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Article

Environmental Cost Accounting and Financial Performance of Oil and Gas Companies Listed in Nigeria

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Abstract: This study examines the effect of environmental cost accounting on the financial performance of oil and gas companies listed on the Nigerian Exchange Group between 2015 and 2024. Using an ex post facto research design and secondary data extracted from the annual reports of seven sampled companies, the study investigates the impact of key environmental cost accounting variables waste management cost and employee health and safety cost on net profit margin as a measure of financial performance. Employing panel least squares regression with fixed effects, the findings reveal that neither waste management cost nor employee health and safety cost has a statistically significant influence on net profit margin in the sampled firms. These results suggest that environmental accounting expenditures may not directly affect short-term profitability, highlighting the need for oil and gas companies to adopt integrated and strategic approaches towards environmental management. The study recommends greater transparency in environmental cost reporting and encourages the adoption of sustainable practices to enhance long-term financial and operational outcomes.

Keywords: Environmental Cost, Financial Performance, Waste Management Cost, Employee Health and Safety Cost, Net Profit Margin.

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1. Introduction

Environmental degradation has become a profound and pressing global issue, eliciting growing concern and engagement from a broad spectrum of actors which including researchers, policymakers, lawmakers, environmental activists, and ordinary citizens. The cumulative consequences of human activity on nature have reached a critical point where the integrity of the biosphere itself is increasingly at risk. This widespread recognition has spurred intensive research and dialogue on sustainable development, with a particular focus on the methodologies and tools that might be used to measure and manage environmental impacts more effectively. One of these tools is environmental accounting which has emerged as a promising framework for embedding ecological awareness into the fabric of economic and organizational decision-making.

Environmental accounting, sometimes referred to as "green accounting," is essentially a modification of traditional accounting practices to incorporate environmental costs and consequences. It provides a mechanism for organizations to assess their ecological footprints, estimate the value of natural capital, and evaluate the long-term sustainability of their operations. This process aligns with the broader goals of sustainable development,

which seeks to balance the economic, social, and environmental dimensions of progress in ways that do not compromise the ability of future generations to meet their own needs.

The need for such integrative frameworks has become more acute in the face of rapid industrialization and intensified globalization. Over the past few decades, industrial expansion and the liberalization of global markets have contributed significantly to the degradation of ecosystems. The consequences of these processes include air and water pollution, soil depletion, deforestation, biodiversity loss, and the depletion of finite natural resources. These ecological damages are not isolated phenomena but are part of a global pattern of unsustainable development.

It is widely recognized in academic literature that companies are among the primary agents of environmental harm. As Jahanshahi and Brem [1] observe, corporate operations are often the direct cause of environmental degradation, whether through emissions, resource extraction, or waste generation. As a result, businesses face increasing pressure from both regulators and society at large to internalize environmental costs and adopt practices that are less destructive to the natural world. The imperative to conserve the environment while also achieving financial objectives has become a defining challenge for contemporary organizations [2]. This dual responsibility which includes economic viability and environmental stewardship has led to a growing interest in sustainable development as a strategic organizational goal.

According to Tu et al. [3], sustainability is no longer a peripheral concern but a central tenet of long-term organizational survival and competitiveness. It compels companies to rethink their production methods, supply chains, waste management systems, and investment strategies. Within this evolving paradigm, environmental accounting plays a crucial role by offering quantifiable metrics and reporting systems that reflect ecological impacts alongside economic outcomes.

Environmental accounting thus becomes an essential instrument in evaluating the sustainability of business practices. It allows companies to track the use and degradation of natural resources, assess the effectiveness of their environmental initiatives, and communicate these efforts transparently to stakeholders. Furthermore, it facilitates informed policymaking by providing governments and regulatory bodies with the data necessary to design interventions that support both economic growth and environmental protection. The integration of environmental accounting into mainstream financial systems also signifies a shift in how value is perceived and calculated. No longer is value confined to short-term profits or market share; rather, it is increasingly understood in terms of long-term ecological resilience and social responsibility. By adopting green accounting practices, firms not only enhance their legitimacy in the eyes of stakeholders but also contribute to the global endeavor to reverse environmental decline and build a more sustainable future.

1.1 Problem Statement

Environmental accounting, as defined by Schaltegger and Burritt [4], is a specialized branch of accounting that encompasses the activities, methods, and systems used to record, analyze, and report the financial and ecological impacts of economic activities. Over time, this form of accounting has grown to become a pivotal element in organizational environmental decision-making processes. However, despite significant efforts in economic advancement and the design of sustainable development initiatives, a noticeable gap remains. The absence of standardized norms, uniform regulations, and comparable environmental accounting frameworks has posed considerable challenges to the realization of genuinely sustainable progress. Traditional accounting practices, though essential, are increasingly seen as insufficient in addressing the complex demands of sustainability. A more representative and integrated accounting approach is required, one that not only supports governmental policymaking and institutional frameworks for sustainability but also actively engages with emerging domains such as carbon accounting

and sustainable reporting, both of which are critical in confronting the realities of climate change [5].

Furthermore, there is a growing necessity for companies to adopt transparent and sustainable reporting practices. This includes not only environmental disclosures but also accountability in areas such as bribery, corruption, human rights, and the management of human capital. Companies are therefore called to reorient their decision-making processes toward long-term sustainability rather than short-term financial gains. Such an approach strengthens corporate governance, improves stakeholder confidence, and contributes to the efficiency and integrity of capital markets [6]. Against this backdrop, the present study seeks to evaluate how effectively environmental accounting contributes to the achievement of sustainability goals within industrial companies. The research is grounded in the understanding that for true sustainable development to be attained, environmental accounting must evolve from a theoretical framework into a practical, standardized, and enforceable tool for corporate sustainability.

Conceptual Framework Model

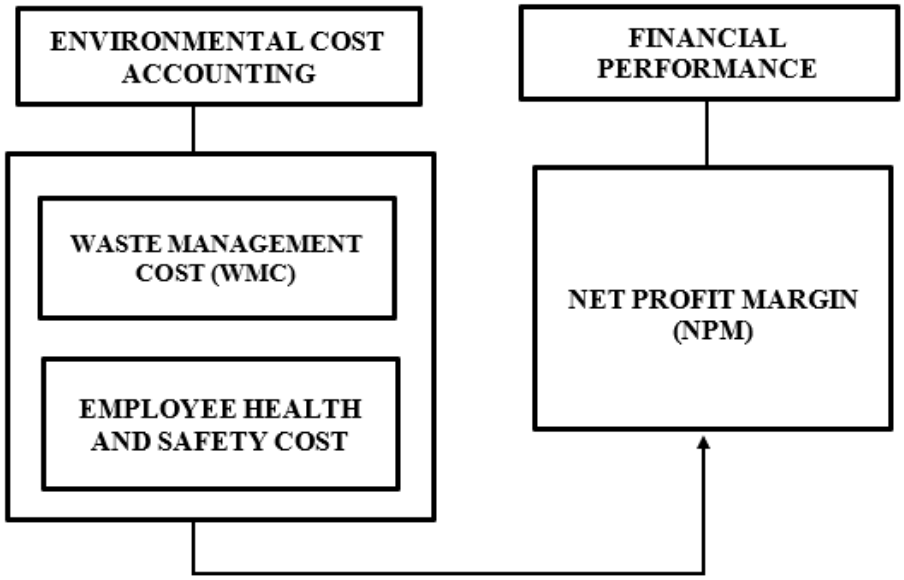


Figure 1. Conceptual framework on the effect of environmental accounting cost on financial performance of oil and gas companies in Nigeria.

Source*:* Anewe & Ogbu [7]

1.2 Aim and Objectives of the Study

1. To ascertain the effects of waste management cost on net profit margin (NPM) of listed oil and Gas companies in Nigeria.
2. To investigate the effect of employee health and safety cost on net profit margin (NPM) of oil and Gas companies in Nigeria.

1.3 Research Question

1. What is the effect of waste management cost on net profit margin (NPM) of listed oil and Gas companies in Nigeria?
2. What is the effect of employee health and safety cost on net profit margin (NPM) of oil and Gas companies in Nigeria?

1.4 Research Hypotheses

To achieve the objective of this study, a number of hypotheses were proposed and are tested using data from listed oil and Gas companies in Nigeria?

Ho1: Waste management cost has on significant effects on net profit margin (NPM) of listed oil and Gas companies in Nigeria'

Ho2: Employee health and safety cost has no significant effects on net profit margin (NPM) of oil and Gas companies in Nigeria.

Environmental accounting has emerged as a critical component of modern organizational practice, driven by growing awareness of environmental issues and the pressing need for sustainability in economic development. At its core, environmental accounting involves the identification, measurement, and communication of costs and benefits related to the environmental impacts of an entity's activities. It bridges the gap between traditional accounting practices and the increasingly urgent demands for environmental stewardship, transparency, and accountability. Environmental accounting goes beyond the financial cost of environmental initiatives; it integrates environmental considerations into financial and managerial accounting systems. This means recognizing and quantifying the environmental costs of business operations, such as pollution control, waste management, and resource depletion, as well as the potential liabilities associated with environmental damage. According to Schaltegger and Burritt [8], environmental accounting serves both internal and external functions, internally, it aids managers in making more informed, sustainable decisions; externally, it provides stakeholders with critical information about a company's environmental performance.

A key aspect of environmental accounting is Environmental Management Accounting (EMA**)**, which focuses on internal use by managers for decision-making. EMA helps organizations track environmental costs that are often hidden in general overheads, such as energy use, water consumption, and waste disposal. By uncovering these hidden costs, companies can identify opportunities for efficiency improvements and cost savings while simultaneously reducing their ecological footprint [9], [10]. On the external side, Environmental Financial Accounting (EFA) involves the reporting of environmental liabilities, assets, and expenditures in financial statements. While traditional financial reporting frameworks have been slow to incorporate detailed environmental information, there is increasing pressure on companies to disclose such data. The rise of sustainability reporting frameworks such as the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), and the recent International Sustainability Standards Board (ISSB) demonstrates a shift toward greater environmental transparency and standardization in corporate reporting [11]. Environmental accounting also supports the polluter pays principle, wherein companies are expected to bear the costs of managing pollution and environmental harm caused by their activities. This principle has been gradually integrated into legal and economic systems across the world, reinforcing the need for firms to internalize environmental costs through accurate accounting and reporting [12].

Despite its growing relevance, environmental accounting still faces several challenges. One major hurdle is the lack of universally accepted standards and methodologies for measuring environmental costs and benefits. While frameworks like the GRI provide guidance, differences in implementation and reporting remain significant across industries and countries. Moreover, many firms still regard environmental costs as secondary or optional, often driven more by regulatory compliance than by proactive environmental responsibility [13].

1.5 Waste Management Cost (WMC)

Waste Management Cost (WMC) has become an increasingly significant aspect of operational expenditure for contemporary businesses, reflecting the financial implications of environmental stewardship in an era of heightened ecological awareness and regulatory enforcement. These costs are inherently shaped by the nature of a company's industrial or commercial activities and the specific types of waste they generate. For instance, heavy manufacturing industries such as mining, oil refining, or chemical

production often produce hazardous or non-biodegradable waste, which demands more intensive and costly treatment than the general waste generated by office-based service enterprises. Among the most common components of WMC are environmental taxes, waste disposal fees, pollution control costs, and the implementation of environmental hazard mitigation systems, including those targeting air and water pollution. These costs are not merely compliance obligations but they also reflect a growing societal expectation for corporations to take responsibility for their ecological footprint [14]. Companies that fail to manage their waste effectively risk not only regulatory penalties but also reputational damage, legal liability, and community opposition, all of which can erode investor confidence and stakeholder trust.

From a financial perspective, these waste management-related expenses pose direct challenges to corporate profitability. They increase operational costs, often without immediately visible returns, thereby placing pressure on net margins. Moreover, firms are increasingly required to invest in occupational health and safety infrastructure to protect both employees and the surrounding community from the adverse effects of industrial waste. These might include improved ventilation systems, hazardous material containment measures, or enhanced training programs each of which adds to the firm's financial outlay. Furthermore, companies are also expected to engage in community development initiatives, particularly in areas where industrial activity may result in environmental degradation or pose health risks. These initiatives, while socially valuable, represent yet another financial commitment often borne disproportionately by firms operating where environmental regulation is catching up with industrial expansion. In many cases, these costs are viewed as necessary investments in long-term social stability and business continuity, especially in environmentally vulnerable or densely populated regions [15].

Waste management costs are conventionally classified as part of a firm's operational expenditures, meaning they are accounted for prior to the calculation of profits or the disbursement of dividends. This accounting treatment ensures that the financial statements reflect a more realistic view of the cost of doing business in compliance with environmental and social standards. However, this also means that increasing environmental compliance costs can significantly affect the bottom line, compelling firms to reevaluate their production processes, supply chains, and waste disposal strategies in search of more cost-effective and sustainable practices [16]. In response, many organizations are now adopting more holistic approaches to waste management, viewing it not merely as a cost center but as a potential avenue for value creation. Concepts such as waste valorization, circular economy, and closed-loop production systems are gaining traction, allowing businesses to recover resources, reduce waste, and lower long-term disposal costs. By transforming waste from a liability into a resource, firms can mitigate the financial burden of WMC while also demonstrating environmental leadership in a competitive global market [17]. Ultimately, Waste Management Cost is a crucial reflection of the evolving relationship between business and the environment. It underscores the reality that environmental responsibility is no longer optional or charitable, it is integral to strategic financial planning, regulatory compliance, and sustainable development. As such, businesses must continue to adapt their operational and accounting frameworks to not only capture the true costs of waste management but to leverage them toward more resilient and sustainable modes of value creation.

1.6 Employee Health and Safety Costs

Employee health and safety costs refer to the comprehensive range of expenditures incurred by organizations to safeguard workers against occupational hazards and promote overall well-being in the workplace. In high-risk industries such as oil and gas, these costs are not merely operational necessities but strategic investments with far-reaching implications. They typically include the procurement of personal protective equipment (PPE), implementation of safety training programs, installation of hazard

monitoring and alarm systems, and development of emergency response plans [18]. In addition, firms often bear the financial responsibility for medical services, rehabilitation, insurance, and compensation related to work-induced injuries or illnesses.

Given the inherently hazardous nature of oil and gas operations ranging from offshore drilling and high-pressure extraction to the transportation and refining of volatile substances ensuring robust occupational health and safety measures is of critical importance. These activities expose workers to numerous risks, including explosions, toxic chemical exposure, mechanical accidents, and long-term health conditions. As such, the implementation of stringent health and safety protocols is not only an ethical imperative but also a legal and financial necessity.

Beyond regulatory compliance, the strategic value of investing in employee safety is increasingly recognized in both academic and corporate discourses. Adherence to rigorous safety standards has been shown to reduce the frequency and severity of workplace accidents, thereby lowering insurance premiums, legal liabilities, and compensation claims [19]. More importantly, such investments foster a culture of safety that enhances employee morale, reduces turnover, and boosts productivity ultimately contributing to operational efficiency and financial resilience.

Smith and Llewellyn's study offers empirical insights into the link between health and safety management systems and key financial performance indicators within the oil and gas sector. Their findings suggest that companies with proactive safety cultures and systematic safety investments tend to perform better financially due to fewer operational disruptions, lower regulatory penalties, and improved stakeholder trust. This aligns with broader evidence indicating that health and safety initiatives when effectively implemented offer a favorable return on investment, not only by mitigating direct risks but also by improving overall business continuity and reputational capital.

Moreover, the economic rationale for prioritizing worker safety extends to its policy relevance. As Johnson et al. [20] observe, the cost of regulatory non-compliance and reputational damage arising from poor safety records can be substantial, especially in jurisdictions with evolving environmental and labor regulations like Nigeria. Thus, empirical research into the cost-effectiveness of health and safety expenditures can serve as a vital resource for policymakers seeking to strengthen regulatory frameworks and incentivize safer practices across the industry.

1.7 Net Profit Margin (NPM)

Profitability is a fundamental objective for any organization, whether it operates in the realm of commerce or as a non-profit entity. In the context of profit-driven enterprises, the primary goal is to generate maximum profit, typically achieved by selling products or services at prices that exceed their production or operational costs. The Net Profit Margin (NPM) ratio serves as a crucial financial metric, offering insight into the degree of profit retained from every revenue generated. Calculating the Net Profit Margin Ratio involves comparing the net income, or profit after accounting for taxes, with the total net sales revenue [21], [22]. This ratio, expressed as a percentage, holds a mirror to a company's profit-making prowess. A higher NPM ratio indicates a more efficient and effective profit generation process.

Investors, financial analysts, and stakeholders use this key ratio as a litmus test for an organization's financial health and profitability [23]. Essentially, the NPM ratio is a yardstick that measures the profitability of a business entity. A robust and sustained net profit margin indicates that a company is adept at converting its sales revenue into profit. In the words of Syamsuddin [24], "The higher the net profit margin, the better the operation of a company."

In essence, the Net Profit Margin (NPM) stands as a critical metric in the arsenal of financial tools that organizations employ to gauge their financial performance. By delving into the intricacies of this ratio, stakeholders can gain valuable insights into a company's profitability and its ability to effectively translate sales revenue into profit, a fact that

significantly influences investment decisions and overall financial well-being. Net Profit Margin (NPM) can be formulated as follows:

$$NPM = \frac{\text{Net profit after tax}}{\text{Net sales}} \times 100$$

The high NPM ratio will cause a firm to be considered good performance, besides it will increase also the attractiveness of investors to invest capital because the higher NPM indicates the company's profit is getting bigger [25]. The net profit margin, expressed as a percentage, represents the portion of revenue that remains once all expenses have been subtracted from total sales. This essential metric serves as a key indicator of a business's ability to generate profit from its operations. Gunawan & Yuanita [26] stated that net profit margin is a vital gauge of a firm's overall performance and financial health. A high net profit margin signifies effective pricing strategies and prudent cost management, reflecting the business's capacity to convert sales into profit. This metric proves especially valuable when comparing businesses operating within the same industry. Such comparisons are insightful because these enterprises contend with similar market dynamics, customer bases, and cost structures. By evaluating net profit margins, stakeholders can assess how efficiently a business operates in its competitive landscape and ascertain its relative success within the industry.

1.8 Financial Performance

This refers to the ability of companies within the oil and gas sector to generate profits and create value for stakeholders through their operational activities. This encompasses various financial metrics, including revenue growth, profitability, liquidity, solvency, and shareholder returns. Effective financial performance management involves optimizing revenue streams, minimizing costs, managing financial risks, and maximizing shareholder wealth. In the oil and gas industry, financial performance is influenced by factors such as commodity prices, production volumes, operational efficiency, technological advancements, regulatory compliance, and market dynamics. Companies must balance the pursuit of short-term financial gains with long-term sustainability objectives, including environmental stewardship, social responsibility, and corporate governance practices, to ensure continued success and resilience in a rapidly evolving business landscape. Authors like Jiang and Fethi [27] have explored the determinants of financial performance in the oil and gas sector, emphasizing the importance of factors such as innovation, diversification, and strategic management in driving sustainable value creation for stakeholders. Through rigorous analysis and empirical research, scholars aim to provide insights into the key drivers of financial performance in the oil and gas industry and inform strategic decision-making processes for companies operating within this sector.

1.9 Theoretical Framework

1.9.1 Legitimacy Theory

This study is anchored on Legitimacy Theory, a framework situated within the broader category of systems-oriented theories, alongside Stakeholder Theory and Political Economy Theory. Legitimacy Theory asserts that organizations both influence and are influenced by the societies in which they operate. It emphasizes the dynamic interplay between corporate behavior and societal expectations, proposing that an organization's legitimacy is not inherent but granted by society based on perceived alignment with social norms and values. In this context, corporate disclosure practices are seen as strategic tools employed by management to influence public perception and secure societal approval [28]. Through the lens of Legitimacy Theory, such disclosures are not merely mechanisms of transparency but are vital instruments in shaping how stakeholders interpret organizational actions. Central to Legitimacy Theory is the notion of a "social contract," which suggests that an organization's continued access to resources and its very right to exist are contingent upon the approval of the society in which it operates. When organizations breach this unwritten contract, whether through unethical practices,

environmental harm, or failure to meet societal expectations, they risk losing societal support, which can have adverse implications for their operations and sustainability. Managers, therefore, are motivated to implement strategies that uphold or restore legitimacy in order to secure the resources necessary for organizational survival. These strategies may include targeted and timely disclosures, engagement with community stakeholders, partnerships with reputable institutions, and other forms of legitimacy-building activities.

1.9.2 Empirical Review

Adegbite et al. [29] investigated the relationship between environmental management costs and the financial performance of oil and gas firms in Nigeria. By analyzing data from listed companies, the authors find evidence suggesting that investments in environmental management positively influence financial performance metrics, including profitability and market value. The study underscores the importance of integrating environmental considerations into business strategies to enhance financial outcomes and ensure sustainable operations in the oil and gas sector.

Olowe et al. [30] investigated the quality of financial reporting; this study examines the impact of environmental management expenditures on listed oil and gas companies in Nigeria. Through empirical analysis, the authors uncover a positive association between environmental management spending and financial reporting quality. The findings suggest that firms with robust environmental management practices are more likely to provide reliable financial information, thereby enhancing investor confidence and reducing information asymmetry.

Madukwe, Chimezie et al., [31] conducted a study on the impact of environmental and social accounting on the performance of Nigerian firms, analyzing data from fourteen randomly selected listed enterprises. They found a negative correlation between environmental accounting and return on capital employed and earnings per share (EPS), while there was a substantial correlation with net profit margin and dividend per share (cum DPS). Castro et al. [32], using data for 50 firms spanning 2008–2017, the reports that the environmental performance has positively influenced the stock price of both the product and service-based firms listed on LSE. Additionally, the dissemination of social and environmental reports was found to have little effect on company performance.

Ihenyen, and Ikegima [33] investigated Environmental Accounting and Organizational Performance of Listed Industrial Sector Companies in Nigeria. An ex-post facto design was used in the research. From the annual reports and financial statements of listed firms on the Nigerian stock exchange, researchers gathered secondary data that was utilized in the study. As proxies for Environment Accounting (EVA) are, waste management cost (WMC), Community Development Cost, and employee health and safety cost. The dependent variable is the company's performance in terms of return on asset, return on equity, and profit margin. Canonical correlations were used to analyze the data in SPSS version 26. Environmental accounting (waste management costs, community development expenses, employee health and safety costs) and organizational performance (Return on assets, return on equity, and profit margin) of listed industrial sector businesses in Nigeria have a substantial association. Other recommendations included making environmental accounting in annual reports mandatory, as most companies do not declare their environmental operations in their annual reports.

1.9.3 Gap in Literature

Previous studies on environmental accounting and financial performance in Nigeria's oil and gas sector have yielded mixed results, with some showing positive impacts while others report insignificant or even negative relationships. Many of these studies either focus broadly on environmental management or use aggregate environmental costs without isolating specific components like waste management cost and employee health and safety cost. Additionally, there is limited use of recent data incorporating fixed effects to control for unobserved heterogeneity among firms over time. Our study fills these gaps

by specifically examining the distinct effects of waste management and employee health and safety costs on net profit margin using a recent 10-year panel dataset of listed Nigerian oil and gas companies, applying a rigorous panel least squares fixed effects approach. This allows for a more nuanced understanding of how particular environmental accounting practices influence financial performance, addressing inconsistencies in prior findings and providing updated empirical evidence relevant for stakeholders and policymakers.

2. Materials and Methods

This study adopted an ex post facto research design to investigate the impact of waste management cost and employee health and safety cost on the net profit margin of listed oil and gas companies in Nigeria. The population comprised all oil and gas companies listed on the Nigerian Exchange Group (NXG) as of 31 December 2023. Using a census sampling method, seven (7) companies were selected as the sample for the study. Secondary data were employed, collected from the published annual reports of these companies covering the period from 2014 to 2023. The use of secondary data is appropriate given the quantitative nature of the research, which requires reliable numerical data for statistical analysis. The sampled companies include Conoil Plc (Ticker: CONOIL), Eterna Plc (Ticker: ETERNA), MRS Oil Nigeria Plc (Ticker: MRS), Oando Plc (Ticker: OANDO), Japaul Oil Company (Ticker: JAPAUL), Seplat Energy Plc (Ticker: SEPLAT), and TotalEnergies Marketing Nigeria Plc (Ticker: TOTAL) [34]. The study employed panel least squares regression with fixed effects. These firms represent key players in the oil and gas sector and provide a comprehensive basis for assessing the relationship between environmental costs and financial performance in the industry.

2.1 Model Specification

$NPM_{it} = \beta0 + \beta1\ WMC_{it} + EHSC_{it} + \mu_i + \lambda_t + \varepsilon_{it}$

Where:

1. NPM_{it} = Net Profit Margin of company i at time t
2. WMC_{it} = Waste Management Cost of company i at time t
3. $EHSC_{it}$ = Employee Health and Safety Cost of company i at time t
4. $\beta0$ = Intercept (constant term)
5. $\beta1$, $\beta2$ = Coefficients measuring the impact of WMC and EHSC respectively
6. μ_i = Unobserved individual (company-specific) fixed effects
7. λ_t = Time-specific fixed effects capturing period variations
8. ε_{it} = Error term capturing random disturbances

2.2 Data Analysis and Discussion

Data analysed here are waste management cost, employee health and safety cost and net profit margin (NPM).

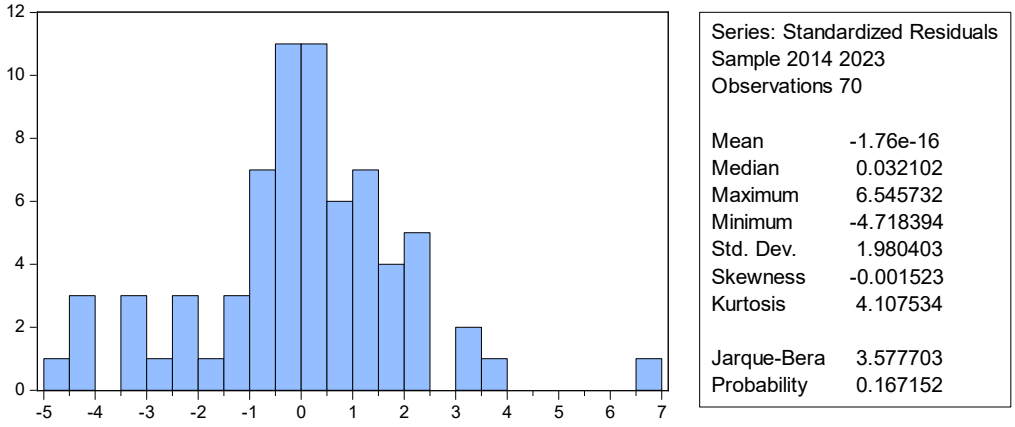
Table 1. Descriptive Statistics

	WMC	EHSC	NPM
Mean	3.820107	4.490543	4.397238
Median	4.458564	5.347757	5.610402
Maximum	5.725381	6.171308	7.918693
Minimum	0.000000	0.000000	0.000000
Std. Dev.	1.827829	2.049462	2.847067
Skewness	-1.265299	-1.548943	-0.738933
Kurtosis	3.268100	3.822523	1.863654
Jarque-Bera	18.88775	29.96419	10.13650
Probability	0.000079	0.000000	0.006293

	WMC	EHSC	NPM
Sum	267.4075	314.3380	307.8067
Sum Sq. Dev.	230.5261	289.8204	559.2995
Observations	70	70	70

The descriptive statistics for waste management cost (WMC), employee health and safety cost (EHSC), and net profit margin (NPM) reveal insightful characteristics about the data set of 70 observations. The mean values indicate that on average, EHSC (4.49) is higher than WMC (3.82), while NPM stands at 4.40, suggesting a moderate profitability level. Median values exceed the means for all variables, especially NPM (5.61), which indicates a right-skewed distribution with some lower values pulling the mean down. This is supported by the negative skewness values (-1.27 for WMC, -1.55 for EHSC, and -0.74 for NPM), indicating that the data are left-skewed with a longer tail on the lower end. The maximum values show considerable variation, with NPM reaching as high as 7.92, while the minimum for all variables is zero, suggesting some firms might have no recorded costs or profits in some periods. The standard deviations show moderate dispersion around the mean, particularly for NPM (2.85). Kurtosis values for WMC (3.27) and EHSC (3.82) suggest data distributions slightly more peaked than a normal distribution, while NPM's kurtosis (1.86) indicates a flatter distribution. The Jarque-Bera test results and corresponding low probabilities (<0.01 for all variables) strongly reject the null hypothesis of normality, confirming that the data for WMC, EHSC, and NPM are not normally distributed.

2.3 Normality Tests for the Model



The normality test for the standardized residuals of the model, based on 70 observations from 2014 to 2023, shows a mean close to zero (−1.76e-16), near-zero skewness (−0.0015), and a kurtosis of 4.11, indicating a slightly peaked distribution. The Jarque-Bera statistic of 3.58 with a p-value of 0.167 suggests that the residuals do not significantly deviate from normality, as the p-value exceeds the 0.05 threshold. This implies that, despite the original variables being non-normally distributed, the residuals from the model approximate a normal distribution, supporting the validity of parametric analyses and indicating an adequate model fit regarding the normality assumption.

Table 2. Unit Root Tests

Variables	ADF t-Statistic	ADF Prob.	ADF Result	Decision
WMC	0.1418	0.0064	I(0)	Stationary
EHSC	0.2925	0.0000	I(0)	Stationary
NPM	0.3003	0.0114	I(0)	Stationary

Table 2 presents the results of the Augmented Dickey-Fuller (ADF) unit root tests for waste management cost (WMC), employee health and safety cost (EHSC), and net profit margin (NPM). The ADF statistics and corresponding p-values indicate that all three variables are stationary at level, as their p-values are below the 0.05 significance threshold (WMC: 0.0064, EHSC: 0.0000, NPM: 0.0114). This means that the null hypothesis of a unit root is rejected for each variable, confirming that they do not exhibit a stochastic trend and are mean-reverting over time. Stationarity is a crucial condition for reliable regression analysis and time series modeling because it ensures that the statistical properties of the variables are consistent across the sample period, reducing the risk of spurious results. Therefore, the findings support the use of these variables in further econometric analysis without requiring differencing or transformation to achieve stationarity.

Table 3. Dependent Variable: NPM

Method: Panel Least Squares
Date: 06/09/25 Time: 13:37
Sample: 2014 2023
Periods included: 10
Cross-sections included: 7
Total panel (balanced) observations: 70

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.150396	1.881627	2.737203	0.0085
WMC	0.230657	0.666529	0.346057	0.7307
EHSC	-0.363941	0.663346	-0.548645	0.5856

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.516149	Mean dependent var	4.397238
Adjusted R-squared	0.357967	S.D. dependent var	2.847067
S.E. of regression	2.281268	Akaike info criterion	4.704374
Sum squared resid	270.6176	Schwarz criterion	5.282559
Log likelihood	-146.6531	Hannan-Quinn criter.	4.934036
F-statistic	3.263006	Durbin-Watson stat	2.003141
Prob(F-statistic)	0.000527		

The regression results in Table 3 examine the effects of waste management cost (WMC) and employee health and safety cost (EHSC) on the net profit margin (NPM) of listed oil and gas companies in Nigeria, using panel least squares with fixed effects for both cross-sections and time periods. The constant term is statistically significant ($p = 0.0085$), indicating a positive baseline net profit margin. However, the coefficients for WMC (0.2307, $p = 0.7307$) and EHSC (−0.3639, $p = 0.5856$) are both statistically insignificant at the 5% level, with p-values well above 0.05. This means we fail to reject the null hypotheses (H01 and H02) that waste management cost and employee health and safety cost have no significant effect on the net profit margin of these companies. The R-squared value of 0.5161 suggests that about 51.6% of the variation in NPM is explained by the model, but the adjusted R-squared of 0.358 indicates a moderate fit after accounting for the number of predictors. The F-statistic is significant ($p = 0.0005$), indicating the overall model is statistically valid. The Durbin-Watson statistic near 2 (2.003) suggests no serious autocorrelation issue in residuals. In summary, based on this analysis, neither WMC nor

EHSC significantly influences NPM, implying that these environmental and safety costs do not have a direct measurable impact on profitability in the sampled oil and gas firms during the study period.

3. Result and Discussion

3.1 Summary of Finding

This study examined the effect of environmental cost accounting and financial performance of listed oil and gas companies in Nigeria. Specifically, the study probed into the effect of net profit margin, waste management cost and employee health and safety cost and financial performance of measures of net profit margin (NPM) of oil and gas companies in Nigeria. Ex post facto research design and secondary data extracted from the annual reports of seven sampled companies and panel least squares regression with fixed effects was used. The result of the analysis revealed the following: waste management cost (WMC) and employee health and safety cost (EHSC) do not have a statistically significant effect on the net profit margin (NPM) of listed oil and gas companies in Nigeria during the study period among others.

3.2 Discussion of Findings

Our findings indicate that waste management cost (WMC) and employee health and safety cost (EHSC) do not have a statistically significant effect on the net profit margin (NPM) of listed oil and gas companies in Nigeria during the study period [34]. This suggests that these environmental and safety costs do not directly influence profitability in the sampled firms. This result contrasts with some empirical studies, such as Adegbite et al. [35], who found that environmental management investments positively impact financial performance and profitability, emphasizing the importance of integrating environmental concerns into business strategies. Similarly, Olowe et al. [36] observed that higher environmental expenditures are associated with better financial reporting quality, which can enhance investor confidence and firm value. These studies suggest that while environmental costs may not immediately affect profit margins, they may contribute to long-term financial health and stakeholder trust.

However, our findings align more closely with studies like Madukwe, Chimezie et al, who reported mixed results with environmental accounting showing negative correlations with some performance metrics but positive links with net profit margin. Castro et al also found that environmental performance improved stock prices but had limited impact on traditional company performance indicators. Furthermore, Ihenyen and Ikegima found significant associations between environmental accounting (including WMC and EHSC) and organizational performance measures, recommending mandatory environmental cost disclosure to improve transparency. Our non-significant results may be due to differences in disclosure levels, the efficiency of environmental practices, or the relatively short period examined. This suggests that the impact of environmental and safety costs on profitability could be indirect, context-dependent, or require longer-term analysis to be fully understood.

4. Conclusion

Our study concludes that waste management cost and employee health and safety cost do not have a statistically significant impact on the net profit margin of listed oil and gas companies in Nigeria within the period analyzed. While these costs represent important aspects of environmental and social responsibility, their direct effect on profitability appears limited or indirect in the short term. This underscores the complexity of linking environmental expenditures to immediate financial outcomes and suggests that other factors may mediate this relationship in the oil and gas sector. The study further suggested that;

1. Companies should enhance transparency by mandating the disclosure of environmental and safety costs in their annual financial reports to improve stakeholder awareness and accountability.

2. Oil and gas firms should integrate long-term environmental management strategies that consider not only cost control but also potential reputational benefits and compliance with evolving regulations to support sustainable financial performance.

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