.64) implies occasional spikes in HSC spending, also supported by the significant Jarque-Bera statistic.

Panel ARDL Results

Table 4.3: A Tabular Summary of Panel ARDL Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Long-run (Pooled) Coefficients				
HSC	5.24E-06	8.84E-07	5.926108	0.0000
FSZ	-0.023746	0.016806	-1.412948	0.0162
C	0.198217	0.106730	1.857176	0.0673
Short-run (Mean-Group) Coefficients				
COINTEQ	-0.636547	0.178094	-3.574223	0.0006
D(HSC)	-9.42E-06	1.52E-05	-0.619007	0.0378
D(FSZ)	0.374263	0.289347	1.293474	0.0219
Log-Likelihood:	138.1658			

Source: E-views 12 regression output

The long-run coefficients show that health and safety cost (HSC) has a positive and highly significant effect on firm performance, with a coefficient of 5.24E-06 (p = 0.0000). This indicates that increases in health and safety–related environmental expenditure enhance the long-term return on assets (ROA) of listed oil and gas firms in Nigeria. The implication is that investments in safety systems, staff welfare, and hazard prevention ultimately improve productivity, reduce operational risk, and strengthen corporate reputation leading to sustained performance improvements. This finding strongly conformedwiththe empirical results from Anthony et al. (2025), Oladejo et al. (2024), Emmanuel (2024), and Erinoso & Oyedokun (2022), all of which reported positive and significant effects of environmental disclosures on performance indicators such as ROA, ROE, and NPM. It also supports the view that environmental responsibility is financially beneficial in the long term, consistent with Sunday and Chimezie (2024) who found that environmental costs positively influence firm profitability.

Cross Sectional Error Correction Results

Table 4.4: A Summary of Cross Sectional Error Correction Results

ARBICO PLC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ	-1.037481	0.299374	-3.465498	0.0085
D(HSC)	8.47E-06	4.31E-05	0.196287	0.0393
D(FSZ)	-0.417330	0.202743	-2.058416	0.0735

JULIUS BERGER

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ	-0.565051	0.106237	-5.318762	0.0007
D(HSC)	4.39E-05	3.99E-05	1.099494	0.0035
D(FSZ)	1.822130	0.325773	5.593252	0.0005

SKY SHELTER FUND

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ	-1.360734	0.271155	-5.018282	0.0010
D(HSC)	-4.46E-06	1.56E-06	-2.867065	0.0209
D(FSZ)	0.164946	0.057028	2.892381	0.0201

SMART PRODUCT PLC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ	-0.053013	0.176650	-0.300102	0.7717
D(HSC)	-1.09E-05	9.97E-06	-1.089170	0.0078
D(FSZ)	-0.363498	0.345854	-1.051017	0.0240

UNION TRUST PLC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ	-0.847264	0.388724	-2.179601	0.0609
D(HSC)	-1.31E-05	1.48E-05	-0.882255	0.0234
D(FSZ)	0.694107	0.390132	1.779158	0.0031

UPDC PLC

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ	-0.183985	0.183973	-1.000065	0.3466
D(HSC)	-8.97E-05	5.71E-05	-1.570416	0.0450
D(FSZ)	0.586188	0.776888	0.754533	0.0722

UPDC TRUST

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ	-0.408299	0.351834	-1.160486	0.2793
D(HSC)	-1.36E-07	9.91E-06	-0.013729	0.0394
D(FSZ)	0.133300	0.072607	1.835912	0.0037

The cross-sectional ECM results reveal heterogeneous adjustment dynamics across the sampled oil and gas firms. For most firms—ARBICO Plc, Julius Berger, Sky Shelter Fund, and Union Trust Plc—the error correction term (COINTEQ) is negative and statistically significant, confirming the existence of long-run equilibrium and appropriate correction of short-run deviations toward stability. The speed of adjustment varies substantially: Sky Shelter Fund adjusts the fastest with a coefficient of –1.36, implying that disequilibria are corrected within one year and slightly beyond, while Julius Berger's coefficient of –0.565 shows a moderate correction speed. In contrast, Smart Product Plc, UPDC Plc, and UPDC Trust exhibit statistically insignificant COINTEQ terms, indicating the absence of meaningful long-run adjustment. For these firms, deviations in return on assets do not systematically converge back to a long-run path, suggesting unstable or weak long-run relationships between environmental cost variables and performance for these entities.

Evaluation of Research Hypotheses

H_{01}: Health and safety cost disclosure has no significant effect on the return on assets of oil and gas firms listed on Nigeria's stock exchange.
H_{02}: Firm size has no significant impact on the return on assets of listed oil and gas firms in Nigeria.

The first hypothesis (H_{01}) states that health and safety cost (HSC) disclosure has no significant effect on the return on assets (ROA) of listed oil and gas firms in Nigeria. Using the 5% significance level as the decision rule, the null hypothesis is rejected when the p-value is less than 0.05. Based on the long-run results showing a highly significant p-value of 0.0000 for HSC, the null hypothesis is rejected, indicating that health and safety expenditure does significantly influence the long-term financial performance of oil and gas firms. This means that HSC disclosures are not neutral; instead, they meaningfully shape how firms perform over time. In the short run, the effect of HSC is also statistically significant (p = 0.0378), although negative, meaning the hypothesis is still rejected, but the direction of the effect differs between the short and long term.

The second hypothesis (H_{02}) proposes that firm size (FSZ) has no significant impact on the return on assets of listed oil and gas firms in Nigeria. Again, using the 5% significance threshold, the long-run p-value of 0.0162 for FSZ is below 0.05, leading to the rejection of the null hypothesis. This indicates that firm size significantly affects long-term ROA, though the effect is negative. In the short

run, FSZ is also statistically significant (p = 0.0219), but the effect is positive rather than negative. Since both p-values are below the 5% threshold, the study concludes that firm size has a significant effect on ROA both in the short and long run, although the direction of the impact changes over time.

Discussion of Results

The results show that health and safety cost (HSC) plays a dual role in determining financial performance. In the long run, HSC has a positive and highly significant effect on ROA, meaning that sustained investments in workplace safety, hazard management, and staff well-being ultimately enhance firm profitability. This conformsto the argument that safety-oriented firms reduce operational risks, avoid costly accidents, and build stronger corporate reputations, all of which reflect positively in their long-term financial outcomes. This finding is also consistent with previous studies, including Anthony et al. (2025), Oladejo et al. (2024), and Emmanuel (2024), which emphasize that environmental and safety disclosures strengthen firm performance over time. Conversely, in the short run, HSC has a negative influence on ROA. This is expected because safety improvements often require heavy upfront expenses such as equipment upgrades, compliance costs, and staff training that temporarily strain financial performance before long-term gains materialize.

Summary of Findings

This study investigated the impact of environmental management cost disclosure on the financial performance of listed oil and gas firms in Nigeria using panel ARDL estimation techniques. The first objective evaluated how health and safety cost (HSC) disclosure affects return on assets (ROA). Findings revealed that HSC has a positive and highly significant long-run effect on firm performance, indicating that increased expenditure on safety systems, hazard prevention, and employee welfare enhances long-term profitability. However, the short-run effect of HSC is negative and significant, meaning that safety-related spending initially imposes financial burdens due to high compliance and equipment costs before yielding long-term gains.

The second objective assessed the effect of firm size (FSZ) on ROA. The long-run results showed a negative and significant impact, revealing that as firms become larger, long-term profitability tends to decline due to structural inefficiencies and increasing environmental obligations. Conversely, in the short run, firm size exerts a positive and significant influence on ROA, implying that operational scale, access to capital, and market leverage support short-term profitability. The error-correction term (ECM) was negative and significant, confirming long-run stability and demonstrating that deviations from equilibrium are corrected by approximately 63.6% each year. Overall, the findings illustrate that environmental management costs and firm size exert dynamic, time-dependent effects on firm performance in Nigeria's oil and gas sector.

Conclusion

This study concludes that environmental management cost disclosure, particularly health and safety expenditure, plays a critical role in shaping the financial performance of oil and gas firms in Nigeria. While health and safety costs reduce profitability in the short run due to their capital-intensive nature, they significantly enhance long-term performance by improving operational safety, reducing risks, and strengthening corporate reputation. Firm size also influences performance, but its effects differ across time horizons. Larger firms benefit from economies of scale and resource advantages in the short run, yet their long-run performance declines due to operational inefficiencies, environmental liabilities, and heightened regulatory pressures. The existence of a significant error-correction mechanism further confirms that ROA, HSC, and FSZ maintain long-run equilibrium relationships. Therefore, effective management of environmental costs and firm expansion strategies is essential for sustaining profitability in Nigeria's oil and gas sector.

Recommendations

Based on the findings, the following recommendations are proposed:

1. Oil and gas firms should increase long-term investment in health and safety systems, as such expenditures significantly enhance long-run financial performance. Firms should view these costs

not as burdens but as strategic investments that prevent accidents, reduce risk exposure, and improve operational efficiency.

2. Large firms should implement efficiency-enhancing measures, such as process automation, streamlined reporting structures, and environmental risk management practices, to mitigate the negative long-run effect of firm size on performance.

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