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ENVIRONMENTAL ACCOUNTING COSTS AND FINANCIAL PERFORMANCE OF LISTED OIL AND GAS COMPANIES IN NIGERIA

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ABSTRACT

The study examined the effect of environmental accounting costs on financial performance of listed oil and gas companies in Nigeria. The objectives were to assess the effects of energy conservation costs and environmental training costs on return on assets. The scope covered NGX-listed oil and gas companies from 2014 to 2023, using audited annual reports and accounts. Anex-post facto design was adopted. The population comprised all 8listed oil and gas companies. The sample consisted of7 firms with complete data. Data analysis involved descriptive statistics, Pearson correlation, panel regression, and the Hausman specification test. The random effects model was retained (χ^2=4.221, p-value = 0.239). At 5% level of statistical significance, the results showed that energy conservation costs had a negative and insignificant effect on ROA (β=−1.1112, p-value = 0.274), while environmental training costs had negative and insignificant effect on ROA (β=−0.6675, p-value =0.687). The model explained 31.5 percent of ROA variation with F=13.806 (p<0.001). The study concluded that energy conservation and environmental training costs did not yield immediate profitability gains. Among others, the study recommended that oil and gas companies should adopt a gradual approach to investing in energy efficiency projects, by modernizing energy systems in phases and integrating renewable sources and as well, management of oil and gas companies should develop training initiatives that focus on practical implementation of sustainability practices.

Keywords: Environmental Accounting Costs, Energy Conservation Costs, Environmental Training Costs, Financial Performance and Return on Assets.

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1. INTRODUCTION

Background of the Study

Traditionally, firms' financial performance has been measured predominantly as they affect shareholders wealth, thereby ignoring the interest of other stakeholders. Contemporarily, this narrowed perspective has changed, which gave way to broader stakeholders consideration. For instance, Smita (2022) opined that business is a socio-economic activity that draws its inputs from the society; hence its objectives should include the welfare of the society. Consequently, firm performance measurement should include all facets of performance indicators to satisfy the wider Stakeholders considerations which are a derivative of both internal and external factors. A new business model that considers the environment and people before profit has emerged. Hence, the Stakeholders' theory propounded by freeman in 1984 advocated that business entities should not be shareholders focused, but Stakeholders focused.

This eventually brought the idea of social responsibility, which makes corporate organizations socially responsible to the entire public that defines its environment; rather than only the owners of such entity (Adewoye, et al. 2018). Therefore, the success or failure of any corporate entity is no longer going to be based only on return on investment, but also on parameters that question their responsibilities and responsiveness to the environment in which they operate. Hence, Alade (2022) who warned that where companies disregard environmental laws and regulations and continue to degrade the environment with its attendant's consequences of health hazard, marine and land ecosystem disturbances, dispute between the companies and host communities is inevitable.

Financial performance is a major key in all economic decision making relating to public and private companies to identify the difficult and hidden cost. Financial performances are a quantitative ratio of how well a company uses assets from its business operations and generate revenues. The financial performance is also seen as a measure of a company's overall financial health over a given period of time. Analyzing environmental information to determine the extent of effect it has on financial performance in an oil and gas firm includes analysis and interpretation of financial statements in such a way that it undertakes full diagnosis of the profitability and financial soundness of the company (Chashim & Fadaee, 2016).

Environmental costs are expenses incurred by enterprises in compliance with environmental regulations and sustainability efforts. They cover adherence to laws, mitigation of ecological impacts, pollution control, and penalties. These costs also include equipment acquisition and financial safeguards against degradation (Anselm & Okoye, 2020). An enterprise that embraces environmental accounting not only reflects fiscal prudence but also underscores its commitment to the larger social fabric. By weaving environmental considerations into the very fabric of corporate management, businesses demonstrate their willingness to contribute positively to the world they operate within.

This symbiotic relationship between sound management practices and environmental consciousness creates a fertile ground for sustainable business growth and societal well-being. Furthermore, the implications of environmental accounting extend far beyond statement of financial position and financial statements. Embracing this practice reflects a commitment to being ecologically conscious, an attribute that resonates with a society increasingly attuned to environmental concerns. Thus, environmental accounting encapsulates a company's ability to project itself as an ally in the collective pursuit of environmental preservation (Şimşek & Öztürk, 2021).

Lately, a great deal of interest has been focused on the relation between business activities and environmental issues as companies are now expected to be more environmentally responsible (Christmann & Taylor 2021). An increasing number of companies worldwide are putting in place environmental management systems as part of their efforts towards better environmental cost management (Melnyk et al., 2023). Measuring environmental cost and setting targets is a critical component for organizations to become more productive, more profitable, and more sustainable (Freedman, 2019). Monitoring key metrics such as energy, waste, and water usage leads to reductions in greenhouse gas emissions as well as operational efficiency improvements and cost savings. When environmental costs are not adequately allocated, cross-subsidization occurs between products. In most cases, different products are made by different processes, and each process tends to have a different environmental cost (Christ & Burritt, 2021).

Statement of the Problem

The increasing environmental challenges such as pollution, climate change, and resource depletion have placed immense pressure on organizations globally to integrate environmental considerations into their operational and financial reporting systems. In response, environmental accounting has become a critical component of modern corporate governance. However, in Nigeria, particularly among listed oil and gas companies, the adoption and effective implementation of environmental accounting practices remain inadequate and inconsistent (Melnyk et al., 2023).

Despite the fact that oil and gas companies are among the largest contributors to environmental degradation due to their production processes, many of these firms treat environmental costs as peripheral rather than integral to their strategic and financial decision-making. This neglect raises concerns about the long-term sustainability of their operations and casts doubt on the true representation of their financial performance (Şimşek & Öztürk, 2021).

Furthermore, there is an ongoing debate on whether environmental accounting costs enhance or hinder firm performance. Some corporate managers perceive environmental costs as an additional burden that reduces profitability, while others argue that proactive environmental spending can lead to improved efficiency, brand loyalty, regulatory compliance, and ultimately better financial outcomes. This contradiction highlights a significant gap in empirical research, particularly in the Nigerian context where environmental regulations are often weakly enforced and corporate accountability is sometimes overlooked.

Objective of the Study

The main objective of this study is to examine the effect of environmental accounting cost on the financial performance of listed oil and gas companies in Nigeria. The specific objectives are to:-

i. assess the effect of energy conservation costs on return on assets of listed oil and gas companies in Nigeria.

ii. evaluate the influence of environmental training costs on return on assets of listed oil and gas companies in Nigeria.

Research Questions

The study seeks to provide answers to the following research questions:-

i. What is the effect of energy conservation costs on return on assets of listed oil and gas companies in Nigeria?

ii. To what extent do environmental training costs influences return on assets of listed oil and gas companies in Nigeria?

Research Hypotheses

HO_1: Energy conservation costs have no significant effect on return on assets of listed oil and gas companies in Nigeria.

HO_2: Environmental training costs have no significant effect on return on assets oflisted gas and oil companies in Nigeria.

2. LITERATURE REVIEW

Conceptual Review

Financial Performance

Financial performance refers to the overall measure of a firm's profitability, stability, and efficiency in utilizing its resources to generate income and sustain growth. It is a critical indicator used by investors, management, payables, and regulators to assess how well an organization is achieving its financial objectives. According to Nwakaego and Malizu (2022), financial performance reflects the financial health of a company and its ability to create value for its stakeholders over a given period.

Common metrics used to evaluate financial performance include Return on Assets (ROA), Return on Equity (ROE), Earnings per Share (EPS), Gross Profit Margin (GPM), Net Profit Margin (NPM), and Operating Cash Flow. These indicators provide insight into how efficiently a company is using its assets, managing its costs, generating profits, and maintaining liquidity.

Financial performance is influenced by both internal and external factors. Internal factors include cost structure, asset utilization, operational efficiency, innovation, and management quality. External factors involve economic conditions, industry competition, regulatory policies, and market dynamics. A company with strong financial performance is typically characterized by steady revenue growth, high returns on investment, low debt ratios, and efficient asset management.

Environmental Accounting Costs

Environmental accounting has emerged as a crucial aspect of modern accountancy, integrating environmental costs into financial decision-making and corporate reporting. This aspect explores the historical development, theoretical foundations, and practical applications of environmental accounting costs, highlighting its evolution from a voluntary practice to a fundamental element of corporate sustainability (Agbede et al., 2025).

Agbiogwu (2019) sees environmental accounting as the process of communicating the environmental effects of organization’s economic actions to particular interest group that is found in the society as well as the society itself in general. It is a process that enables an organization to identify the cost of environmental conservation while engaging in normal course of business, identify benefits gained from such activities, to bring about the best possible ways of quantitative measurement (in monetary value or physical units) and support the dissemination of its results (Aminga & Momanyi, 2019).

Environmental accounting involves the identification, measurement and allocation of environmental costs, and the integration of these costs into business and encompasses the way of communicating such information to the company’s stakeholders (Effiok & Eton, 2021). It is a management tool that can be used for various purposes, for example, improving

environmental performance, costs controlling, investing in cleaner technologies, greener processes and product development, and taking decisions that pertain product mix, product retention, and product pricing (Uwuigbe, 2021). Charles et al. (2018) opined that environmental costs are costs which are incurred by organizations for the purpose of protecting the environment, the prevention of environmental problems, and also to minimize damages that the environment may suffer.

According to Kamieniecka and Nozka (2020), environmental accounting also known as green accounting is a management tool addressing all areas of accounting that may be affected by the response of business organizations to environmental issues, including the new area of eco accounting. It is an essential exercise necessary for the replenishment of the environmental losses due the activities of various business outfits within the environments.

In light of this, Edward (2021) argued that the definition of the environmental cost depends on the utilization of information in a company and that environmental costs can include conventional costs (raw materials and energy costs with environmental relevance), potentially hidden costs (costs which are captured by accounting system but then lose their identity in overheads), contingent costs (costs in a future time contingent liabilities), and image and relationship costs.

Energy Conservation Costs

Energy conservation cost refers to the financial resources spent by companies to minimize energy consumption and improve energy efficiency in their operations. These costs include expenses on energy-efficient technologies, energy audits, renewable energy adoption, retrofitting production facilities, and training employees on energy-saving practices. For industries such as consumer goods manufacturing, where production processes are energy-intensive, these costs are particularly significant in driving both environmental and financial outcomes (Aminga & Momanyi, 2019).

The International Energy Agency (IEA, 2022) notes that global investment in energy efficiency has continued to rise, as companies increasingly recognize the long-term financial and environmental benefits of reducing energy consumption. Similarly, the United Nations Industrial Development Organization (UNIDO, 2021) emphasizes that energy efficiency initiatives not only lower operational costs but also contribute to achieving broader sustainability goals. Incorporating energy conservation costs into environmental accounting provides managers with critical information to make decisions that balance profitability with sustainability.

Energy conservation cost refers to the expenses that organizations incur in their effort to reduce energy consumption and improve efficiency in their operations. These costs may include the acquisition of energy-efficient machinery, modernization of production facilities, adoption of renewable energy sources, retrofitting of lighting & heating systems, carrying out energy audit and training employees on energy-saving practices. In energy-intensive sectors such as consumer goods manufacturing, where processes often involve heavy machinery, refrigeration, and large-scale distribution, these costs can form a critical component of environmental accounting (Elmassri & Basiruddin, 2023).

Environmental Training Cost

Qian et al. (2022) viewed environmental training costs as the expenditures incurred by organizations to enhance the knowledge, skills, and attitudes of employees regarding environmentally sustainable practices. These costs encompass a wide range of activities such as employee workshops, seminars, certification programs, awareness campaigns, and the

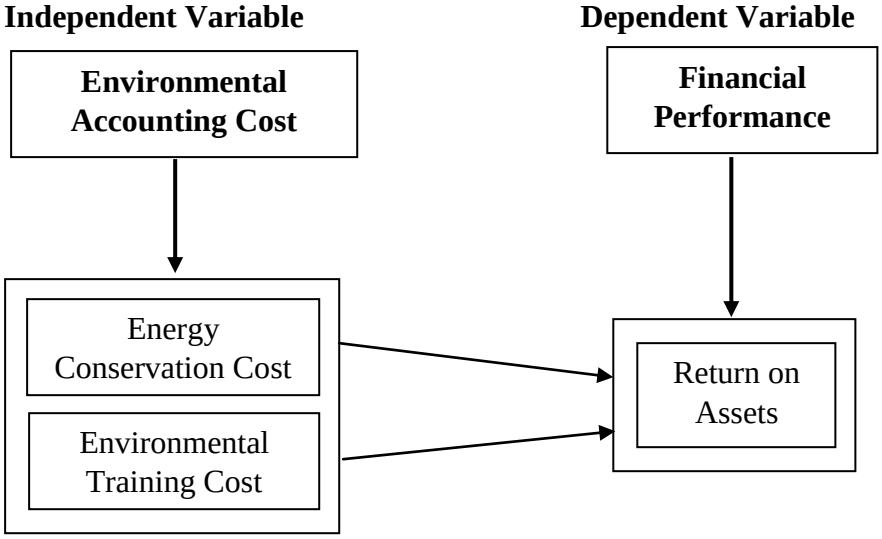
development of internal policies on waste management, energy efficiency, and pollution control. Unlike compliance-driven costs such as taxes or penalties, environmental training represents a proactive investment in building human capital for sustainability.

The rationale behind environmental training is that human resources are central to achieving corporate sustainability goals. Employees at all levels—from operations to management—play a role in reducing waste, conserving energy, and ensuring regulatory compliance. Training equips staff with the technical and managerial competencies required to integrate eco-friendly practices into daily operations, thereby contributing to long-term organizational efficiency (Zhou & Wang, 2021).

From a strategic perspective, environmental training costs can be viewed as an intangible investment rather than a pure expense. Similar to research and development (R&D), such investments enhance organizational capabilities and yield long-term benefits in productivity, regulatory compliance, and brand reputation. Companies that invest in environmental education often achieve operational cost savings through efficient resource use, reduced waste, and improved environmental risk management (Elmassri & Basiruddin, 2023).

Globally, evidence suggests that environmental training improves both environmental and financial outcomes. For instance, multinational firms adopting ISO 14001 Environmental Management Standards invest significantly in training as a requirement for certification. Such initiatives have been shown to lower compliance costs, improve market competitiveness, and increase stakeholder trust (Martínez-Ferrero & García-Sánchez, 2019).

Conceptual Model



Source: Researchers (2025)

Theoretical Framework

Stakeholder Theory

Developed by Freeman (1984), Stakeholder Theory emphasizes that companies do not exist solely to maximize shareholder wealth, but to serve a broader set of stakeholders, including employees, customers, suppliers, regulators, communities, and the environment. In this context, environmental accounting costs such as waste management, internal failure prevention, and external failure rectification are expenditures incurred to meet stakeholder expectations regarding environmental responsibility.

Stakeholder Theory suggests that firms that effectively manage and disclose their environmental performance will build stronger relationships with stakeholders. These relationships can enhance the firm's reputation, attract socially responsible investors, foster consumer loyalty, and reduce the risk of conflict with regulators or environmental groups. In turn, these outcomes can improve the firm's financial metrics, including Return on Assets (ROA), by promoting more efficient operations and stable market positioning.

Thus, this theory supports the hypothesis that environmental accounting costs, when properly managed, can contribute positively to firm performance.

Legitimacy Theory

Legitimacy Theory asserts that organizations continually seek to align their operations with societal values, norms, and expectations to gain and maintain legitimacy. According to Deegan (2002), legitimacy is essential for long-term survival, as stakeholders may withdraw support if they perceive a company's actions as socially or environmentally unacceptable.

In applying this theory to environmental accounting, firms voluntarily disclose and manage environmental costs to demonstrate their commitment to environmental sustainability and regulatory compliance. Actions such as investing in waste management or addressing environmental failures are seen as efforts to protect and enhance the firm's legitimacy in the eyes of the public, regulators, and investors.

Legitimacy Theory, therefore, provides a rationale for the proactive adoption of environmental accounting practices. It also explains why firms that maintain strong environmental credentials may experience better financial performance, including improved ROA, due to enhanced stakeholder trust and reduced regulatory risk.

Empirical Review

Okafor (2018) ascertained the effect of environmental costs on firm performance. To achieve the objective, the study made use of financial reports of oil and gas companies quoted in the Nigerian Stock Exchange Market from years 2006-2015. Regression analysis was employed with the aid of the Statistical Package for Social Sciences (SPSS). The results of the statistical analysis indicated that better environmental performance positively impacted the business value of an organization. Moreover, environmental accounting provides the organization with an opportunity to reduce environmental and social costs and improve its performance.

Osisioma and Chiamogu (2020) ascertained the effect of environmental costs on financial performance of oil and gas companies listed on Nigeria stock exchange. The specific objectives were to: assess the effect of Employee Health and Safety Cost on Tobin's Q of oil and gas companies listed on Nigeria Stock Exchange and determine the effect of Waste Management Cost on Tobin's Q of oil and gas companies listed on Nigeria Stock Exchange. Ex post facto research design was adopted for the study and data collected was analysis and tested using regression analysis with aid of E-view 9.0 the result shows that employee health and safety cost has a significant positive effect on Tobin's Q of oil and gas companies listed on Nigeria Stock Exchange at 5% level of significance. Another finding indicate that waste management cost has significant positive effect on Tobin's Q of oil and gas companies listed on Nigeria Stock Exchange at 5% level of significance.

Okere, et al. (2022) examined the effects of environmental accounting costs on the financial performance of selected quoted oil and gas firms in Nigeria. To achieve this objective,

Secondary source of data was used in the study and sourced through Nigeria exchange group and companies' annual report of Conoil, MRS Oil and Forte Oil covering the period of 21years (2000-2020). The study adopted both the descriptive and inferential statistics in analyzing the panel data and in order to empirically investigate the effect of the explanatory variables on the dependent variable, multiple regression model involving ordinary least square method was used to test hypotheses formulated. Results from the regression indicate that environmental internal failure cost and environmental external failure cost have a positive and significant effect on the financial performance of oil and gas companies in Nigeria, while, Environmental pollution prevention costs and environmental detection costs revealed an insignificant effect on the financial performance of oil and gas companies in Nigeria. The Implications of these results are that, if the variables are not identified and improved upon, the challenges facing environmental accounting costs on the financial performance of the companies may persist and may lead to sub optimal performance and failed vision.

Owoeye (2023) focused on the empirical investigation of the environmental impact accounting and financial performance of listed oil and gas companies within the largest economy in Africa. To address these environmental challenges and investigate the potential impact of environmental management accounting (EMA) practices on company performance, this paper utilized a quantitative methodology. Panel data from all the nine (9) oil and gas listed firms' audited financial statements from 2007 to 2023 on the Nigerian Exchange Group (NGX) as at September 30, 2023 were analyzed. It is important to note that these oil and gas companies may have variations in their EMA systems or policies. The researcher findings argued that environmental effect and concerns have an impact on the financial performance of Nigerian listed oil and gas businesses. As a result, it was advised that investors consider environmental and operational factors while making investment decisions. Finally, authorities should adopt laws and regulations to ensure that Nigerian oil and gas corporations understand the need of incorporating environmental and operational performance into long-term strategic goals.

Wobo and Odoemelam (2024) examined the impact of environmental accounting costs on the financial performance of listed oil and gas companies in Nigeria. High-risk industries like oil and gas face significant scrutiny with environmental sustainability now a global priority. In Nigeria, oil exploration in the Niger Delta has caused severe environmental damage, affecting the operational performance of oil and gas companies. This research evaluates whether transparent reporting on environmental conservation and pollution remediation costs influences profitability and financial health. Grounded in Resource-Based View, Stakeholder, and Legitimacy Theories, the study explores how environmental costs can function as strategic assets, enhancing corporate reputation and stakeholder trust. Using a quantitative approach, the study analyzed data from ten (10) oil and gas firms listed on the Nigerian Exchange Limited (NGX) that spanned from 2013 to 2022 (10 years), yielding 400 observations. Data from annual reports were subjected to regression analysis, with robustness checks confirming the results' reliability. The findings show a positive relationship between environmental costs and financial performance, suggesting that companies that sign environmental agreements will be more profitable. This supports the view that companies seen as environmentally responsible attract investors and customers, gaining a competitive edge.

Hassan and Oseremen (2024) examined environmental accounting practices and its benefits to oil and gas companies in Nigeria. Two research questions guided the study. An ex-post

research design was used. From the selected companies, proportionate sampling technique was used to select 15 employees from each making a total of 150 employees as sample size. The researchers self-developed questionnaire tagged: Environmental Accounting Practices and Benefits Questionnaire (EAPBQ) was used for data collection with 0.93 as reliability coefficient. Descriptive statistics of mean and bar-chart were adopted in answering and presenting research questions 1 and 2. The findings of the study indicated that there was lower level of environmental accounting practices in oil and gas companies in Nigeria. Oil and gas companies accrued benefits from environmental accounting practices in Nigeria such as disclosing information about environmental performance, commitment to sustainability, transparency and accountability to stakeholders, comply with evolving environmental regulations and standards, encouraging eco-efficiency, and companies to invest in more eco-efficient.

Bawa (2025) investigated the effect of Environmental Accounting Disclosures (EAD) on the profitability of listed oil and gas companies in Nigeria over the period 2015–2024. Using panel data from six sampled firms, the research employs a dynamic panel data approach with the Generalized Method of Moments (GMM) to account for the persistence of profitability and potential endogeneity between financial performance and environmental disclosures. The findings reveal that environmental policy disclosures have a strong and positive effect on profitability, it also provide important insights into how environmental transparency shapes financial performance in a sector characterized by high environmental risk, regulatory scrutiny, and public sensitivity. The results show that profitability exhibits moderate persistence over time, indicating that past financial performance continues to influence current outcomes.

2. METHODOLOGY

This study employed an ex post facto research design, which is ideal for investigations where the events have already occurred and cannot be manipulated by the researcher. As Kothari (2024) noted, ex post facto causal research is suitable for investigating how one variable affects another, which is in line with this study's objective of analyzing the influence of environmental accounting cost on financial performance. The study's population comprises all the eight (8) oil and gas companies listed on the Nigerian Exchange Group as of December, 2024. For this study, a purposive sampling was used to select seven (7) listed oil and companies from the eight listed companies. Secondary data was employed, sourced from the audited annual financial reports of the selected oil and gas companies listed on the Nigerian Exchange Group (NGX) for a ten-year period spanning from 2015 to 2024. The data collected was analyzed with the use of descriptive statistics, correlation and regression analysis. Furthermore, the statistical technique used for testing the hypothesis of this study is Panel EGLS (Estimated Generalized Least Squares) which was modeled using multiple linear regression analysis. In this model, the explanatory variable (environmental accounting cost) was used to evaluate the explained variable (Financial Performance).

The study model adopts a panel regression framework to empirically analyze the effect of environmental accounting cost on Financial Performance. The dependent variable proxy is return on assets, representing Financial Performance, while the independent variables include energy conservation costs, environmental taxes, environmental training costs, which serve as proxies for environmental accounting cost. The general and specific model equations are as follows:

$$\boldsymbol{Y_{it} = f(X_{it})}$$

In this study, $\boldsymbol{Y_{it}}$is a denotation for the dependent variable (ROA), which serves as a proxy of financial performance. The independent variable (environmental accounting cost) $\boldsymbol{X_{it}}$ which is a denotation for ECC and ETC.

For this study (In Explicit Form)

$$ROA_{it} = \alpha_i + \beta_1 ECC_{it} + \beta_2 ETC_{it} + \varepsilon_{it}$$

Where:
α_i = Intercept for each firm (captures unobserved firm-specific characteristics)
Where:
ROA_{it}= Return on Assets *i* at time *t* (dependent variable)
ECC_{it} = Energy Conservation Costs (independent variable)
ETC_{it} = Environmental Training Costs (independent variable)
α = Constant Term
$\beta_1 - \beta_2$= Coefficient of Independent Variables
ε_{it} = Idiosyncratic error term

4. RESULTS

In this chapter, the study uses an extensive analysis and presentation of data collected. The descriptive analyses of the variables used in this study were presented. This was followed closely by discussion and interpretation of the results formulated for this study. The analysis of the instrument was carried out based on the statistical tools adopted. The study's position in this study was clearly stated under the result presentation and discussion that was further elaborated in the interpretation of the results. These views were within the theoretical framework of this study. The survey Results of this study were analyzed using E-Views (Version 12).

Presentation of Results

Table 1 Descriptive Statistics

	ROA	ECC	ETC
Mean	4.840266	5.924040	6.738682
Median	4.261550	6.212250	6.767300
Maximum	26.49350	7.276300	8.062400
Minimum	-30.09520	0.000000	5.248100
Std. Dev.	8.704208	1.029232	0.626321
Skewness	-0.540645	-2.188631	-0.439211
Kurtosis	5.254070	12.81209	2.880614
Jarque-Bera	24.47923	452.1304	3.078023
Probability	0.000005	0.000000	0.214593
Sum	454.9850	556.8598	633.4361
Sum Sq. Dev.	7045.981	98.51655	36.48181
Observations	70	70	70

Source: Researchers' Extraction from Eviews 12

Table1 shows the descriptive statistics for Return on Assets (ROA), Energy Conservation Cost (ECC), and Environmental Training Cost (ETC). ROA recorded a mean of 4.84, reflecting the average profitability of the sampled companies. The standard deviation of 8.70 indicates high dispersion around the mean, suggesting wide fluctuations in financial performance. The skewness value of –0.54 and kurtosis of 5.25 reveal a negatively skewed

and leptokurtic distribution, while the Jarque-Bera probability of 0.000005 confirms non-normality.

ECC had a mean of 5.92, indicating a relatively consistent level of energy conservation expenditure across the firms. The standard deviation of 1.03 shows low variability, suggesting firms invested almost equally in energy-saving initiatives. The skewness of –2.18 and kurtosis of 12.81 point to a highly left-skewed and peaked distribution. The Jarque-Bera probability of 0.000000 further confirms significant non-normality in ECC data.

ETC produced a mean of 6.74, showing the highest average cost among the independent variables. With a standard deviation of 0.63, the data reveal very low variability, implying uniform commitment to environmental training across the firms. The skewness of –0.44 and kurtosis of 2.88 indicate a fairly symmetric and mesokurtic distribution. The Jarque-Bera probability of 0.214593 suggests ETC is normally distributed, unlike the other variables.

Table 2: Correlation Analysis

Correlation Probability	ROA	ECC	ETC
ROA	1.000000 -----		
ECC	-0.053010 0.6119	1.000000 -----	
ETC	0.122099 0.2411	0.629694 0.0000	1.000000 -----

Source: Researchers' Extraction from Eviews 12

Table 2 shows the correlation between ROA and ECC is weak and negative (r = –0.053, p = 0.6119), while ROA and ETC are weakly positive but insignificant (r = 0.122, p = 0.2411). ECC and ETC exhibit a strong and significant positive relationship (r = 0.630, p = 0.0000), indicating firms that invest more in energy conservation also tend to spend more on environmental training. Overall, the results reveal that environmental taxes contribute meaningfully to financial performance, while ECC and ETC are more strongly related to each other than to ROA.

Table 3 Correlated Random Effects - Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	4.221483	2	0.2385

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
ECC	-2.024607	-1.111164	0.221741	0.0524
ETC	-1.404822	-0.667476	0.648199	0.3598

Source: Researchers' Extraction from Eviews 12

Table 3 shows the result of the Hausman test conducted to determine the appropriate model between fixed effects and random effects. The null hypothesis of the Hausman test states that the preferred model is random effects, as it assumes no correlation between the individual effects and the regressors. The test produced a chi-square statistic of 4.2215 with 3 degrees of freedom and a probability value of 0.2385, which is greater than 0.05. This implies that the null hypothesis cannot be rejected, indicating that the random effect model is more suitable for this study. Therefore, the random effect specification will be employed for hypothesis testing and interpretation of the relationship between environmental accounting costs and financial performance.

Interpretation of Results

Given that the Hausman Test in Table 3 indicated that the Random Effect Model is the appropriate model for this study, Hence, Random Effect Model would be suitable for testing of the study's hypotheses.

Table 4: Panel EGLS Random Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.901870	9.947877	0.090660	0.9280
ECC	-1.111164	1.010088	-1.100067	0.2742
ETC	-0.667476	1.650096	-0.404507	0.6868
	Effects Specification			
			S.D.	Rho
Cross-section random			3.704365	0.2554
Idiosyncratic random			6.325068	0.7446
	Weighted Statistics			
R-squared	0.315159	Mean dependent var		2.287346
Adjusted R-squared	0.292331	S.D. dependent var		7.604318
S.E. of regression	6.411523	Sum squared resid		3699.686
F-statistic	13.80580	Durbin-Watson stat		1.252286
Prob(F-statistic)	0.000000			
	Unweighted Statistics			
R-squared	0.304041	Mean dependent var		4.840266
Sum squared resid	4903.715	Durbin-Watson stat		0.944807

Source: Researchers' Extraction from EViews 12

Table 4 shows the regression results for the effect of environmental accounting costs on financial performance. The constant term (C) recorded a coefficient (β) of 0.9019 with a t-statistic of 0.0907 and a probability value of 0.9280, which is not statistically significant. This indicates that when all explanatory variables are held at zero, the baseline return on assets is positive but negligible and insignificant. The high p-value implies that the intercept does not contribute meaningfully to explaining variations in financial performance, hence the explanatory strength lies in the independent variables.

Energy Conservation Cost (ECC) produced a negative coefficient (β = –1.1112), with a t-statistic of –1.1001 and a probability of 0.2742. This outcome demonstrates that a one-unit increase in energy conservation costs leads to a 1.11 decrease in return on assets, although the relationship is statistically insignificant. The insignificant probability indicates that, despite the negative slope, energy conservation costs do not exert a meaningful direct effect on financial performance. This suggests that energy-saving expenditures may not translate into immediate profitability benefits within the sampled companies.

Environmental Training Cost (ETC) revealed a negative coefficient (β = –0.6675), with a t-statistic of –0.4045 and a probability of 0.6868, which is statistically insignificant. This suggests that a one-unit increase in environmental training expenditure results in a 0.67 reduction in return on assets, but the relationship is weak and not meaningful in explaining profitability. The result indicates that although training investments are essential for long-term sustainability, they do not directly contribute to immediate improvements in financial performance within the period under review.

Turning to the model fit, the R-squared value of 0.3152 indicates that approximately 31.5% of the variations in return on assets are explained by energy conservation cost, environmental taxes, and environmental training cost. The adjusted R-squared of 0.2923 further confirms that after adjusting for the number of predictors, nearly 29.2% of the variability in financial performance is accounted for by the model. The F-statistic of 13.8058 with a probability value of 0.000000 demonstrates that the model as a whole is statistically significant, confirming that the explanatory variables jointly have a meaningful effect on financial performance. This underscores the robustness of the regression results and validates the model for policy and managerial interpretation.

Hypothesis One

$H0_1$ Energy conservation costs have no significant effect on return on assets of listed oil and gas companies in Nigeria.

From Table 4, the coefficient of Energy Conservation Cost (ECC) shows a probability value of 0.2742, which is greater than the significance level of 0.05. Therefore, the null hypothesis that energy conservation costs have no significant effect on return on assets is accepted.

Hypothesis Two

HO_2 Environmental training costs have no significant effect on return on assets oflisted oil and gascompanies in Nigeria.

From Table 4, the coefficient of Environmental Training Cost (ETC) presents a probability value of 0.6868, which is greater than the significance level of 0.05. Therefore, the null hypothesis that environmental training costs have no significant effect on return on assets is accepted.

Discussion of Results

The findings of this study began with the descriptive statistics presented in Table1, which highlighted the central tendency and distributional properties of the variables under study. Return on Assets (ROA) displayed high variability with evidence of non-normality, indicating fluctuating financial performance across the sampled companies. Energy Conservation Costs (ECC) exhibited non-normal distributions, while Environmental Training Cost (ETC) was the only variable that approximated normality. Correlation results in Table 2 demonstrated a low negative and positive association between ECC and ETC respectively.

Focusing on the effect and significance of the independent variables on financial performance, the random effect model revealed that energy conservation costs had a negative but insignificant effect on ROA, showing that additional spending on energy-saving projects did not enhance profitability in the short run. This aligns with the findings of Nwaobia et al. (2019), who reported that Nigerian firms face challenges in deriving immediate profitability from energy conservation due to high implementation costs and unstable power supply.

Environmental training costs were also negative and insignificant, indicating that training expenditures did not directly translate into immediate financial gains. This outcome is consistent with the position of Nwaobia et al. (2019), who noted that the financial burden of training in developing economies often outweighs the short-term benefits to firm performance. These results both energy conservation and training costs have limited or insignificant direct effects.

In line with the overall objectives of the study, the findings demonstrate that environmental accounting costs does not influence financial performance in different ways across the selected oil and gas companies. The first objective, which examined the effect of energy conservation costs on ROA, was not supported as ECC did not significantly impact performance. The second objective, which evaluated the role of environmental training costs, was not supported as ETC failed to demonstrate significance. Collectively, the analysis affirms that both energy conservation costs and environmental training costs are not part of the critical component of environmental accounting costs influencing financial performance, thereby providing valuable insights for policymakers and managers within the oil and gas sector in Nigeria.

5. CONCLUSION AND RECOMMENDATIONS

Conclusion

This study examined the effect of environmental accounting costs on the financial performance of listed oil and gas companies in Nigeria, using Return on Assets (ROA) as the performance measure. The specific objectives were to assess the effect of energy conservation costs and environmental training costs on ROA. Findings revealed that both energy conservation costs and environmental training costs exhibited negative but insignificant relationships.

With respect to the first objective, the study concludes that energy conservation costs have no significant effect on return on assets of listed oil and gas companies in Nigeria. Although the coefficient was negative, it failed to attain statistical significance, indicating that short-term financial benefits may not accrue from these expenditures.

Regarding the second objective, the study concludes that environmental training costs have no significant effect on return on assets of listed oil and gas companies in Nigeria. Although investment in training is critical for long-term sustainability, the results show that it does not translate into immediate profitability gains.

Recommendations

Based on the findings, this study offers the following recommendations which are beneficial to the sampled companies, the wider oil and gas industry and policymakers committed to enhancing sustainable business practices in Nigeria:

Phased investment strategy for energy conservation costs:- Firms should adopt a gradual approach to investing in energy efficiency projects. By modernizing energy systems in phases and integrating renewable sources, companies can minimize the short-term financial burden while still securing long-term operational efficiency and sustainability benefits.

Design cost-effective and practical environmental training programs:- Management of oil and gas companies should develop training initiatives that focus on practical implementation of sustainability practices. Collaborations with regulatory agencies and NGOs can reduce training costs while equipping employees with the skills to achieve environmental targets, thereby reducing the strain on short-term profitability.

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