The Journal of Accounting and Management

Impact of Environmental Accounting Disclosure on Cost of Capital in Nigeria

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Abstract: Objectives: This study investigates the impact of environmental accounting disclosure on the cost of capital among Nigerian oil and gas companies. Specifically, the study examines whether effluents and waste disclosure, energy disclosure, enviromental laws and regulations significantly influence cost of capital. **Prior Work:** A review of emprical data from earlier studies reveals that prior investigations have predominantly focused on the manufacturing sector, consumer goods industries and non-financial entreprises, neglecting a concentrated examination of the oil and gas sector specifically. Further, from the analyses of previous studies, which have yielded heterogeneous outcomes; thus, suggesting the presence of incongruent findings. This study explores the impact of environmental accounting disclosure and cost of capital in Nigeria. **Approach:** Spanning a decade from 2014 to 2023, the study uses data derived from the annual reports and financial statements of eight publicly traded oil and gas firms listed on the Nigerian Exchange Group (NGX). Adopting an ex-post facto research design and utilizing both descriptive and inferential statistical techniques, panel-corrected standard error methods were employed for hypotheses testing. **Results:** Demonstrate that disclosures related to effluents and waste have a positive but statistically insignificant influence on capital costs, while adherence to environmental laws and regulations presents a negative but also statistically insignificant effect. Conversely, energy disclosure reveal a statistically significant positive impact, implying that enhanced transparency in energy reporting may be associated with higher capital costs. While effluents and waste disclosures do influence capital costs, their effect remains statistically insignificant. **Implications and Value:** The study advises companies to reevaluate their energy disclosure strategies, while policymakers should consider modifying regulations to alleviate potential increases in capital costs. It also enhance the extant body of knowledge by providing empricial evidence on other aspects of environmental accounting disclosure which could be relevant to the researchers.

Keywords: Environmental Accounting Disclosure; Cost of Capital; Energy Disclosure; Effluents and Waste Disclosure

JEL Classification: G14, G30, M40

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1. Introduction

In a developing economy like Nigeria, where natural resources are extensively exploited, environmental accounting disclosure holds significant importance. Sectors such as manufacturing, agriculture, and energy greatly contribute to the nation's Gross Domestic Product (GDP) but simultaneously exert considerable pressure on the environment. Consequently, companies in these industries are increasingly expected to disclose their environmental activities, impacts, and initiatives (Abba et al., 2018; Ikpor et al., 2022; Ite et al., 2013). Environmental accounting disclosure serves as a communication channel through which businesses report their environmental performance to various stakeholders. This transparency enhances corporate reputation and lays a strong foundation for sustainable earnings growth and improved operational efficiency (Udo, 2018). Corporate environmental transparency entails the clear and accessible dissemination of information about a company's waste management practices, ecological performance, pollution control efforts, resource utilization, and other environmentally impactful activities. The objective of environmental accounting disclosure is to provide stakeholders, customers, employees, regulatory bodies, including investors and the broader community, with an extensive comprehension of a firm's environmental activities, obligations, and contributions to sustainable practices. This increased level of transparency promotes responsible environmental governance (El Ghoul et al., 2011) by harmonizing the interests of management with those of the proprietors.

Recently, the negative environmental effects of economic activities have become a critical global issue. Businesses face growing pressure to conduct their operations responsibly and disclose their environmental performance transparently (Iwata & Okada, 2011; Ribeiro & Aibar-Guzman, 2010). Concerns about climate change, which is attributed to harmful corporate activities, have led to challenges such as rising sea levels, pollution, land degradation, global warming, deforestation, and depletion of natural resources. Particularly, there is extensive apprehension regarding climate change induced by corporate activities that detrimentally impact the environment, resulting in escalating sea levels, contamination, land degradation, global warming, deforestation, and the depletion of natural resources, among other challenges (Berdugo & Mefor, 2012). Nevertheless, petroleum and gas enterprises possess avenues for revenue generation through the recycling and repurposing of waste-derived pollutants, such as benzene, among others (Hansen & Mowen, 2003). In Nigeria's oil-extraction regions, for example, crude oil extraction and petroleum production have resulted in elevated pollution levels, including both spillage and flaring, as noted by Ojo (2016). Moreover, there are recurrent demonstrations by members of oil communities and militants who perceive themselves as marginalized and overlooked, lacking adequate compensation. This occurs despite their local environment being profoundly degraded and contaminated. Consequently, companies operating in the area frequently contend with sabotage from these protestors, while the Nigerian government reports diminished oil and gas revenues attributable to resource mismanagement and environmental sabotage (Udo, 2018).

The relationship between environmental accounting disclosure and capital costs is complex and requires thorough investigation. Companies with effective environmental disclosure practices are believed to gain enhanced trust from stakeholders, better risk management, and improved sustainability outcomes, potentially reducing their capital costs (Wendai et al., 2022). Campa and Kern (2020) articulate that a firm's "cost of capital" encompasses all financial expenses associated with financing, including interest on debt and dividends distributed on equity shares. Furthermore, Dogan and Acar (2018) contend that the weighted average cost of capital (WACC) serves as the most

accurate metric for assessing a company's cost of capital, given that the majority of enterprises utilize both debt and equity for financing. The WACC signifies an average rate derived from these financial sources—debt and equity—where each is weighted according to its intended utilization. In essence, it denotes the anticipated return that a corporation must disburse to appease its investors or lenders for undertaking investment risks with their capital. Nindya (2020) asserts that businesses aspire for a high rate of return, making the assessment of equity costs critical for calculating a company's total capital expenditures. A financially stable enterprise typically sustains a low cost of capital. Numerous elements contribute to this diminished cost, including the organization's policies on environmental disclosure. It is anticipated that firms that voluntarily disclose their environmental stewardship will incur lower capital costs, as this transparency signals to investors their commitment to sustainable practices that will not alienate any stakeholder demographics.

In a context characterized by escalating consumer expectations and heightened environmental considerations, the relationship between environmental disclosure and capital costs is crucial for oil and gas corporations listed in Nigeria. In the absence of transparency regarding their environmental initiatives and performance metrics, these corporations, along with the wider Nigerian economy, may encounter substantial difficulties. A review of empirical data from earlier studies reveals that prior investigations have predominantly focused on the manufacturing sector (Udomah & Emeniyi, 2023; Adegbie et al., 2021; Igbekoyi et al., 2021), consumer goods industries (Akpan & James 2024), and non-financial enterprises (Usman & Suleiman, 2023; Emeka et al., 2020), neglecting a concentrated examination of the oil and gas sector specifically. The advanced model being employed seeks to enhance the existing body of knowledge. The analysis of previous literature suggests that environmental accounting disclosure impact capital costs both positively and negatively. Building upon this foundation, the present study intends to explore whether such disclosures genuinely mitigate capital costs for oil and gas firms listed in Nigeria. To fulfill this aim, we propose a null hypotheses asserting that disclosures pertaining to effluents and waste do not significantly influence the capital costs for these entities; likewise, adherence to environmental regulations appears to have no substantial effect. Moreover, there seems to be no significant relationship between energy-related disclosures and their implications for either decreasing or increasing capital costs among oil and gas firms listed in Nigeria.

2. Literature Review and Hypotheses Development

2.1. Concept of Cost of Capital

The "cost of capital" for a corporation encompasses the totality of its expenses related to financing, which includes costs associated with debt financing as well as dividends paid on equity shares, as posited by Campa and Kern (2020). A fundamental concept within the realm of finance, the cost of capital represents the minimum rate of return that an enterprise must achieve on its investments to maintain or enhance its value and fulfill the expectations of its investors (Ross et al., 2019). The weighted average cost of capital (WACC) is regarded as the most effective metric for evaluating a corporation's cost of capital, considering that firms typically rely on both debt and equity financing. WACC is derived by averaging the costs linked to these financing sources, specifically debt and equity, and assigning weights to each based on their respective proportions in the company's financial framework. As stated by Dogan and Acar (2018), WACC signifies the composite rate of return that a corporation is obligated to deliver to meet the requirements of both its debt holders and equity

stakeholders, thereby adequately compensating them for the risk they undertake by investing their capital in the enterprise.

In the context of significant financial decisions such as valuation assessment, capital allocation, and investment appraisal, the cost of capital assumes a pivotal role. Organizations often utilize the cost of capital as a discount rate to ascertain whether prospective projects are expected to generate returns that exceed this cost, thereby enhancing the firm's valuation (Damodaran, 2012). This analysis incorporates various elements, including prevailing market interest rates, evaluations of credit risk, as well as the duration and composition of existing debt obligations (Brealey et al., 2017).

2.2. Concept of Cost of Debt

The cost of debt capital, or the interest rate a company pays on its borrowings, is a crucial financial metric influencing both profitability and financial stability. It is suggested that companies with strong environmental accounting disclosure practices might see reduced costs of debt due to enhanced stakeholder confidence, better risk management, and improved overall sustainability performance (Wendai et al., 2022).

The interest that an organization incurs on its borrowings and bonds is referred to as the cost of debt, constituting a pivotal concept in the realm of corporate finance (Ross et al., 2019). The lenders' requirements for repayment are influenced by various factors, including the entity's credit rating, prevailing market interest rates, and the risk level associated with the loan (Brealey et al., 2017). This expenditure significantly influences a firm's financial outcomes and investment decisions, and it is integral to determining its overall capital costs. Corporations often secure the necessary funds for operational investments or potential growth initiatives by integrating debt financing with equity. Additionally, the cost of debt has a direct effect on a firm's weighted average cost of capital (WACC), which is essential for discounting projected cash flows during investment evaluations and valuation analyses (Damodaran, 2012).

2.3. Concept of Cost of Equity

Brealey et al. (2017) articulate that the cost of equity encapsulates the inherent risks and anticipated returns correlated with investing in a corporation's equity instruments. This cost is influenced by myriad factors, including the risk-free rate, the market risk premium, and the firm's beta coefficient (Damodaran, 2012). Moreover, it signifies the yield that shareholders necessitate for their investment in the corporation. This requisite yield reflects the perceptions of investors regarding investment risks and can be exemplified through frameworks such as the Capital Asset Pricing Model (CAPM). In the context of CAPM, as delineated by Mulyati (2017), it is determined by the summation of the pertinent firm's covariance with the overall market; alongside the baseline returns represented by prevailing "risk-free rates." Corporations procure capital for operational financing through two main avenues: equity and debt (Keown et al., 2005). The choice between equity and debt financing is shaped by their respective costs, which are intricately associated with corporate efficacy (Alhares & Alhares, 2019). While the cost of equity is characterized by intricate interrelations among factors such as governance frameworks, political stability, and macroeconomic conditions, the cost of debt is typically dictated by the lending institutions themselves (Raimo et al., 2020). Equity financing is sourced from investors

acquiring shares in return for yields such as dividends or capital appreciation. Conversely, debt financing is derived from creditors extending loans for which companies incur interest payments.

2.4. Concept of Environmental Accounting Disclosure

In both financial and non-financial reports, environmental accounting disclosure is the process of including data on the environmental performance, impacts, and activities of a company. Uwigbe (2011) defines environmental accounting as the process by which businesses provide data on their environmental performance in support of their accountability. Corporate environmental disclosure includes, according to Gatimbu and Wabwire (2016), documentation on the environmental effect of an organization's activities. Among these things are repackaging, recycling, waste management, energy and material conservation, pollution control, and carbon management. Environmental disclosure, then, is the act of reporting, notifying, or communicating information about energy emissions, surface water contamination, ground contamination, or soil contamination either on the entity's behalf or otherwise to environmental authorities or another third party. It is a case of corporate responsibility stemming from environmental damage done. Environmental disclosure (Oshiole et al., 2020) addresses the informational needs of a company's stakeholders—including shareholders, investors, customers, and others.

In recent years, environmental accounting disclosure—also known as sustainability or environmental reporting—has become increasingly important. Businesses are becoming more conscious of the need to address environmental issues and demonstrate their commitment to sustainable practices. These reports give stakeholders crucial information about a company's environmental impact and its proactive approaches to managing and reducing ecological risks by disclosing data on ecological impacts, risks, and performance indicators (Grey, 2010). Businesses use this kind of disclosure to explain how they address possible environmental issues while adhering to regulations (Cho & Patten, 2007).

2.5. Theoretical Review

Max Weber first put forth legitimacy theory in 1947, Lindblom and Suchman Mark expanded on it in 1994 and 1995, respectively. Lindblom (1994) defined legitimacy as a status that arises when an entity's actions align with the values of its broader social context. Legitimacy theory states that organizations make an effort to ensure that their activities respect social norms, values, and boundaries. Legitimacy theory states that environmental disclosures can assist in bridging the gap between what companies do and what the public expects. It offers a potent instrument for comprehending the voluntary social and environmental disclosures made by businesses, which can be used as a starting point for important public discussions. Legitimacy, according to Deegan (2002), explains why a company aiming for sustainability needs to follow community norms. Because it recognises the significance of all stakeholders—society, employees, suppliers, creditors, customers, and shareholders, who may be interested in the company's social and environmental actions, legitimacy theory is especially pertinent to this study. This guarantees that any discrepancies between business operations and public expectations are filled in part by environmental disclosures.

2.6. Review of Prior Empirical Studies

Oshiole et al. (2024) examined the changes in market value of Nigerian listed consumer and industrial goods companies over a ten-year period from 2013 to 2022 in relation to effluent disclosure and employee health and safety costs. The study employed an ex post facto design focused on longitudinal panel series analysis and secondary data from selected few companies listed on the Nigerian Exchange Group (NGX). The data was analyzed using panel regression techniques. The findings demonstrated that employee health and safety expenses significantly affect market value, whereas effluent disclosure has a positive but insignificant effect on these companies' market values in Nigeria.

Kadiri-Ikharo et al. (2024) investigated the impact of environmental accounting disclosure on the cost of capital for Nigerian listed non-financial firms over a ten-year period, from 2013 to 2022. The study's sample consisted of 75 non-financial companies listed on the Nigerian Exchange Group (NGX). Pre-regression analysis was employed in this investigation. Their findings show that while disclosures about biodiversity have little effect on debt and equity costs, those about environmental protection significantly reduce debt costs while having no effect on equity costs. However, waste and effluent disclosures were found to significantly increase debt and equity costs.

The impact of green innovation on the connection between capital investment and environmental regulations was examined by Farooq et al. in 2024. Their study examined publicly traded companies from ten Asian economies over a ten-year period, from 2010 to 2019. The findings showed that green innovation is significantly harmed by environmental regulations. However, their results also imply that the relationship between capital investment and environmental regulations is positively moderated by green innovation.

Akpan and James (2024) conducted an empirical study that examined the relationship between corporate social responsibility disclosure and weighted cost of capital in consumer goods companies in Nigeria. They found that philanthropic responsibility disclosures significantly reduce the weighted average cost of capital. However, among listed Nigerian consumer goods companies, disclosures about environmental and community responsibility have no statistically significant impact on it.

Usman and Suleiman (2023) investigated the relationship between the cost of debt capital and environmental accounting disclosure in Nigerian listed non-financial companies. An ex-post facto research design was used to collect data from a sample of 78 non-financial companies over a ten-year period (2012–2021). To analyze this data, they employed a panel regression technique, which accounts for both cross-sectional differences and time series variations. The findings demonstrated that for these Nigerian businesses, environmental disclosure dramatically lowered the cost of debt.

Bonetti et al. (2023) looked at the connection between environmental disclosure and cost of capital. They used the Fukushima nuclear accident as a natural experiment to assess the importance of environmental information for investors. According to the findings, businesses that revealed their carbon emissions saw a lower increase in the cost of capital than those that did not.

Udomah and Emenyi (2023) investigated the impact of sustainability reporting on the financial performance of ten Nigerian cement manufacturing companies. The findings indicated a weak and unfavourable relationship between environmental reporting and the prosperity of these Nigerian companies.

Adegbie et al. (2023) looked into the relationship between environmental disclosure and return on assets in listed manufacturing companies in Nigeria. The study, which employed an ex-post facto

research design, focused on 66 manufacturing companies that were listed on the Nigerian Exchange Group (NGX) as of December 31, 2021. Purposive sampling was used to collect data from published financial statements for a sample of 29 selected companies over a sixteen-year period, from 2006 to 2021. The results demonstrated that there was no correlation between environmental disclosure and return on assets in these Nigerian listed manufacturing firms.

Over a seven-year period, from 2012 to 2018, Mohammed et al. (2022) examined the relationship between the financial performance of manufacturing companies and the disclosure of environmental information. The 41 manufacturing companies that were listed on the Nigerian Stock Exchange as of 2019 comprised the study's population and sample size, which was determined through the use of purposive sampling techniques. Research employing content analysis and ordinary least squares regression techniques found that disclosures regarding material usage had a negligible negative impact on the return on assets (ROA) for pharmaceutical manufacturers in Nigeria. However, revealing adherence to environmental standards had a significant positive impact on ROA among listed manufacturing companies in Nigeria.

From 2010 to 2018, Wendai et al. (2022) investigated the effects of environmental data on Chinese companies' cost of capital. According to their research, environmental data has a substantial and adverse impact on the cost of capital.

A study by Wang and Liang (2021) in China examined how environmental regulations affect the performance of firms within the Chinese cement industry. Utilizing a differences-in-differences model to analyze off-peak production policies, this research assessed the impact of these regulations on both revenue and profit for publicly listed companies. The findings indicated that environmental regulation negatively affects a firm's revenue and profitability.

In 2021, Afonso explored the connection between ecological, social, and governance ratings and the cost of loan financing for European companies in the United Kingdom. The findings indicated that disclosure concerning ecological aspects significantly negatively influenced debt financing costs.

The impact of environmental reporting on the financial performance and return on assets of particular manufacturing companies in Nigeria was examined by Igbekoyi et al., in 2021. Using an ex post facto research design, they looked at data from a subset of manufacturing companies listed in Nigeria over an 11-year period, from 2008 to 2018. Out of the 67 manufacturing firms in the population, they focused on a sample size of 23 firms. The results demonstrated that environmental reporting had a marginally negative effect on corporate financial performance and environmental sustainability reporting.

Over a five-year period, from 2013 to 2017, Nguyen et al. (2020) investigated the relationship between environmental financial accounting and Vietnam's cost of capital. Data from 188 firm-year observations were analyzed using regression analysis. The results demonstrated that improved ecological performance directly leads to lower capital costs.

Over the course of eight years, from 2011 to 2018, Emeka et al. (2020) examined the relationship between sustainability reporting and return on assets (ROA) for several non-financial companies listed in Nigeria. The study's methodological approach, which used data from these companies' annual reports and accounts, was panel regression analysis. The findings demonstrated that environmental disclosure, as determined by economic, social, and governance (ESG) criteria, had a significant and

positive impact on ROA and corporate sustainability reporting among the selected non-financial companies in Nigeria that were the subject of the study.

In a study by Wara et al. (2020), researchers looked at the relationship between environmental disclosure and the corporate performance of companies listed on the Nairobi Stock Exchange. Using an ex post facto research design, they looked at secondary data from financial statements covering 14 years, from 2007 to 2015. To enhance their analysis, they included control variables such as firm size and financial leverage. The results demonstrated that environmental disclosure indices significantly and favourably affected corporate performance as determined by Tobin's Q and return on assets (ROA).

Jalia and Komathy (2019) looked into the connection between Malaysian company performance and sustainability reporting. Using content analysis and regression techniques to analyze secondary data from annual corporate reports and accounts, they discovered a positive correlation between sustainability reporting practices and financial performance metrics such as return on assets (ROA) and earnings per share (EPS) among Malaysian companies.

Barbu et al. (2018) looked into how firm performance was affected by required environmental disclosure and firm size. The study examined secondary data from sampled companies listed in France, Germany, and the UK using a pooled regression analysis and an ex-post facto design. The findings demonstrated that required environmental disclosure and firm size both considerably enhance firm performance among these listed companies in all three nations.

In Indonesia, Yossi (2018) investigated the role that disclosures play in mediating the link between firm value and financial performance. Using data from 2013 to 2015, the study evaluated sustainability disclosure using the Jakarta Islamic Index and found that higher levels of such disclosure greatly increased firm value.

From the perspective of water management disclosure, Bartolacci et al. (2018) examined the impact of firm size and financial sustainability reporting on firm performance. Using an ex post facto methodology, they extracted secondary data for analysis from company accounts and annual reports. Using pooled regression analysis, the researchers discovered that firm size and financial sustainability reporting significantly improved firm performance.

Nnamani et al. (2017) evaluated the impact of sustainability reporting and accounting on the financial performance of Nigerian Breweries Industry Limited. The study examined data from the financial statements of three selected companies using standard linear regression analysis. The findings demonstrated that, in this instance, a company's financial performance is positively and significantly impacted by sustainability accounting.

The relationship between environmental disclosure and financial performance among Malaysia's top 100 companies by market capitalization in 2011 was examined by Nor et al. (2016). The researchers were able to gather data on environmental disclosures from secondary sources by examining financial statements. Their study revealed a significant negative correlation between profit margin and environmental disclosures.

Mohammed and Faouz (2014) looked at how corporate environmental disclosure affected the cost of debt equity capital for Tunisian companies between 2003 and 2011. The results showed that the environmental disclosures made by these Tunisian companies and debt-to-equity capital did not significantly correlate.

Zhao et al. (2014) examined how non-current debt financing affected the cost of capital and environmental information disclosure among thermal power plants in power companies that were listed between 2008 and 2012 in Shanghai and Shenzhen. Out of 180 companies, a sample size of 36 publicly traded companies were selected for analysis. The primary information sources the researchers consulted were the annual reports, CSR, sustainability, and environmental reports from the Giant Tidal Information Network. The findings demonstrated that high levels of corporate debt have a significant influence on the amount of environmental information disclosed.

Markori and Jagongo (2013) examined the relationship between environmental accounting and firm profitability in a subset of companies listed on the Bombay Stock Exchange in India. The data, which came from the annual reports of 14 randomly chosen publicly traded companies on this exchange, was analyzed using multiple regression models. The results indicated a significant negative correlation between environmental accounting and both ROCE and EPS, but a significant positive correlation between environmental accounting and net profit margin and dividend per share (DPS).

2.7. Based on the Information Provided Earlier, the Following Null Hypotheses Were Formulated in This Study

Ho_1: Effluents and waste disclosure have no significant effect on cost of capital of listed oil and gas companies in Nigeria.

Ho_2: Environmental laws and regulations have no significant effect on cost of capital of listed oil and gas companies in Nigeria.

Ho_3: Energy disclosure have no significant effect on cost of capital of listed oil and gas companies in Nigeria.

3. Methodology

The study employs an ex-post facto research design, analyzing eight oil and gas companies listed on the Nigerian Exchange Group (NGX) as of December 31, 2023. The census sampling technique was applied, including all these firms in the research. Data was collected from annual reports and financial statements covering the period from 2014 to 2023. Hypotheses were tested using panel-corrected standard error methods, accompanied by both descriptive and inferential statistical techniques.

3.1. Model Specification

This research develops the following econometric model based on theoretical literature and prior empirical studies:

$$WACC = \beta_o + \beta_1 EWD_{it} + \beta_2 CELRD_{it} + \beta_3 ED_{it} + \mu$$

The model illustrates a linear relationship between environmental disclosures and the cost of capital for publicly listed oil and gas firms in Nigeria.

Where:

WACC = Weighted Average Cost of Capital

EWD = Effluents and Waste Disclosure

CELRD = Compliance to Environmental Laws and Regulations Disclosure

ED = Energy Disclosure

μ = Error (Stochastic term)

3.2. Operationalization of Study Variables

Table 1. Variable Definition and Measurements

Variables	Symbol	Measurements	Sources	Apriori Sign
Dependent: Cost of Capital: Debt and Equity:	WACC	Calculated as interest expenses divided by the total outstanding interest-bearing debt; and also calculated as cash dividends paid divided by market capitalization.	Van et al. (2010) and Fonseka et al. (2019).	+
Independent: Effluents and Waste Disclosure	EWD	Indicated by "1" for companies that provide information on effluents and waste disclosure; otherwise, it is marked as "0".	Global Reporting Initiative (GRI, 2021)	+
Compliance to Environmental Laws and Regulations	CELRD	Indicated as "1" for companies that provide information regarding their adherence to Environmental Laws and Regulations, but if not, then 0.	Global Reporting Initiative (GRI, 2021)	+
Energy Disclosure	ED	Assigned a value of "1" for companies that disclose energy-related information, and "0" if they do not.	Global Reporting Initiative (GRI, 2021)	+

Source: Author's Compilation, 2025

4. Results and Discussion

4.1. Descriptive Statistics Analysis

Table 2. Descriptive Statistics Results

Variables	Mean	Std. Dev	Min	Max	Obs.
WACC	3.375	7.956	-25.25	25.36	80
EWD	0.129	0.338	0	1	80
CELRD	0.052	0.223	0	1	80
ED	0.039	0.194	0	1	80

Source: Author's Compilation, 2025 (STATA Output)

Table 2 displays the descriptive statistics for the independent and dependent variables. At a minimum of -25.25 and a maximum of 25.36, the weighted average cost of capital, or WACC, has a mean of

3.375 and a standard deviation of 7.956. The emissions and waste disclosure (EWD) data show a mean of 0.129 and a standard deviation of 0.338. For compliance with environmental laws and regulations (CELRD), the average is 0.052 with a standard deviation of 0.223. Energy disclosure shows a mean value of 0.039 and a standard deviation of 0.194.

4.2. Data Normality Test

Table 3. Normality Test

Variables	W	V	Z	Prob.
WACC	0.797	13.444	5.681	0.000
EWD	0.867	8.808	4.757	0.000
CELRD	0.999	0.030	-7.666	1.000
ED	0.640	23.939	6.943	0.000

Source: Author's Compilation, 2025 (STATA Output)

Table 3 shows the normality test result for each of the variable. The p value for weighted average cost of capital, effluents and waste disclosure and energy disclosure is 0.000 which shows that these variables are not normally distributed but compliance with environmental laws and regulations disclosure p value is 1.000 which shows that the data for the variable is normally distributed. Therefore, we assume the normality for the variables, hence we estimated correlation matrix using Pearson correlation.

Table 4. Correlation Matrix (Pearson correlation)

Variables	WACC	EWD	CELRD	ED
WACC	1.000			
EWD	0.155	1.000		
CELRD	0.281	0.257	1.000	
ED	0.338	0.322	0.860	1.000

Source: Author's Compilation, 2025 (STATA Output)

Table 4 presents the correlation matrix that illustrates the relationships among the variables. The cost of capital (WACC) is positively associated with all independent variables: effluents and waste, compliance with environmental laws and regulations, and energy disclosure.

Table 5. Multicollinearity Test (Vector Inflation Factor)

	VIF	1/VIF
ED	4.01	0.249
CELRD	3.85	0.259
EWD	1.12	0.895
Mean		2.99

Source: Author's Compilation, 2025 (STATA Output)

As shown in Table 5, a preliminary test for multicollinearity was performed on the variables using the Variance Inflation Factor (VIF). All of the variables' VIF values are less than 10, suggesting that multicollinearity is not a problem.

4.3. Regression Analysis

Table 6. Panel Regression Analysis (Panel Corrected Standard Error for Random Effect Model)

	Coff.	Z value	P value
Cons.	2.721	3.17	0.002
EWD	1.214	0.80	0.421
CELRD	-1.241	-1.16	0.247
ED	14.370	3.49	0.000
R^2			0.117
Wald Chi^2			13.00
Prob.			0.004
Breusch and Pagan Lagrangian multiplier Test for random effect			
Chi^2			14.07
Prob.			0.000
Hausman Test			
Chi^2			2.68
Prob			0.443
Wooldridge Test for autocorrelation			
F stat.			0.338
Prob.			0.579
Breusch-Pagan / Cook-Weisberg test for Heteroskedacity			0.74
Chi^2			0.038
Prob.			

Source: Author's Compilation, 2025 (STATA Output)

The panel regression analysis's findings are shown in Table 6, along with a number of pre- and post-estimation tests. To ascertain whether a random effects model or a panel of ordinary least squares was more suitable, a random effects test was performed. The results of the Breusch and Pagan Lagrangian Multiplier test for random effects, which yielded a chi-square value of 14.07 with a corresponding p-value of 0.000, indicate that the random effects model is superior in this case. Additionally, a chi-square value of 2.68 and a p-value of 0.443 were obtained from the Hausman test, which was used to choose between the fixed effect and random effect models. This suggests that the use of a random effects model is still justified because the p-value is higher than the significance level (5%), which we chose.

Additional tests were carried out following the estimation. The Breusch-Pagan/Cook-Weisberg test for heteroskedasticity yielded a chi-squared value of 0.74 with a p-value of 0.038, whereas the Wooldridge test for panel autocorrelation yielded an F-statistic of 0.338 and a corresponding p-value of 0.579. These results demonstrate that residual autocorrelation is not an issue, but there is evidence that heteroskedasticity might be.

To address the issue of heteroskedasticity, panel-corrected standard errors were employed for hypothesis testing, as indicated in Table 6. The disclosure of waste and effluents has a positive effect on the cost of capital for Nigerian listed oil and gas companies (1.214); however, this effect is statistically insignificant ($p = 0.421$). Similarly, when environmental laws and regulations are followed, there is a negative impact (-1.241) that is statistically insignificant ($p = 0.247$). Conversely, at the $p = 0.000$, energy disclosure exhibits a statistically significant positive influence (14.370).

Previous research has provided support for the findings of this study. The results of Usman and Sulaiman's (2023) study, which affirmed the favourable and noteworthy influence of energy

disclosure on cost of capital, were in conflict with those of Bonetti et al.'s (2023) investigation. While Mohammed et al. (2022) and Usman and Sulaiman's findings were in the opposite direction, Wang and Liang (2021) and Igbekoyi et al. (2021) found a negative and negligible effect of environmental disclosure on cost of capital, supporting the study's findings that compliance with environmental laws and regulations reported a negative impact. Studies by Mohammed and Faouz (2014) and Oshiole et al. (2024) supported the idea that effluents and waste disclosure have a positive and negligible impact on the cost of capital, but Kadiri-Ikharo et al. (2024) did not.

5. Conclusion and Recommendations

This study investigates the impact of environmental disclosure on the cost of capital for publicly listed oil and gas companies in Nigeria over a ten-year period (2014–2023). The findings revealed that energy disclosure significantly influences capital costs, while effluents and waste disclosure and compliance with regulations do not have significant effects. Based on these results, the study recommends that companies reassess their energy disclosure strategies and policymakers review existing regulations to reduce potential increases in capital costs. Additionally, more robust policies should be developed for effluents and waste disclosure to enhance their relevance to capital cost management.

The study contributes to the growing body of literature on environmental accounting disclosure and provides practical insights for policymakers, regulatory bodies, and corporate managers aiming to enhance sustainability practices and minimize capital costs.

References

Abba, M., Said, R. M., Abdullah, A., & Maha, F. (2018). The relationship between environment operational performance and environmental disclosure of Nigerian listed companies. *Journal of Environmental Accounting and Management*, *6*(1), 1-15.

Adegbie, F. F., Dada, S. O., & Ajayi, A. (2023). Environmental Disclosure and return on assets of manufacturing companies listed in Nigeria. *International Journal of Economics, Business and Management Research*, *7*(6), 195-211.

Afonso, D.(2021). *How do ESG rating impact the cost of debt? A study on European firms*. Dissertation submitted in partial fulfillment of requirements for the MSc in finance, at the Universidade Catolica Portuguesa and ESCP Europe Paris.

Akpan, D. C., & James, J. A. (2024). Empirical analysis of the Nexus between corporate social responsibility and cost of capital of consumer goods firms in Nigeria. *International Journal of Finance and Economics Research, 12*(1), 53-65.

Alhares, A., & Alhares, O. M. (2019). The impact of corporate governance mechanisms on risk Disclosure [special issue]. *Corporate ownership and control*, *17*(4), 292-307.

Barbu, E., Dumontier, P., Feleaga, N., & Feleaga, L. (2018). Mandatory environmental disclosures by companies complying with IAS_s/$IFRS_s$: the cases of France, Germany and the UK. *International Journal of Accounting, 49*(12), 231-247.

Bartolacci, F., Paolini, A., Quaranta, A. G., & Soverchia, M. (2018). Assessing factors that influence waste management financial sustainability. *Waste management 79*, 571-579.

Berdugo, S., & Mefor, I. (2012). The impact of environmental accounting and reporting on sustainable development in Nigeria. *Research Journal of Finance and Accounting, 14*(37), 55-63.

Bonetti, P., Cho, C. H., & Michelon, G. (2023). Environmental disclosure and the cost of capital: Evidence from the Fukushima nuclear disaster. *Journal of Business Ethics, 17*(3), 775-794.

Breley, R. A., Myers, S. C., & Allen, F. (2017). *Principles of corporate finance*. McGraw-Hill Education.

Campa, D., & Kern, A.(2020). Employee stock ownership and cost of capital: evidence from the S & P 500. *Journal of Corporate Accounting and Finance, 31*(3), 150-162.

Damodaran, A. (2012). *Investment valuation: Tools and techniques for determining the value of any asset*. John Wiley and sons.

Deegan, C. (2002). The legitimizing effect of social and environmental Disclosure: A theoretical foundation. *Auditing Accountability Journal, 4*(1), 32-38.

Dogan, B., & Acar, M.(2020). The impact of corporate governance on cost of capital: and application on the firms in the manufacturing industry in Borsa Istanbul. *Centre for European Studies* (CES) *Working Papers*, *12*(1), 23-44.

El Ghoul, S., Guedhami, O., Kwok, C. C., & Mishra, D. R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking and Finance, 35*(9), 2388-2406.

Emeka, L. O., Nwezu, A. U., & Nwadiolor, E. O. (2020). Effect of social and environmental disclosures on performance of non-financial firms in Nigeria. *Journal of Accounting and Financial Management, 6*(1), 40-58.

Farooq, U., Wen, J., Tabash, M. I., & Fadoul, M. (2024). Environmental regulations and capital investment: Does green innovation allow to grow? *International Review of Economics and Finance, 89* (Part A), 878-893.

Gatimbu, K., & Wabuife, J. (2016). Effects of corporate Environmental disclosure of financial performance of firms listed at Nairobi security exchange Kenya. *International Journal or Sustainability Management and Information Technologies, 2*(2), 1-6.

Gray, R. (2010). Is accounting for sustainability actually accounting for sustainability woodmore and how would we know? An exploration of narratives of organizations and the planet. *Accounting Organizations and Society, 35*(1), 47-62.

Hansen, D., & Mowen, M. (2003). *Cost management accounting control* (4th ed.) USA: Thompson South Western.

Igbekoyi, O. E., Ogungbade, O. I., & Olayele, A. G. (2021). Financial performance. *European Journal of Accounting, Auditing and Finance Research, 10*(2), 31-51.

Ikpor, I. M., Bracci, E., Kanu, C. I., Ievoli, R., Okezie, B., Mlanga, S., & Ogbaekirigwe, C. (2022). Drivers of sustainability accounting and reporting in emerging economics: *Evidence from Nigeria Sustainability, 14*(7).

Ite, A. E., Ibok, U. J., Ite, M. U., & Petters, S. W. (2013). Petroleum exploration and production: past and present environmental issues in the Nigeria's Niger Delta. *American Journal of Environmental Protection, 1*(4), 78-90.

Iwata, H. K., & Okada, K. (2011). How does environmental performance affect financial performance? Evidence from Japanese manufacturing firms. *Ecological Economics, 70*(9), 1691-1700.

Jalia, J., & Komathy, J. (2019). Sustainability reporting and firm performance: Evidence in Malaysia. *International Journal of Accounting, Finance and Business, 4*(17), 37-45.

Kadiri-Ikharo, H. L., Ozele, C.E., & Josiah, M. (2024). Environmental accounting disclosure and cost of capital of listed non-financial firms in Nigeria. *International Journal of Research Publication and Reviews, 5*(8), 754-766.

Keown, A. J., Martin, J. D., Petty, J. W., & Scott, D. F. (2005). *Financial Management: Principles and Applications* (10th ed.). Pearson.

Lindblom, C. (1994). The implications of organizational legitimacy for corporate social performance and Disclosure. *Critical Perspectives on Accounting Conference*, New York.

Mohammed, A., Alhassan, I., & Mohammed, Y. (2022). Effect of environmental disclosure on financial performance of listed manufacturing firms in Nigeria. *International Academic Journal of Economics and Sustainable Development, 8*(5), 56-65.

Mohammed, T., & Farouz, P. I. (2014). Does corporate environmental disclosure affect the cost of capital? Evidence from Tunisian companies. *Global Journal of Management and Business Research: Accounting and Auditing, 14*(1), 1-8.

Mokori, D., & Jagongo, A.(2013). Environmental accounting and firm profitability: An empirical analysis of selected firms listed in Bombay stock exchange India. *International Journal of Humanities and Social Science, 3*(18), 248-256.

Mulyati, Y. (2017). The influence of voluntary disclosure, stock beta and firm size on cost of Equity Capital. *Jurnal Keuangan Dan Perbankan*, *21*(3), 387-396.

Nguyen, H. A., Nguyen, L. S., & Ha, H. H. (2020). Environmental accounting practices and cost of capital of enterprises is in Vietnam. *Congent Economics and Finance 2*(8), 1-17.

Nindaya, F., & Dwi, P. (2020). Cost of equity: Disclosure, size, and political connection: *Advances in Economics, Business and Management Research, 2*(2), 143-156.

Nnamani, J. N., Onyekwelu, U. L., & Ugwu, O. K. (2017). Effect of sustainability accounting and reporting on financial performance of firms in Nigerian breweries sector. *European Journal of Business and Innovation Research*, *5*(1), 1-15.

Nor, N., Bahari, N., Adnan, N., Qamarul, S., Kamal, A., & Ali, I. (2016). The effects of Environmental disclosure on financial performance in Malaysia. *Procedia Economics and Finance, 4*(35), 117-126.

Ojo, G. (2016). Environmental Justice struggles Ogoni: No more delays clean up now. Environmental impact. *A Newsletter of Environmental Rights Action/Friends of Earth Nigeria, 28*, 1-15.

Oshiole, B. V., Orbunde, B., & Ame, J. (2024). Employee health and safety cost and effluent disclosure on market value of listed consumer and industrial firms in Nigeria. *International Journal of Research and Innovation in Social Science (IJRISS), 7*(5), 1-26.

Oshiole, O. O., Elamah, P. O., & Ndubuisi, N. C. (2020). Environmental cost disclosure and profitability of oil and gas firms listed on Nigerian Stock Exchange. *Journal of finance and accounting, 8*(2), 56-70.

Raimo, N., De Nuccio, E., Giakoumelou, A., Petruzzella, F., & Vitolla, F. (2020). Non-financial information and cost of equity capital: an empirical analysis in the food and beverage industry. *British Food Journal, 123*(1), 49-65.

Ribeiro, V., & Aibar-Guzman, C. (2010). Determinant of Environmental accounting practices in local entities: evidence from Portugal. *Social responsibility Journals, 6*(3), 404-419.

Rose, S. A., Westerfield, R. W., Jordan, B. D., & Roberts, G. S. (2019). *Fundamentals of corporate finance.* McGraw-Hill Education.

Suchman, M. C. (1995). Managing legitimacy: strategic and institutional approaches. *The Academy of Management Review, 20*(3), 571-610.

Udo, E. J. (2018). *Companies financial attributes and environmental accounting disclosures of the oil and gas industry in Nigeria*. PhD thesis. University of Uyo Nigeria.

Udomah, M. O., & Emenyi, D. E. O. (2023). Sustainability reporting and financial performance of selected cement firms in Nigeria. *GPH-international Journal of Business Management, 6*(8), 40-65.

Usman, M. M., & Suleiman, M. (2023). Effect of environmental accounting disclosure on cost of debt capital of lifted non-financial firms in Nigeria. *POLAC International Journal of Accounting Management Sciences and Security Studies (PIJAMSS*) *5*(10), 1-14.

Uwigbe, U. (2011). An empirical examination of the risk associated with corporate social responsibility disclosures and firms size. *International Journal of Business Continuity and Risk Managemen*t, *2*(3), 284-294.

Wang, Q., & Liang, K. (2021). The impact of environmental regulation on firm performance: Evidence from Chinese cement industry. *Journal of Environmental Management,* 299.

Wara, R. K., Magali, J., & Mohammed, S. (2020). Environmental disclosure and financial performance of firms in Kenya. *Research Journal of Finance and Accounting, 11*(14), 52-63.

Wendai, L., Jing, Z., & Bin, L. (2022). Does more voluntary environmental information and disclosure cut down the cost of equity: heavy pollution industries in China. *Environmental Science and Pollution Research, 29*(42), 62913-62940.

Yossi, D. (2018). The mediating effect of sustainability disclosure on financial performance and firm value in Indonesia. *Journal of Accounting Finance Auditing Studies, 4*(2), 32-48.

Zhao, X., Zhang, L., & Song, Y. (2014). Environmental information disclosure of listed company study on the cost of debt capital empirical data: Based on thermal power industry. *Canadian Social Science, 10*(6), 88-94.