

## Determinants of environmental disclosure in the Oil and Gas industry: Evidence from Nigeria

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### Abstract

**Purpose:** This study examined the determinants of environmental disclosure among oil and gas companies listed on the Nigerian Exchange Group (NGX), focusing on the effects of profitability, leverage, firm size, audit firm type, and financial constraints.

**Methodology:** An ex post facto research design was adopted using secondary data extracted from the annual reports of all listed oil and gas companies in Nigeria from 2013 to 2024. Data were analyzed using descriptive statistics, correlation analysis, diagnostic tests, and pooled Ordinary Least Squares (OLS) regression.

**Results and conclusion:** The findings showed that profitability and firm size have a positive and statistically significant effect on environmental disclosure, indicating that larger and more profitable firms provide more extensive environmental information. Financial constraint exhibited a significant negative relationship with environmental disclosure, suggesting that financially constrained firms disclose less environmental information. Conversely, leverage and audit firm type had no significant influence on environmental disclosure. The study concluded that profitability, firm size, and financial constraints are key determinants of environmental disclosure practices among listed oil and gas companies in Nigeria.

**Implication of findings:** The study highlights the need for stronger environmental reporting regulations and mandatory disclosure standards. It also suggests that policymakers should provide incentives and support mechanisms to encourage improved environmental reporting, particularly among financially constrained firms, thereby enhancing corporate transparency, accountability, and sustainable development in Nigeria's oil and gas sector.

**Keywords:** Environmental Disclosure, Environmental, Constraints; Sustainability, Global Reporting Initiative (GRI)

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### 1. Introduction

Environmental reporting and disclosure remain vague and inconsistent because statutory bodies, quasi-regulatory agencies, and standard-setters have not yet provided definitive framework or backing for them. Previous research has shown that environmental accounting disclosure is usually voluntary in developing nations, with a focus on Nigeria, because there are no national or international guidelines to offer guidance on such disclosure. Prior studies have assessed the determinants of environmental accounting disclosure in different contexts and domain (Sumiani et al., 2007; Deegan et al., 2002; de Villiers & Barnard 2000; Tilling & Tilt 2010). Several studies have explored the relationship between environmental information disclosure and firm characteristics, as evident as cited in Nor et al. (2016), Cormier et al. (2005), and Deegan et al. (2002). Despite these contributions, a significant portion of the research has predominantly relied on the perspectives of employees, often gathered through cross-sectional surveys. Notable examples of these survey-based studies include the works of Ahmad et al. (2003), Fifka (2012), Suttipu and Stanton (2012), Sulaimana et al. (2014), and Chandok et al. (2017). In practice however, it is difficult to generalize conclusions drawn on the level of environmental disclosure by firms based on these studies and hence, the need for further studies (Ahmad et al. 2003; Suttipun & Stanton 2012). Therefore, it is necessary to evaluate the issue over a longer time period in order to comprehend the cause-and-effect link between firm-specific characteristics and environmental accounting disclosure.

In terms of sector-in-focus, there are a few studies that have examined environmental disclosures in the oil and gas industry (Al-drugi & Fodio, 2012; Abdullah & Azhar, 2016). But the majority of these earlier studies' factors focused on industrialized nations. Both the variables examined in earlier research and the outcomes of those investigations varied. While some research suggested that environmental disclosure is solely positively impacted by profitability, others claimed that environmental disclosure is negatively impacted by business size, leverage, and audit firms; yet others did not take leverage into account. Prior studies also found that firm size, audit firm type and profitability all had a positive relationship with the environmental accounting disclosure in the oil and gas companies in Nigeria (Abdullah & Azhar, 2016; Dibia & Onwuchekwa, 2015; Suleiman et.al, 2014; Uwalomwa, 2011; Abdullah & Azhar, 2016; Ebiringa 2013; Abubakar 2017). To the best of our knowledge, no prior research has looked at the relationship between environmental accounting disclosure and the combination of the variables (firm size, profitability, leverage, audit quality, and financial constraint). Therefore, by examining the impact of company characteristics on environmental disclosure in developing economies like Nigeria, this study aims to close the gaps in earlier literature. The research attempts to contribute to already existing literature as regards determinant of environmental disclosure of Oil and Gas Company in Nigeria.

## 2. Literature review

### *Environmental Disclosure*

Malik et al. (2023) investigated the influence of environmental disclosure on corporate financial outcomes, introducing green innovation as a mediating variable. Grounded in stakeholder and signaling theories, the authors analyzed a dataset of Chinese firms listed on the Shanghai and Shenzhen stock exchanges from 2005 to 2016. Their structural measurement model revealed that green innovation partially mediates the positive link between environmental reporting and firm performance. Ultimately, the empirical evidence demonstrated that while environmental disclosure directly improves financial performance, it also indirectly drives it by fostering green innovation. The study concluded that Chinese firms can optimize their financial returns by scaling up both their environmental transparency and sustainable practices.

In a similar vein, Muttanachai et al. (2023) explored the extent and structural patterns of Environmental, Social, and Governance (ESG) disclosures within the annual reports of publicly traded companies. Examining data from 2015 to 2019, the study utilized word-count content analysis mapped against the Global Reporting Initiative (GRI) framework to quantify ESG disclosures, while measuring financial performance via corporate net income. The analytical framework incorporated control and contextual variables, including stock market reactions, firm age, risk, and specific ESG groupings. Using a methodology that spanned descriptive statistics, independent sample t-tests, correlation matrices, and panel data analysis, the findings reinforced stakeholder theory by highlighting the financial advantages of sustainability reporting, even within Thailand's largely voluntary disclosure environment.

Shifting the focus to the financial services industry, Mehak et al. (2022) evaluated how Corporate Social Responsibility (CSR) disclosures impact the financial performance of the Pakistani banking sector between 2010 and 2020. Utilizing data from the Pakistan Stock Exchange, the study examined five distinct dimensions of CSR alongside performance indicators like Return on Assets (ROA) and Return on Equity (ROE), while controlling for firm size, debt, and capital ratios. Employing Ordinary Least Squares (OLS), Fixed Effect (FEM), and Random Effect (REM) regression models, the researchers found meaningful correlations across all selected CSR dimensions (ethical, environmental, economic, and philanthropic). However, the regression analysis ultimately revealed that only the legal dimension exerted a statistically significant impact on the financial performance of banks in Pakistan.

#### *Leverage and Environmental Disclosure*

Though leverage has been theoretically proved to be useful in understanding oil companies' financial performance, the empirical evidence is inconclusive. Dibia et al., (2015); Ahmed et al., (2017) documented negative association between leverage and environmental accounting disclosures. Contrarily, Maliah et al (2014) and Patrick et al. (2017) reported positive effect of leverage on environmental accounting disclosure. In a study conducted by Juhmani (2014), he found a significant positive relationship between financial leverage and corporate disclosure, that the companies listed on Bahrain with high financial leverage disclose more of social and environmental information on their website than those with low financial leverage. Ohidoa et al., (2016), Dibia et al., (2015), Prastiwi et al., (2016), Suleiman et al., (2014) also documented that leverage do not influence the ability of a company to disclose environmental information. Indeed, some studies like Juhmani (2014) and Agbdan (2015), suggests that a company's leverage can have a positive influence on its capacity to provide environmental information in annual reports.

However, it's important to note that empirical findings regarding the relationship between leverage and environmental disclosure can vary, and these studies may have specific contextual factors or data that contribute to these differing conclusions. For instance, Aksu and Kosedag (2006) investigated the factors influencing voluntary disclosure levels in a prior study carried out in Turkey. The transparency and disclosure policies of 52 of the biggest and most liquid businesses listed on the Istanbul Stock Exchange now formally known as Borsa Istanbul, or BIST were the main focus of their investigation. Free cash flow, accounting performance (return on equity), leverage, size (market capitalization), and market-to-book ratio were the five independent variables they looked into. Interestingly, they discovered that differences in transparency and disclosure scores could not be explained by leverage. This shows how the effect of leverage on disclosure can change depending on the particular situation and variables involved. An oil company's scale has a big impact on how environmental decisions are made in the context of its operations. Additionally, Nawaiseh (2015) found a strong and favorable correlation between environmental disclosure and firm size. Jariya (2015), study on the determinants of environmental disclosure of Sri Lankan listed manufacturing companies found that firm size had a positive influence on the level of corporate environmental disclosure. Similarly, research by Burgwal et a., (2014) on environmental disclosure determinants in Dutch listed companies discovered a positive association between firm size and environmental disclosure. Ismail et al., (2018) conducted a study to investigate the factors influencing the quality of corporate environmental disclosure (CED). They examined annual reports, stand-alone reports, and corporate homepages from 116 oil and gas corporations in 19 developing nations using content analysis, an index, and a rating system. Only five of the twelve hypothesized variables company size, foreign ownership, profitability, leverage, and membership in industry associations showed a positive correlation with CED quality, according to the data. This study clarifies the elements influencing the caliber of such disclosure and advances knowledge of CED procedures in DC oil and gas businesses. As a result, the study's findings can help create better CED laws for the oil and gas sector and offer regulators direction on how to include social and environmental data into standards.

H<sub>01</sub>: Leverage has no significant effect on environmental accounting disclosure in the oil and gas industry.

#### *Firm Size and Environmental Disclosure*

The size of an oil company plays a significant role in shaping decisions related to the environment within the company's operating context. Nawaiseh (2015) opined that there is a positive and significant relationship between firm size and environmental disclosure. Jariya (2015) studied the determinants of

environmental disclosure of Sri Lankan listed manufacturing companies found that firm size had a positive influence on the level of corporate environmental disclosure. Similarly, Burgwal & Vieira (2014) also examined environmental disclosure determinants in Dutch listed companies discovered a positive association between firm size and environmental disclosure. However, there are contrasting findings in some studies. Dibia & Onwuchekwu (2015) documented a negative relationship between firm size and environmental disclosure. Gatimbu & Wabwine (2016) also found a negative association between firm size and environmental disclosure. O'Dwyer (2003) conducted a study on the extent of environmental disclosure in annual reports and standalone environmental reports of all listed Irish companies. He discovered that Irish businesses showed an increasing tendency in environmental disclosure using content analysis within the framework of legitimacy theory. However, businesses with readily apparent environmental effects were the main ones that engaged in detailed environmental reporting. Additionally, he pointed out that environmental reporting was more frequently done internally than externally and that corporation size and environmental sensitivity were positively correlated with the level of environmental disclosure. These varied findings highlight the multifaceted relationship between firm size and environmental disclosure, which can be influenced by industry context and other factors.

Abdul ((2010) state that larger companies come under more scrutiny than smaller companies. Therefore, these companies feel the heaviness to disclose more social information to obtain approval from the stakeholders for continued survival (O'Donovan, 1997). Larger firms are as well perceived to be important economic entities and thus have greater demands placed on them to provide more information for customers, suppliers, analysts and government (Cooke, 1991). Making information available is equally made easier because these larger firms possess the necessary resources to furnish stakeholders with the pertinent information and hence producing extra data at a competitive cost than smaller firms (Cooke, 1991, 1992). A positive relationship between size of a corporation and the amount of environmental disclosure has been consistently found by prior studies (Stanny & Ely, 2008; Raar, 2002; Stanwick & Stanwick, 2006 and Ho & Taylor, 2007). Roberts (1992) found a negative association between the size of the company and the level of Corporate Social Responsibility disclosure.

Dibia & Onwuchekwa (2015) explored the determinants of environmental disclosures in Nigerian oil and gas companies. During the fiscal years 2008–2013, a sample of fifteen businesses from the Nigerian Exchange Group's oil and gas industries participated in their study. They used binary regression analysis to obtain secondary data from these companies' annual reports. The study identified that company size had a significant relationship with corporate social responsibility disclosures, whereas profitability, leverage, and audit firm type did not exhibit significant relationships with such disclosures. The study concluded that some companies tend to underreport their environmental impact, using voluntary environmental reporting as an excuse. They recommended that the introduction of incentives to encourage more comprehensive disclosures. Dibia & Onwuchekwa (2021) investigated the impact of environmental disclosure determinants on the quality of environmental disclosure by oil and gas firms listed on the Nigerian Exchange Group between 2009 and 2018. They used a census sampling technique, considering all 15 oil and gas firms listed on the Nigerian Stock Exchange as of December 31, 2018. Data were collected from annual reports, including environmental, sustainability, and corporate social responsibility reports, and analyzed using descriptive statistics and binary logistic regression. The results showed that firm size had a positive and statistically significant influence on the quality of environmental disclosure, while share ownership distribution had a negative impact. The study recommended that Nigerian accounting regulatory bodies align their environmental disclosure framework with the Global Reporting Initiative and motivate listed oil and gas firms to enhance their environmental reporting.

Aluwong & Inuwa (2019) focused on the influence of corporate attributes on environmental disclosure in Nigerian oil companies. From 2011 to 2017, they gathered secondary data from the annual reports and accounts of nine oil companies that were chosen at random. The study employed logistic regression analysis and discovered that firm size significantly affected environmental accounting disclosure positively.

H<sub>02</sub>: Firm size has no significant relationship with environmental accounting disclosure in the oil and gas Industry

#### *Profitability and Environmental Disclosure*

Previous research work had been carried out on the determinant of environmental accounting disclosures where profitability is one of the variables used among many other determinant, and the following results were made available; Jariya (2015) maintained that profitability affects environmental disclosure, while Suleiman, Abdullah & Fatima (2014) examined the determinants of environmental reporting quality in Malaysia, the result indicated that profitability had no significant relationship with the quality of environmental reporting. The company's profitability, level of leverage, size (firm size), and external audit quality (kind of audit firm) are the corporate characteristics whose effects on required disclosure were examined. Previous research have used a variety of firm-specific factors to examine the relationship between environmental disclosure and firm-specific qualities (Hackson et al., 1996; Cormier et al., 2001; Magness, 2006; Dibia, 2015). The results of the analysis of the connection between voluntary environmental disclosure and profitability are inconsistent. Cormier et al. (2005), Ten (2009), and Dibia (2015) were among the research that came to the conclusion that profitability had little bearing on the degree of environmental disclosure. Contrastingly, other studies, like Christensen et al., (2004) and Smith et al., (2007); suggest the opposite, indicating that profitability plays a significant role in influencing the level of environmental disclosure. Furthermore, Hussainey et al. (2011) conducted research on a sample of 111 Egyptian listed firms over the period of 2005-2010. Their findings reveal that 66% of the firms in their sample disclose an average of 10-50 Corporate Social Responsibility (CSR) statements. Additionally, they discover that the primary factor influencing CSR disclosure is profitability. Nevertheless, they discover no connection between environmental disclosure and ownership structure, company size, financial leverage, or liquidity.

Ismail et al., (2018) conducted a study to investigate the factors influencing the quality of corporate environmental disclosure. They examined annual reports, stand-alone reports, and corporate homepages from 116 oil and gas corporations in 19 developing countries (DCs) using content analysis, an index, and a rating system. Only five of the twelve hypothesized variables company size, foreign ownership, profitability, leverage, and membership in industry associations showed a positive correlation with CED quality, according to the data. This investigation clarifies the variables influencing the caliber of such disclosure and advances knowledge of CED procedures in oil and gas firms in developing nations. As a result, the study's findings can help create better CED laws for the oil and gas sector and offer regulators direction on how to include social and environmental data into standards.

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H<sub>03</sub>: Profitability has no significant relationship with environmental accounting disclosure in the oil and gas Industry

#### *Audit Firm Type and Environmental Disclosure*

The quality of information disclosure is influenced by the auditors' level of monitoring. According to current research, brand-name (Big 4) auditors offer better quality assurance than non-Big 4 auditors (Teoh and Wong, 1993; Watkins et al., 2004). The reliability, or perceived dependability, of information is influenced by the reputation of Big 4 auditors (Menon and Williams, 1991). Additionally, in order to preserve a company's reputation as a brand and prevent expensive legal action, Big 4 auditors frequently insist that it reveal additional information.

Ahmed and Courtis (1999) point out that when a firm is audited by a more established accounting firm, analysts tend to extend higher recognition to the quality of the corporate disclosure. An accounting firm's reputation is more trusted by investors and it is less vulnerable to its clients the more established it is. According to previously examined literature on environmental disclosures and company qualities, there is also a favorable correlation between audit firm type and social environmental information disclosure (Olayinka and Oluwamayuwu, 2014). In the work of Ohidoa et al., (2016) on the determinants of environmental disclosure indicated a positive association between audit firm type and environmental disclosure while leverage has no significance effect on the company's decision to disclose environmental information.

Dibia and Onwuchekwa (2015) examined the determinants of environmental disclosures in Nigeria, the results of the study uncovered a negative impact on firm size(type), leverage and audit firm to disclose environmental information by the Nigerian quoted companies. Leverage and audit firm type have little effect on EAD, although firm size and type have a considerable impact. The firm's decision to reveal important environmental information seems to be positively influenced by profit after taxes. According to Aluwong & Fadio,(2019) auditor types have a favorable but negligible impact on Nigerian oil firms' environmental accounting disclosure. The study recommends that the regulators of the oil companies in Nigeria should encourage the use of more debts in the oil companies' capital structure, which will make them disclose more information about the environment based on the close monitoring and demand by the debt holders

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disclosure in Nigerian oil companies. From 2011 to 2017, they gathered secondary data from the annual reports and accounts of nine oil companies that were chosen at random. Auditor types had a positive but insignificant effect on environmental accounting disclosure.

H<sub>04</sub>: Audit firm type has no significant effect on environmental accounting disclosures in the oil and gas Industry

#### *Financial Constraints and Environmental Disclosure*

In ideal principles of capital markets, a firm financing mix could be internal and external financing mix and they are perfect substitutes (Modigliani & Miller, 1958), and firms could finance their investment opportunities by sourcing outside capital at a rate equivalent to that of internal source. However, there is some friction in the investment markets, and this friction leads to financial limitations. Financial constraints are defined by Lamont et al. (2001) as "frictions that thwart the firm ability to fund all desired investments," and they further state that "this inability of the firm to finance her investment could be due to credit constraints or inability to source for external funds, inability to issue equity, dependence on bank loans, or illiquidity of assets." Financial constraints does not only lead firms to cutting down on their investments in inventory (Carpenter et al., 1998) and Research & Development (Himmelberg & Petersen, 1994; Hall & Lerner, 2010), and forego positive NPV projects (Stein, 2003), they could also affect a firm's market entry and exit decisions (Holtz-Eakin et al., 1994), impair a firm's ability to engage in labor hoarding (Sharpe, 1994), and lower a firm's stock returns (Lamont et al., 2001).

Asymmetric information is one of the flaws in the market that lead to financial limitations. In order to compensate investors for a potential "lemons" issue, companies must secure external financing at a premium due to the asymmetric information between management and investors, which creates a gap between internal and external financing costs (Myers, 1984; Myers & Majluf, 1984). In this scenario, restricted internal funds may limit investment opportunities, forcing constrained enterprises to forgo lucrative ventures. Reducing asymmetric information through extensive information disclosure may help ease a firm's financial restrictions. By giving investors and other interested parties crucial information about how businesses handle environmental issues like the costs of reducing pollution, removing hazardous chemicals, and waste management, as well as lowering investors' uncertainty about regulatory interventions, fines, and penalties, the disclosure of a company's environmental risks and policies in annual reports increases information transparency. Dhaliwal et al. (2011) and Aerts et al. (2008) document that firms with more expansive disclosure of corporate social responsibility have lower levels of analyst forecast errors and dispersion. More recently, Wang et al. (2019) demonstrate that bank loans are a very important capital source in China due to strict requirements regarding public equity financing. Banks typically need a third-party guarantor to secure a loan, who is responsible for repaying the amount in the event that the borrower defaults. By insuring the banks, the credit guarantee lessens the financial burden on borrowers, but it also raises the financial risk and audit costs for guarantors. Wang et al. (2019) find that the disclosure of social responsibility information decreases the audit fees associated with loan guarantees as transparent information reduces audit risk and scope.

Enhancing reporting dependability is another way that environmental disclosure might lessen asymmetric information. Prior studies find a positive association between the quality of the manager's information and levels of disclosure (Verrecchia, 1990; Francis et al., 2008). As a result, investors will view these announcements as more reliable, which will further lessen information asymmetry. Simnett et al. (2009) report evidence that firms having their sustainability reports assured can enhance the credibility of their reports, a finding that is consistent with the arguments that the demand for assurance

stems from the need for effective within company control (Abdel-khalik, 1993) and the need to mitigate information asymmetry with institutional creditors (Blackwell et al., 1998). This reduction in information costs, in turn, increases a firm's access to capital markets or reduces the cost of raising outside capital by lowering the transaction costs or bid-ask spread (Demsetz, 1968; Copeland & Galai, 1983; Glosten & Milgrom, 1985; Amihud & Mendelson, 1986), and/or by reducing the non-diversifiable estimation risk (Barry and Brown, 1985; Coles & Loewenstein, 1988), and or by increasing the liquidity of the company's securities (Diamond & Verrecchia, 1991). Several empirical studies report a negative association between corporate social responsibility and/or environmental disclosure and the cost of equity (Cormier & Magnan, 2007; Francis et al., 2008; Dhaliwal et al., 2011; El Ghouli et al., 2011; Plumlee et al., 2015).

Transparent environmental information can also potentially mitigate a firm's financial constraints by improving a firm's commitment to and engagement with stakeholders, resulting in a reduction in agency costs and providing more flexible financing (Foo, 2007; Jones, 2010; Karolyi, 2012). Jones (2010) argues that "given that the contracting process gives rise to agency problems, transaction cost problems, and team production problems because ethical solutions to commitment problems are more efficient than mechanisms designed to curb opportunism, it follows that firms that contract (through their managers) with their stakeholders on the basis of mutual trust and cooperation will experience reduced agency costs, transaction costs, and costs associated with team production. More specifically, monitoring costs, bonding costs, search costs, warranty costs, and residual losses will be reduced." Similarly, Francis et al. (2005) find that firms in industries with greater external financing needs disclose more and have a lower cost of debt. Goss & Roberts (2011) also find evidence that banks charge a lower premium for firms with superior corporate social responsibility performance. 2

Yao et al. (2019) hypothesizes that firms with more extensive environmental information disclosure will face lower financial constraints because of reduced information asymmetry and lower agency costs. Financial limitations that go beyond the cost of debt or equity include the inability to borrow money, the inability to issue equity, reliance on bank loans, and the illiquidity of assets. Hadlock-Pierce SA index measure is used to assess financial constraints faced by firms. It incorporates qualitative data from financial filings, calculating the index based on firm size and age to provide insights into their financing capabilities (Bodnaruk et.al, 2015). When evaluating a company's capital structure, determining how financially limited it is essential. Extant measures of financial constraints focus on macro firm characteristics such as age and size variables highly correlated with other firm attribute using a unique lexicon based on constraining words and found that the frequency of constraining words exhibits very low correlation with traditional measures of financial constraints and predicts subsequent liquidity events like dividend omissions or increases, equity recycling, and underfunded pensions better than widely used financial constraint indexes (Bodnaruk et.al, 2015).

Lin and Qamruzzaman (2023), examined the role of environmental and financial disclosure, IT adoption, and good governance on firms' sustainability from 1990 to 2019, focusing on 75 financial institutions listed in Bangladesh's capital market. The study used secondary data sources, including annual reports, economic review reports, and central bank publications. Their findings showed a positive and statistically significant association between sustainability and the studied variables. The study also highlighted the mediating role of corporate governance in enhancing financial performance. The researchers recommended that financial policymakers prioritize fairness and integrity in disclosing information to the public and enforce measures to ensure good governance.

H<sub>05</sub>: Financial constraint has no significant relationship with environmental accounting disclosure in the oil and gas Industry

### *Theoretical Framework*

Stakeholder theory and legitimacy theory are two important ideas that shed light on the connection between environmental disclosure and company characteristics. A framework in business ethics and organizational management, the stakeholder theory highlights the significance of morals and values in managing an organization. Ian Mitroff first proposed it in his book "Stakeholders of the Organizational Mind," which was released in San Francisco in 1983. This theory has made a substantial impact across various fields, including accounting, finance, law, management, and human resources, challenging traditional analytical frameworks by advocating for the prioritization of stakeholders' needs in guiding a company's decision-making processes. However, according to legitimacy theory, organizations constantly work to adhere to the standards and limitations established by the societies in which they are located.

From a legitimacy theory standpoint, a business would willingly reveal its operations if management felt that doing so would meet the expectations of the communities in which it works. This concept is supported by previous research (Deegan 2002; Deegan, Rankin, and Voght 2000; Cormier and Gordon 2001). Given the potential consequences of breaching the social contract in terms of organizational survival, it becomes crucial to explore the remedial actions that organizations might undertake. In this context, legitimacy theory introduces the concepts of a 'legitimacy gap' and 'legitimacy strategies,' which are further discussed below. In summary, these theories shed light on the moral and ethical considerations in organizational management and the need for businesses to align their operations with societal norms and expectations, with a specific focus on environmental disclosure as an aspect of corporate behavior.

### **3. Methodology**

The study used secondary data and an ex post facto research design. The data will be manually retrieved from the annual reports of the chosen companies for the 12-year period (2013–2024) suggested for consideration in the oil and gas sector mentioned on the Nigerian Exchange Group in order to guarantee the accuracy of the information gathered. Due to the small sample size, the study will take into account all oil and gas businesses quoted on the Nigeria Exchange group. The population of the study is made up of all companies quoted in the Nigeria Exchange group as of December 31st, 2024. The study adopted and modifies the model of Dibia and Onwuchekwa (2015) (ENVD = F(Size, Profit, Lev, and ADFT).

the model for the study is specified thus

$$\text{ENVD} = F(\text{SIZE}, \text{PROFIT}, \text{LEV}, \text{B4}, \text{FINCOM}) \text{-----}(1)$$

This can be re-specified in regression form as;

$$\text{ENVD} = \text{B0} + \text{B1SIZE} + \text{B2PROFIT} + \text{B3 LEV} + \text{FINCOM} + \text{Ut} \text{-----}(2)$$

Where: ENVD = Environmental Disclosure

LEV = Leverage,

PROFIT = Profitability,

SIZE = Company Size

B4 = Big 4 (Audit Type): An indicator variable equal to 1 if a company is audited by the Big 4, zero otherwise.

FINCOM= Financial Constraint

U = Stochastic term

The apriori signs are  $B_1 > 0$ ,  $B_2 > 0$ ,  $B_3 > 0$ ,  $B_4 > 0$ ,  $B_5 > 0$ ,  $B_6 > 0$ .

**Table A: Model Variables and Their Interpretations**

Variables	Notation	Measurements	a priori expectation	Source (Used by)
Environmental disclosure	ENVD	Proportion of environmental disclosure score measured by the un-weighted GRI-G4 environmental disclosure 34-item index.	-nil-	Ienciu, Popa, & Ienciu (2012)
Firm size	Size	Natural log of total assets	+	Akbas (2016)
Profitability	Profit	Profit after tax	+	Baboukardos (2017)
Leverage	Lev	Total debt/Total Asset	+	Dibia and Onwuchekwa (2015)
Audit firm type	B4	An indicator variable equal to 1 if a company is audited by the Big 4, zero otherwise.	+	Aluwong & Fobio(2019)
Financial constraint	FINCOM	Hadlock-Pierce (SA) Index	-	Hadlock and Pierce (2010)

Source: Researcher's Compilation (2026)

#### 4. Results and discussion

**Table 1 Results of the Descriptive Statistics**

	ENVD	LEV	FSIZE (₦'000)	ROA	BIG4	FINCOM
Mean	0.392323	0.732799	274924112.4	0.022996	0.703390	0.752422
Median	0.441176	0.707932	65717793	0.026711	1.000000	0.510375
Maximum	0.705882	2.478465	3143270270	1.762669	1.000000	4.309535
Minimum	0.000000	0.022934	47150.00	-0.71357	0.000000	-3.08753
Std. Dev.	0.135368	0.305677	522903291.8	0.198346	0.458711	1.463895
Skewness	-2.00684	2.345365	3.303234	5.184920	-0.89057	0.131382
Kurtosis	6.632450	13.74047	16.00496	53.26552	1.793115	3.322834
Jarque-Bera Probability	144.0799	675.3562	1046.140	12951.27	22.75941	0.851895
Sum	0.000000	0.000000	0.000000	0.000000	0.000011	0.653151
Sum Sq. Dev.	46.29412	86.47029	3.24E+10	2.713469	83.00000	88.78576
Observations	2.143980	10.93228	3.20E+19	4.602921	24.61864	250.7296
	118	118	118	118	118	118

Source: EViews10, (2026)

Table 1 shows the mean values of each of the variables and their respective standard deviations (degrees of dispersion) for the sampled oil and gas companies from 2012–2023 (12 years). The mean value for the variable ENVD was 0.3923, which suggests that over the course of the study's 12-year period, the sampled oil and gas companies disclosed an average of about 39% of the GRI environmental disclosure requirement. Also, the ENVD showed a median value of 0.44118 (i.e., about 44%), which implies that about 50% of the sampled oil and gas companies disclosed over forty-four percent of the environmental disclosure requirements within the 12-year period studied. The minimum and maximum values showed 0% and 70.6%, respectively, which is an indication that some of the sampled firms disclosed close to 71% (e.g., Seplat Petroleum Plc) of the entire environmental disclosure requirements in some of the years under study, while others did not disclose any environmental reporting information.

On the variable of LEV, the mean ratio of 0.733 (73.3%) suggests that, on average, the majority of the sampled oil and gas companies are highly leveraged. The median value (0.705) is an indication that the debt-to-asset ratio of 50% of the sampled oil and gas companies is over 70%. Also, the table shows that the variable FSIZE, which is based on the total value of all assets, has a mean value of 274,924,112.4. This means that the average size of the oil and gas companies that were studied over the past 12 years was about ₦274.9 billion. The minimum and maximum values show that the biggest oil and gas company among the sample (i.e., Oando Plc) has a total asset of up to ₦3.14 trillion as of year-end 2023, while the smallest firm in the log (i.e., Rak Unity Plc) had a total asset of about ₦47 million as of the start of the study. The median value suggests that up to 50% of the sampled oil and gas firms had total assets worth ₦65.7 billion during the studied period.

Comparably, the mean ROA value for the companies' profitability levels was 0.023 (about 2.3%), with minimum and maximum values of -0.714 and 1.763, respectively. When combined, the sampled oil and gas businesses' average ROA of roughly 2.3% can be regarded as a somewhat poor overall performance. A ROA of roughly 5% is regarded as an excellent performance, according to Jewell and Mankin (2011), albeit the higher the better. The highest value, however, indicates that while some of the examined oil and gas businesses did badly in relation to their overall assets, others were quite effective at leveraging their assets to generate earnings. Further, the mean variable of BIG4 showed that about 70% of the sampled oil and gas firms are audited by one of the Big Four auditing firms. The oldest firm among the sample has been listed on the Nigerian Stock Exchange for 59 years, while the youngest firm is just about 3 years (post listing). Lastly, the mean value of the Hadlock-Pierce (SA) Index (the adopted measure of financial constraints) showed 0.75, implying that, on average, about 75% of the sampled oil and gas firms are financially constrained.

The overall result of the normality test is shown in Figure 1. As observed, the Jarque-Bera statistics test of goodness-of-fit showed a value of about 10.6, which indicates that not all the variables conform with the standard normal distribution. The positive kurtosis suggests that the distribution is largely non-symmetry which is peculiar to panel data-sets. The p-value of 0.005 is lesser than 5%, which suggests that the majority of the data did not followed a normal distribution.

### ***Correlation Analysis***

Table 2's correlation coefficients reveal a mixed connection with both positive and negative values. Specifically, we find that the variables FSIZE, ROA, and LEV are positively correlated with the variable ENVD. However, only the variables of FSIZE and LEV are statistically significant, according to their probability values, which were 0.004, 0.502, and 0.000. This suggests that more environmental reporting procedures and disclosures are linked to large and highly leveraged companies.

**Table 2. Results of the Correlation matrix**

Variables	ENVD	LEV	ROA	FSIZE	BIG4	FINCOM
ENVD	1.0000					
LEV	0.2631 (0.0040)	1.0000				
ROA	0.0624 (0.5020)	-0.1784 (0.0533)	1.0000			
FSIZE	0.7340 (0.0000)	0.1424 (0.1241)	0.0185 (0.8425)	1.0000		
BIG4	-0.1058 (0.2542)	-0.2281 (0.0130)	0.0080 (0.9316)	0.0424 (0.6481)	1.0000	
FINCOM	-0.6496 (0.0000)	0.0810 (0.3835)	0.0087 (0.9256)	0.6804 (0.0000)	0.0933 (0.3150)	1.0000

Note: Values in parentheses are p-values. The diagonal elements represent perfect correlations of each variable with itself (1.0000).

Source: EViews 10 (2026)

### Regression

**Table 3 Results of the Serial Correlation Test**

Breusch–Godfrey Serial Correlation LM Test		
Statistic	Value	Probability
F-statistic	25.26148	0.0000
Obs*R-squared	37.37210	0.0000

Test Equation:

Dependent Variable: RESID

Presample and interior missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	-0.016972	0.049247	-0.344633	0.7310
LEV	-0.009551	0.023171	-0.412181	0.6810
ROA	-0.003319	0.033663	-0.098598	0.9216
SIZE	3.66E-11	2.07E-11	1.767785	0.0799
BIG4	-0.005600	0.014798	-0.378437	0.7058
FINCOM	-0.006164	0.007318	-0.842307	0.4015
RESID(-1)	0.446511	0.093746	4.762989	0.0000
RESID(-2)	0.215554	0.094628	2.277908	0.0247

### Model Summary Statistics

Statistic	Value	Statistic	Value
R-squared	0.316713	Mean Dependent Variable	-4.49E-17
Adjusted R-squared	0.266563	S.D. Dependent Variable	0.082461
S.E. of Regression	0.070620	Akaike Information Criterion	-2.389787
Sum Squared Residuals	0.543611	Schwarz Criterion	-2.178464
Log Likelihood	149.9975	Hannan–Quinn Criterion	-2.303984
F-statistic	6.315369	Durbin–Watson Statistic	1.726571
Prob(F-statistic)	0.000001		

Source: EViews 10 (2026)

Conversely, the variables SA-INDEX and BIG4 displayed negative correlation values of -0.649, -0.133, and -0.106, respectively. With a low p-value of 0.000 ( $p < 0.05$ ), only SA-INDEX is statistically significant. In other words, because of their high probability values of 0.50, 0.25, and 0.152, respectively, the variables ROA and BIG4 are not statistically significant. Additionally, the results showed comparatively low coefficient values and no signs of multicollinearity issues. FSIZE and ENVD have the highest correlation coefficient (i.e., 0.734).

From Table 5, the outcome of the Breusch-Godfrey Lagrange Multiplier (LM) test for serial correlation revealed that the null hypothesis of zero autocorrelation in the residuals cannot be rejected due to the low probability value (Prob. F, Prob. Chi-Square) of 0.0000, which is far less than 5%. However, the presence of serial correlation does not affect the unbiasedness or consistency of panel data estimation.

### Multivariate Analysis

The analyses of the panel regression model described in the study's third chapter are presented in this subsection. The pooled OLS pattern of panel data was estimated considering that the study is sector-based research which subsets are considered homogenous.

**Table 4. Results of the Pooled Regression**

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	-2.586415	0.364939	-7.087255	0.0000
LEV	0.031655	0.026614	1.189418	0.2368
ROA	0.066324	0.027731	2.391716	0.0185
FSIZE	0.173740	0.050096	3.468175	0.0007
BIG4	-0.011443	0.016825	-0.680118	0.4978
FINCOM	-0.164319	0.029522	-5.565926	0.0000

  

Model Summary Statistics			
Statistic	Value	Statistic	Value
R-squared	0.674788	Mean Dependent Variable	0.392323
Adjusted R-squared	0.657208	S.D. Dependent Variable	0.135368
S.E. of Regression	0.079256	Akaike Information Criterion	-2.174776
Sum Squared Residuals	0.697249	Schwarz Criterion	-2.010414
Log Likelihood	135.3118	Hannan–Quinn Criterion	-2.108040
F-statistic	38.38589	Durbin–Watson Statistic	0.611140
Prob(F-statistic)	0.000000		

Source: EViews 10 (2026)

From Table 4, the coefficient of determination, that is, R-squared (R<sup>2</sup>), showed that the model has a fairly high explanatory power of about 67.5%. The adjusted R-squared showed a value of 0.657, which can be explained to mean that the regressors in the equation could not explain only about 34% of the systematic variation in the dependent variable (ENVD) during the 12-year period covered by the study. Similarly, the overall probability value (0.000) and the high f-statistic of 38.39 are statistically significant at the 1% level, which means that a linear relationship exists between the regressors and the dependent variable, environmental disclosures.

The results showed a big probability value of 0.237 (23.7%) and a positive coefficient of 0.032 for the explanatory variable of firm leverage (LEV), which is statistically not significant. The upshot is that while corporate environmental disclosure may rise as a result of increased leverage, this increase will not be significant enough to rule out the null hypothesis. Therefore, the study rejects the null hypothesis, which

states that there is no significant relationship between leverage and corporate environmental accounting disclosure. In other words, there is a significant relationship between leverage and accounting disclosure. Conversely, the profitability (ROA) explanatory factors displayed a significant probability value of 0.0185 ( $p < 0.05$ ) and a positive coefficient of 0.066. Accordingly, a 1% increase in return on assets is anticipated to boost environmental disclosure compliance by up to 6.6%, assuming all other factors remain same. Therefore, the study rejects the null hypothesis, which states that there is no significant relationship between firm profitability and corporate environmental disclosure. In other words, there is a significant positive relationship between firm profitability and accounting disclosure

Furthermore, the low probability value of 0.0007 ( $p\text{-value} = <0.05$ ) indicates that the explanatory variable of FSIZE is statistically significant. The variable revealed a positive coefficient of 0.174, indicating that among the sample oil and gas enterprises under study, environmental disclosure increases with firm size. The implication is that the amount of environmental disclosure will rise by roughly 17% for every 1% growth in the firm's size (total assets). Therefore, the study rejects the null hypothesis, which states that there is no significant relationship between firm size and corporate environmental disclosure. In other words, there is a significant positive relationship between firm size and accounting disclosure. According to the results, the variable BIG4 has a probability value of 0.4978 and a negative coefficient of -0.0114, both of which are statistically insignificant. The negative coefficient indicates that businesses inspected by major auditing firms are more likely to reveal fewer environmental disclosure obligations, even though it is not statistically significant. Therefore, the study cannot reject the null hypothesis, which states that there is no significant relationship between audit firm type and corporate environmental disclosure. In other words, there is no significant relationship between audit firm size and environmental accounting disclosure.

On the other hand, the measure of financial constraints (FINCOM) showed a negative coefficient of -0.164 and a low probability value of 0.0000, which means that the result is statistically significant at the 1% level of confidence. Thus, a one percent increase in the degree of firms' financial constraints is associated with about a 16.4% decrease in the level of environmental disclosure quality, all things being equal. Therefore, the study cannot reject the null hypothesis, which states that financial constraints have no significant relationship with environmental accounting disclosures by oil and gas companies in Nigeria. In other words, there is a significant negative relationship between financial constraint and environmental accounting disclosure.

Based on the outcome of the results, the outcome of the first hypothesis showed that the variable of leverage (LEV) has no significant relationship with corporate environmental disclosure. This is due to the high probability value of 0.237, which is greater than 5%. However, the implication of the positive coefficient is that highly leveraged oil and gas firms may be associated with greater environmental disclosures. This result negates the apriori expectation of the study. The expectation of the study, in line with Cormier and Magnan (2002) and Brammer and Pavelin (2006), is that the burden of debt financing is likely to reduce expenditure on environmental issues, with the resultant effect of low corporate environmental disclosure. Empirically, though, the result is not different from those of Maliah et al. (2014), Patrick et al. (2017), and Naser et al. (2006), which reported a positive relationship between environmental disclosure and the firm leverage of companies that operate in polluting sectors. Be that as it may, the result negates those of Ohidoa et al. (2016), Dibia and Onwuchekwu (2015), Prastiwi et al. (2016), and Suleiman et al. (2014), which documented that leverage does not influence the ability of a company to disclose environmental information. The peculiarity of the oil and gas sector sampled in this study may likely be the reason for the lack of convergence in prior studies since their economic activities

are considered highly environmentally unfriendly. Hence, they may likely strive to ensure compliance with environmental practices irrespective of their capital structure.

Further, in the result of the second hypothesis, the study finds a significant positive relationship between profitability and corporate environmental disclosure. This is due to the low probability value of 0.0185 (i.e., 1.85%), which is less than 5%. In essence, what this result suggests is that firm profitability is a strong determinant of firm environmental reporting practices. The result implies that the oil and gas companies' profit performance enhance their engagement in environmental practices and disclosures, and this impact is statistically significant at the five percent level, which leads to the rejection of the second hypothesis. Empirically, while the result tallies with the *a priori* expectation of the study, it appears to negate those of Cormier et al. (2005), Ten (2009), and Dibia (2015), who all found that profitability was not significant in explaining the extent of environmental disclosure in advanced countries. In the Nigerian context, however, the result corroborates those of Aluwong and Inuwa (2019), who equally studied the same oil and gas companies and found that profitability has a significant positive effect on environmental accounting disclosure by oil companies in Nigeria. The possible reason for this disparity between this result and those aforementioned could be because their studies used information ending in 2015 when environmental issues were not yet widespread. Also, their studies used the dummy variable pattern of environmental reporting, while this study used the unweighted content analysis method.

Similarly, the result relating to the third hypothesis showed that a positive relationship exists between firm size and corporate environmental disclosure (ENVD). The positive coefficient is an indication that, when the other variables are held constant, increases in firm size will lead to up to a 17% increase in the level of environmental disclosure. Theoretically, the result supports the schools of thought (e.g., Burgwal & Vieira, 2014), which hold that larger companies are more exposed and conspicuous and are more receptive to sharing environmental information in order to appease their large stakeholders, protect their reputation, and avoid regulatory penalties. Empirically, the result is consistent with the findings of Nawaiseh (2015), Dibia and Onwuchekwu (2015), and Lin and Qamruzzaman (2023), which all found a positive relationship between firm size and corporate environmental disclosure in Sri Lanka, Nigeria, and Bangladesh, respectively. It, however, negates those of Gatimbu and Wabwine (2016), who found a negative association between firm size and environmental disclosure. This disparity could be attributed to country-specific factors and different environmental laws in different countries.

Conversely, the result relating to the fourth hypothesis revealed that the variable of audit firm size (BIG4) possesses a negative coefficient, but the large p-value of 0.498 ( $< 0.05$ ) implies that such negative impact is not noteworthy. Following this outcome, the  $H_{04}$  cannot be rejected. This outcome negated the *a priori* expectation of this study, which expected the engagement of the Big 4 auditor type to influence extensive corporate environmental disclosure. However, researchers like Nawaiseh (2015) suggest that the audit firm size's reputation theory likely holds in a strong legal environment, with high investor protection rights and disclosure standards. Thus, considering the poor and weak institutional quality that characterises the Nigerian environment, the implication is that audit firm reputation may not likely substitute for a strong legal and regulatory framework in relation to environmental practices and reporting. Empirically, the result contradicts that of Fatima (2014), which examined the determinants of environmental reporting quality in Malaysia and found that the quality of external audit (audit firm type) enhances environmental disclosures. However, the result is similar to those of Dibia and Onwuchekwa (2015) and Aluwong and Inuwa (2019), which explored the determinants of environmental disclosures in Nigerian oil and gas companies and found that audit firm type did not exhibit significant relationships with such disclosures.

On the result relating to financial constraints, in relation to the sixth hypothesis, the study found that the measure of financial constraints (FINCOM) possesses a negative coefficient with a small p-value of 0.000, which is significant at the 1% level of confidence. This led to the rejection of  $H_{o6}$ , which implies that there is a significant negative relationship between financial constraint and environmental accounting disclosure. Following Schauer et al. (2019)'s interpretation of the Hadlock-Pierce (SA) Index of financial constraints, as developed by Hadlock and Pierce (2010), firms with higher SA Index values are considered to be more financially constrained. Therefore, the implication of this finding is that oil and gas firms that are highly financially constrained are associated with a lower degree of environmental disclosure. This outcome corroborates the a priori expectation of this study, which projected that financially constrained firms often have limited access to external capital, which can hinder their ability to invest in environmental initiatives and reporting systems. In relating this result with those of the prior study, it can be seen that it corroborates those of Meng et al. (2023) and Yao et al. (2019), which showed that financial constraint results in less comprehensive environmental disclosures. However, the additional analysis of the former revealed that improving environmental disclosures could significantly alleviate the financing constraints of enterprises, and such a mitigation effect is more pronounced in highly polluting firms, such as oil and gas companies.

## 5. Conclusion

Environmental disclosure could be a strategy within environmental management to communicate with stakeholders. Additionally, environmental disclosure could be frequently synonymous with corporate social responsibility reporting. Aligned with the overarching objective of the study, which is to investigate the determinants of environmental disclosure in Nigerian oil and gas companies, comprehensive analyses have been conducted and found that leverage, firm size, profitability, audit firm type and financial constraint have no significant relationship with environmental accounting disclosure by oil and gas companies in Nigeria. However, improving environmental disclosures could significantly alleviate the financing constraints of enterprises, and such a mitigation effect is more pronounced in highly polluting firms, such as oil and gas companies. The study proposes the implementation of incentives to encourage disclosures. For instance, in many developed economies, environmental disclosures have been included as a prerequisite for stock exchange listing.

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