TSU-International Journal of Accounting and Finance (TSUIJAF)
e-ISSN: 28811-2709, p-ISSN: 28811-2695.Volume 4, Issue 2 (June, 2025).

EFFECT OF BOARD ATTRIBUTES ON ENVIRONMENTAL RISK DISCLOSURE AMONG LISTED OIL AND GAS COMPANIES IN NIGERIA

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The study examines the effect of board attributes on environmental risk disclosure (ERD) among listed oil and gas companies in Nigeria. Using a panel dataset and employing the Generalized Method of Moments (GMM) estimation technique, the study investigates the influence of board independence and board gender diversity on ERD. The findings reveal that prior environmental disclosures significantly impact current reporting practices, indicating a path-dependent approach to sustainability reporting. However, board independence demonstrates a negative but statistically insignificant relationship with ERD, suggesting that independent directors may not be effectively influencing environmental disclosure decisions in the sector. In contrast, board gender diversity exhibits a positive but insignificant association with ERD, implying that while gender-diverse boards may support enhanced transparency, their influence on disclosure levels remains limited. The study highlights the need for stronger regulatory enforcement and corporate governance mechanisms to improve environmental risk transparency. It recommends strengthening disclosure regulations, increasing the effectiveness of independent directors, promoting gender diversity in strategic decision-making roles, encouraging voluntary sustainability reporting, and fostering stakeholder engagement. These measures will enhance the environmental accountability of oil and gas firms, align corporate governance with global best practices, and improve investor confidence in the sector's sustainability efforts.

Keywords: Environmental Risk Disclosure, Board Independence, Gender Diversity.

Introduction

Environmental risk disclosure is a key component of corporate transparency, especially in industries with significant environmental impacts such as the oil and gas industry. In Nigeria, where the oil and gas industry contribute significantly to the economy, concerns about environmental degradation, regulatory compliance, and corporate governance are growing. Despite various regulatory frameworks, including the Nigerian Securities Exchange (NSE) Sustainability Disclosure Guidelines and the Petroleum Industry Act (PIA) of 2021 (PIA), many listed oil and gas companies still demonstrate varying levels of transparency in environmental risk disclosure (Olayemi and Folarin, 2023). A key challenge facing disclosure rules is the role of corporate governance, particularly board characteristics, in influencing disclosure practices. Board characteristics such as board independence and gender diversity have been identified as determinants of corporate disclosure behavior (Okoro & Udo, 2021; Yusuf & Ibrahim, 2022). However, the extent to which these features improve environmental transparency remains controversial, especially in developing economies such as Nigeria where institutional frameworks and implementation mechanisms are weak (Rabiu et al., 2023).

A key challenge is that despite the high environmental risks associated with oil and gas companies' operations, environmental disclosure levels vary. While some companies provide comprehensive reports based on global standards such as the Global Reporting Initiative (GRI) and the Task Force on Climate-related Financial Disclosures (TCFD), others provide limited information, possibly due to weak regulatory enforcement or ineffective boards (Schiemann and Tietmeyer, 2024). The lack of uniformity in disclosure raises concerns about the effectiveness of accountability and corporate governance structures in promoting environmental responsibility (Owolabi and Adeola, 2021). Furthermore, the impact of board independence on RDE remains uncertain. While some studies claim that independent directors increase transparency through their oversight role (Nguyen et al., 2022), others argue that their impact is minimal due to the dominance of directors and political affiliations on Nigerian boards (Odumilam and Okafor, 2018). Similarly, the role of gender diversity in environmental disclosure has also attracted academic attention, with mixed results on whether female directors pay more attention to environmental issues in board discussions (Olanrewaju & Adeyemi, 2023; Zhang et al., 2022).

Another major issue is pressure from stakeholders such as investors, regulators, and environmental advocates to disclose environmental risks in greater detail. In the face of growing global concerns about climate change, Nigerian oil and gas companies are facing increasing scrutiny from domestic and foreign investors, who are demanding that companies achieve sustainable development and assume environmental responsibility (Wahyudi and Mayasari , 2023). However, the lack of mandatory disclosure requirements limits compliance, making board characteristics a key endogenous factor in determining the level of disclosure (Salawu et al., 2021). Furthermore, previous studies on sustainable economic development in Nigeria have focused primarily on the impact on financial performance (Paul et al., 2019; Obi et al., 2021) and have paid less attention to board governance mechanisms. There is a lack of research to understand how board characteristics directly influence the depth and quality of environmental disclosure, particularly for oil and gas companies operating in high-risk environmental environments such as the Niger Delta (Olamide and Ijeoma, 2023).

In light of these issues, this study aims to explore the relationship between board independence, board gender diversity, and environmental risk disclosure among listed oil and gas companies in Nigeria. The study provides answers for the following research questions: What is the impact of board independence on the level of environmental risk disclosure in listed oil and gas firms in Nigeria? and To what extent does board gender diversity influence environmental risk disclosure in listed oil and gas companies in Nigeria? To achieved that, these hypotheses were tested: **H_o1**: Board independence has no significant influence on environmental risk disclosure in listed oil and gas companies in Nigeria. **H_o2:** Board gender diversity has no significant effect on environmental risk disclosure in listed oil and gas companies in Nigeria.

Literature Review

Concept of Environmental Risk Disclosure

Clarkson et al. (2008) define Environmental Risk Disclosure (ERD) as the extent to which firms provide quantitative and qualitative information regarding their environmental risks, liabilities, and impact on natural resources, including mitigation strategies in their annual and sustainability reports. Deegan (2014) describes ERD as a voluntary or mandatory practice where companies disclose environmental risks, policies, and performance indicators to meet regulatory requirements, stakeholder expectations, and corporate governance standards. Similarly, Freedman and Jaggi (2015) view ERD as the process by which organizations communicate their environmental obligations, potential liabilities, and sustainability initiatives in financial and non-financial reports to enhance transparency and accountability.

Michelon, Pilonato, and Ricceri (2015) state that ERD refers to a company's strategic disclosure of information concerning its environmental footprint, risk exposure, compliance with environmental regulations, and initiatives to mitigate negative ecological effects. Luo, Lan, and Tang (2019) define ERD as the extent to which firms provide information about environmental risks and policies, including carbon emissions, waste management, and sustainability measures, to enhance corporate legitimacy and stakeholder trust. Hahn and Kühnen (2013) argue that environmental risk disclosure is a key aspect of corporate social responsibility reporting, where companies outline potential ecological hazards, regulatory compliance, and mitigation efforts to safeguard against environmental damage.

Wahyudi and Mayasari (2023) describe ERD as the degree to which corporations in environmentally sensitive industries, such as oil and gas, disclose information about their environmental risks, regulatory compliance, and sustainability efforts in financial statements and corporate social responsibility reports. Schiemann and Tietmeyer (2024) define ERD as a reporting mechanism that ensures firms disclose their environmental risk exposure, mitigation plans, and compliance with international and national sustainability frameworks, affecting investor confidence and corporate reputation. Verrecchia (1983) considers ERD from a signaling perspective, stating that companies strategically disclose environmental risks to differentiate themselves from competitors and enhance market perceptions regarding sustainability and long-term viability. Lastly, Rahman and Ali (2021) define ERD as the process by which firms communicate environmental uncertainties, liabilities, and regulatory adherence to investors, regulators, and other stakeholders to promote transparency and informed decision-making.

Board Attributes

Board characteristics are the attributes of a company's board of directors. These attributes include board size, degree of independence, frequency of meetings, financial expertise, gender, ethnicity, and other forms of diversity. The effectiveness of consultation sometimes depends on these attributes (Buchita-Martinez & Gallego-Alvarez, 2019). An effective board oversees the affairs of the entity with an independent stance (Beazley, 1996). Section 2 of the Nigerian Corporate Governance Code of 2018 stipulates that a board of directors shall consist of a sufficient number of members with an appropriate balance in terms of diversity, knowledge, skills, experience, and independence. The guidelines recommend that board members be diverse in terms of age, skills, experience, areas of knowledge, gender, and culture. Section 10 of the Code recommends that board members meet at least once a quarter.

Board Independence

Independence in corporate governance is essential for robust oversight and accountability within a firm. As noted by Amahalo and Osunwa (2023), an independent director is defined as someone who does not have any significant financial or material ties to the company or its affiliates beyond receiving attendance or sitting fees. This definition is in line with international guidelines, such as those provided by the Organisation for Economic Co-operation and Development (OECD, 2015), which stress that independent board members must remain free from any relationships or situations that could compromise their objective judgment. Moreover, Solomon (2020) points out that independent directors are expected to offer unbiased insights during board discussions, particularly on issues related to financial reporting, executive compensation, and audit oversight. Because they are not involved in day-to-day management, they serve primarily as monitors rather than as operational participants. In a similar vein, Uwuigbe et al. (2021) argue that independent directors are pivotal in promoting transparency and curbing managerial opportunism, especially in industries facing significant environmental and financial risks, such as oil and gas.

In the Nigerian setting, the Corporate Governance Code issued by the Financial Reporting Council of Nigeria (FRCN, 2018) requires that independent directors be free from any relationships that could affect their impartial judgment and mandates that they must not have served in any executive role within the company for the past five years. This criterion highlights that independence involves more than just a lack of employment ties; it also requires a historical detachment from managerial roles and key stakeholders. Thus, board independence extends beyond merely being non-employed by the firm—it ensures impartial participation in governance decisions, which is crucial for maintaining credibility in disclosures, including those related to environmental risks and sustainability issues (Olayiwola & Olarewaju, 2021; Olatunji & Chukwu, 2023). Independent directors are therefore instrumental in building stakeholder trust and enhancing the firm's legitimacy among regulators, investors, and the wider public.

Gender Diversity

Diversity recognizes the uniqueness of every individual by acknowledging their distinct differences, which can encompass factors such as race, ethnicity, gender, sexual orientation, socioeconomic background, age, physical ability, religious beliefs, political views, or other ideologies. The measure of gender diversity on a board is determined by the proportion of women present (Mbono & Amahalu, 2021b). This concept refers to the fair or equal representation of various genders, typically manifesting as a balanced ratio between men and women. In the workplace, gender diversity implies that men, women, and individuals of other genders are employed in roughly equal and consistent proportions. This balance is vital for board effectiveness and, by extension, has a positive influence on overall company performance (Amahalu & Osonwa, 2023). Furthermore, advancements in gender equality have demonstrated broad impacts on sustainable development ranging from reductions in poverty, hunger, and carbon emissions to enhancements in the health, well-being, and education of families, communities, and nations.

Empirical Review

Board Independence and Environmental Risk Disclosure

Ibrahim and Ismail (2022) investigated how board independence influences environmental risk disclosure practices among Nigerian oil and gas companies between 2015 and 2020. Their analysis revealed a positive link between board independence and the extent of environmental disclosure, suggesting that independent directors, who are less entangled in conflicts of interest, can encourage management to be more forthcoming about environmental risks—especially in sectors facing intense regulatory and public scrutiny. They argue that a higher presence of independent directors tends to promote a focus on long-term sustainability and shareholder value, which is associated with more transparent environmental reporting. However, they also acknowledge that factors such as the regulatory environment or corporate culture might also significantly shape sustainability practices.

Similarly, Olanrewaju and Adeyemi (2023) examined the effect of board independence on environmental risk disclosure in Nigeria's oil and gas industry from 2016 to 2021. Their findings indicate that companies with a larger proportion of independent directors tend to provide more detailed disclosures about environmental risks, particularly those associated with pollution and climate change. They suggest that independent committees add an extra layer of oversight to ensure that environmental issues are adequately addressed. Nonetheless, their research also points out that the effectiveness of board independence might be influenced by other governance elements, such as the existence of an environmental committee or a firm's commitment to corporate social responsibility.

In contrast, Eze and Nwankwo (2022) studied listed Nigerian companies, including those in the oil and gas sector, and found that although board independence was positively linked to environmental risk disclosure, the magnitude of this effect was weaker than anticipated. They emphasize that merely having independent directors on the board does not automatically lead to more thorough environmental reporting. Their research suggests that when ownership is concentrated among a few large shareholders, the influence of independent directors can be undermined, as these major shareholders may sway board decisions on environmental disclosures. This observation points to a potential research gap, highlighting that ownership structure may also play a crucial role in determining the quality of environmental reporting.

Okoro and Udo (2021) analyzed the relationship between board independence and environmental risk disclosure among Nigerian oil and gas companies from 2017 to 2022. Their study found that boards with a higher degree of independence are generally more transparent in their environmental reporting, particularly regarding environmental responsibilities and risk management strategies. They attribute this enhanced transparency to the increased sense of control and accountability that independent directors bring to board discussions. However, they also noted that the Nigerian regulatory framework has been criticized for its lack of clarity regarding environmental disclosure requirements, which might limit the potential impact of board independence on ensuring full disclosure.

Ibrahim and Ismail (2022) further assessed the impact of board independence on environmental risk disclosure by analyzing panel data from 10 listed oil and gas companies over the 2015–2020 period. Their regression analysis confirmed a significant positive relationship between the proportion of independent directors and the level of environmental disclosure. They argued that independent directors help boost transparency, prompting companies to release more detailed information on environmental risks like pollution and resource depletion. Although this study offers important insights into the role of independent directors in enhancing environmental reporting, it also raises concerns regarding the generalizability of the results, as focusing solely on public sustainability reports might introduce publication bias. Expanding the analysis to include other data sources or third-party audits could provide a more comprehensive understanding of the influence of board independence on environmental risk disclosure.

In another study by Olanrewaju and Adeyemi (2023), the researchers examined various corporate governance mechanisms, including board independence, and their effects on environmental risk disclosure in the Nigerian oil and gas industry from 2016 to 2021. Employing a mixed-methods approach that combined quantitative regression analysis of SDGs with qualitative content analysis, they found that board independence significantly enhances both the quality and quantity of environmental information disclosed. They concluded that independent directors contribute to more accurate and transparent environmental risk reports. However, one limitation noted was the inherent subjectivity of content analysis, as sustainability reports can be biased toward corporate interests. Additionally, the study did not account for other potentially influential governance factors, such as board gender diversity or the existence of an environmental committee. Future research could benefit from exploring how these various governance elements interact to influence environmental risk disclosure.

Board Gender Diversity and Environmental Risk Disclosure

Gudawska (2024) analyzed changes in both the quantity and specificity of environmental risk factor information in 10-K reports from US energy companies over the period 2017–2021. Using content analysis, a specificity index, the Wilcoxon rank sum test, and the Pearson correlation coefficient on 210 reports, the study found that beginning with the 2019 reports, the volume of environmental risk disclosure increased markedly compared to the previous year. By 2021, the reports featured, on average, 31% more content (measured in word count) than those from 2017, driven primarily by an uptick in climate-related risk disclosures. Despite this increase in volume, the level of detail in these disclosures did not improve significantly, and boilerplate language continued to be commonly used.

French (2024) investigated the influence of board characteristics on how sustainability reports are received by industrial product companies in Nigeria. The study, which employed a post hoc factorial research design and analyzed data from 13 companies over an eight-year period (2015–2022) using the least squares method, revealed that while board nationality did not significantly affect responses to sustainability reports, the education level of board directors had a positive and significant impact. In addition, panel regression analysis showed that board gender did not significantly influence these responses. The findings underscore the importance of effective board composition including considerations of nationality, ethnicity, and gender for enhancing the quality of sustainability reporting.

Obiomu and Okwi (2024) examined the effects of board size and independence on wastewater disclosure among listed oil and gas companies in Nigeria and Ghana over a 12-year span from 2012 to 2023. Drawing data from the annual reports and accounts of 12 companies and utilizing a post hoc research design with Pearson's correlation coefficient and least squares regression analysis, their findings indicated that board size had a significant negative impact on wastewater disclosure (β_1 = -0.016095; p-value < 0.05). Conversely, board independence was found to have a significant positive effect on outflow disclosure (β_1 = 0.037481; p-value not fully specified in the text).

Issa and Ananzeh (2023) assessed how board composition, with an emphasis on gender diversity, affects sustainable development reporting in Jordan over the period 2016–2021. Their analysis, based on panel data and generalized least squares (OLS) regression using a sample of 50 companies, showed that greater board diversity is linked to improved environmental risk disclosure, with female directors emerging as strong proponents of transparency. Nonetheless, the small sample size and potential cultural differences suggest that these findings should be generalized with caution.

Hussein et al. (2022) explored the role of gender diversity on environmental risk disclosure within the Malaysian oil and gas industry from 2015 to 2020. Employing a mixed-method approach that combined regression analysis of company data with stakeholder interviews, they found that companies with more diverse boards are more likely to comply with environmental reporting regulations and engage stakeholders on sustainability issues. Despite these strengths, the study's emphasis on regulatory compliance may not fully capture the complexities of voluntary environmental disclosure practices, particularly in less regulated environments such as Nigeria.

Theoretical Framework

The theoretical foundation of this study is rooted in Voluntary Disclosure Theory.

Voluntary Disclosure Theory: Voluntary disclosure theory, originally introduced by Verrecchia (1983), explains why firms choose to disclose information beyond what is legally required. The theory suggests that companies voluntarily provide additional information to minimize information asymmetry between management and stakeholders, strengthen market confidence, and sustain a competitive edge. While mandatory disclosure ensures adherence to regulatory requirements, voluntary disclosure demonstrates an organization's commitment to transparency and trust-building. The theory assumes that disclosed information should remain uninfluenced by external factors and should be presented in its original form to offer an accurate representation of events (Day, 1985). Scholars such as Chen and Robert (2010) describe voluntary disclosure as the dissemination of non-financial information—including ethical, environmental, and social aspects by organizations to both internal and external stakeholders without any legal compulsion.

According to Verrecchia (1983), firms weigh the benefits and costs of disclosing additional information. The key advantage of voluntary disclosure is the reduction of uncertainty surrounding a firm's activities, which helps attract investors, enhance stakeholder confidence, and potentially lower capital costs. However, there are associated costs, such as the risk of competitors gaining insights from disclosed information and the expenses involved in compiling and presenting detailed reports. Within the context of environmental risk disclosure, voluntary disclosure theory provides a useful perspective for understanding why industries like oil and gas, which face significant environmental scrutiny, engage in proactive reporting. Issues such as oil spills, gas flaring, and pollution draw regulatory and public attention. By voluntarily disclosing environmental risks and sustainability measures, firms can demonstrate accountability and improve their corporate image, even in the absence of strict regulations.

The theory is particularly applicable to Nigeria's oil and gas sector, where environmental degradation and community concerns are major challenges. Companies operating in this industry encounter significant pressure to provide information regarding their environmental impact and risk mitigation strategies. Research by Hassan and Kouhy (2022) indicates that firms that disclose environmental risks voluntarily are perceived as more socially responsible, leading to better stakeholder relationships and a reduction in potential conflicts.

Several board-related factors influence the extent of voluntary disclosure, including environmental risk reporting. For example, board size can shape the breadth of perspectives in decision-making, leading to greater transparency. Studies such as Akbas (2021) suggest that larger boards are more likely to encourage voluntary disclosure due to their ability to leverage diverse expertise and address stakeholder concerns effectively.

Another crucial board characteristic is independence, as independent directors are less susceptible to management influence and more likely to advocate for transparency. Additionally, gender diversity on boards has been linked to greater voluntary disclosure. Research by Post et al. (2022) found that boards with gender diversity tend to prioritize corporate social responsibility and sustainability reporting. Other factors such as financial expertise and the frequency of board meetings also contribute to voluntary disclosure. Financially knowledgeable board members are better equipped to assess and communicate complex risk-related information, while frequent meetings allow for discussions on environmental matters, ensuring thorough reporting. Uwuigbe et al. (2023) emphasized that board expertise plays a pivotal role in voluntary disclosure practices, particularly in high-risk industries like oil and gas.

Voluntary disclosure theory establishes the link between governance structures and environmental risk reporting, emphasizing the role of board attributes in shaping disclosure practices. Firms with well-structured governance mechanisms—characterized by independent and diverse boards with relevant expertise—are more likely to disclose information proactively to enhance trust and legitimacy. This proactive stance aligns with stakeholder expectations and strengthens a firm's market position. In Nigeria, the theory offers a strong framework for examining how listed oil and gas firms manage environmental accountability. By voluntarily sharing information on environmental risks, these companies address societal concerns, comply with international sustainability standards, and mitigate reputational risks. The theory's emphasis on reducing information asymmetry and fostering stakeholder trust aligns with the growing global demand for corporate transparency and environmental responsibility in the oil and gas sector.

Voluntary disclosure theory also posits that firms that disclose information voluntarily are inherently ethical, which can enhance their reputation and financial performance (Day, 1985). According to Onipe (2018), firms committed to sustainability willingly share information about their sustainability initiatives, as doing so is both ethically sound and beneficial for their corporate image. The failure to disclose relevant information voluntarily may be perceived negatively by market participants, potentially leading to a decline in the firm's asset value. Stakeholders generally favor voluntary disclosure over mandatory disclosure, as the latter is often seen as a regulatory obligation rather than a commitment to transparency.

However, voluntary disclosure has its limitations. Since the disclosure of such information is not legally required, firms may choose to withhold certain details, particularly those that could be unfavorable. This selective reporting can be influenced by the interests of specific stakeholder groups that hold significant sway over the company. Furthermore, the costs associated with voluntary disclosure can be burdensome for firms, leading some to omit information that might be critical for stakeholders. Additionally, concerns about regulatory scrutiny may deter firms from freely sharing information, as disclosed details could be used against them by regulators. Carpenter et al. (2004) highlight that the fear of legal consequences often discourages firms from voluntary disclosure, as certain disclosures might lead to litigation, especially if they negatively impact specific stakeholder groups.

The relevance of this theory to the study is evident, as Environmental, Social, and Governance (ESG) criteria represent a form of voluntary disclosure. ESG frameworks are designed to provide additional information beyond mandatory financial disclosures. The primary objective of voluntary disclosure is to reduce information asymmetry, which aligns with the goals of ESG reporting. Furthermore, the relationship between voluntary disclosure theory and board characteristics is significant, as board members play a crucial role in overseeing management's ESG initiatives. The presence of independent and competent board members ensures that ESG disclosures align with best practices and stakeholder expectations, thereby enhancing corporate accountability and long-term sustainability.

Methodology

This research utilized an ex-post facto design, deemed appropriate for analyzing secondary data obtained from the annual financial reports and accounts of Nigeria's listed oil and gas companies. The study's target population consisted of all listed oil and gas firms in the country. A census sampling method was applied to select the companies, and data were gathered from secondary sources. Specifically, information was extracted from the annual reports and accounts available in the Nigerian Exchange Group fact book and other pertinent sources, covering a ten-year period (2014 to 2023). For data analysis, the Generalized Method of Moments (GMM) was employed to investigate the relationship between each independent variable and the dependent variable.

For the study a model is specified and estimated.

$ERD = f(BIND, BGDV)$ -- i

$ERD_{it} = \beta + \beta_1 ERD_{it-1} + \beta_2 BSIZE_{it} + \beta_3 BIND_{it} + \beta_4 BGDV_{it} + \varepsilon_{it}$ ---------------------------------ii

Where:

ERQ = Environmental Reporting Quality

BIND = Board Independence

BGDV = Board Gender Diversity

β = Constant

$\beta 0$ = Coefficient of the parameter estimate.

ε = Error term of company

it = Company i in time t

Table 3.1 Variables Measurement

Variables	Definition/Measurements	Source
Environmental Risk Disclosure (ERD)	Disclosure index using GRI checklist	Stefan, Georgeta and Diana (2015)
Board Independence (BIND)	Percentage of independent directors on the board	Kamaludin et al. (2022); Wasiuzzaman et al. (2022) and Wasiuzzaman and Wan Mohammad (2020)
Board Gender Diversity	Proportion of female members to total number of Board members	Uwuigbe et al., (2019), Akintayo and Salman (2018)

Source: Researcher, 2025

Results and Discussion of Findings

This section presents the results obtained from the analysis of descriptive statistics and multiple regression analysis. The discussion commences with an examination of the descriptive statistics, which is a measure of centrality and dispersion. Subsequently, the verification and reporting of regression assumptions are discussed.

Table 3

Descriptive Statistics

	Mean	Max	Min	Std.Dev.	Skew	Kurt	Obs
ERD	0.265756	0.752000	0.178922	0.116870	2.406867	7.977213	100
BIND	0.631879	0.916667	0.375000	0.090275	0.076735	3.235600	100
BGDVT	0.174834	0.444444	0.071429	0.085353	0.930694	3.156975	100

Source: *Eviews Output, 2025*

Table 3 summarizes the key descriptive statistics for the main variables in this study, which investigates how board characteristics affect environmental risk disclosure among Nigeria's listed oil and gas companies. On average, firms disclose about 26.6% of environmental risks (mean ERD = 0.2658). While some companies exhibit high disclosure levels (maximum = 0.7520), others reveal very little (minimum = 0.1789). The moderate standard deviation of 0.1169 indicates some variability among companies, and the right-skewed distribution (skewness = 2.4069) shows that most companies have lower disclosure scores, with a few reporting substantially higher values. A kurtosis of 7.9772 suggests a leptokurtic distribution, meaning the data are highly peaked with more extreme values than a normal distribution.

For the Board Independence Index (BIND), the average value is 0.6319, implying that about 63.2% of board members are independent on average. Some firms score as high as 0.9167, while others score as low as 0.3750. A relatively small standard deviation of 0.0903 indicates limited variation in board independence, and the near-zero skewness (0.0767) along with a kurtosis of 3.2356 suggests that the data are fairly normally distributed.

Regarding board gender diversity (BGDVT), the average value is 0.1748, meaning that roughly 17.5% of board members are women. The maximum value of 0.4444 and the minimum value of 0.0714 highlight the range of female representation across companies. With a standard deviation of 0.0854, there is moderate variability in gender diversity. The moderately right-skewed distribution (skewness = 0.9307) indicates that most companies have lower levels of gender diversity, and a kurtosis of 3.1570 shows that the distribution is close to normal.

Table 4

Matrix of Correlations

Correlation t-Statistic Probability	ERD	BIND	BGDVT
BIND	-0.278420 -4.078995 0.0001		
BGDVT	0.458444 7.258599 0.0000	-0.098855 -1.397866 0.1637	

Source: Eviews Output, 2025

Table 4 presents a correlation matrix that investigates the relationships among environmental risk disclosure (ERD), board independence (BIND), and board gender diversity (BGDVT). A correlation of –0.2784 between ERD and BIND implies that as the proportion of independent directors increases, environmental risk disclosure tends to decrease. This inverse relationship is statistically significant (t = –4.0790, p = 0.0001), suggesting that, unexpectedly, a higher presence of independent directors does not correspond to more comprehensive disclosure of environmental risks. This outcome could be due to factors like weak enforcement mechanisms, regulatory gaps, or concerns about reputational risk influencing disclosure practices.

In contrast, the correlation between ERD and BGDVT is 0.4584, indicating a positive and relatively strong association. This means that companies with greater female representation on their boards are more likely to provide detailed environmental risk disclosures. This relationship is also statistically significant (t = 7.2586, p = 0.0000), supporting previous research that suggests diverse boards enhance transparency and sustainability reporting by emphasizing ethical decision-making and stakeholder interests.

Lastly, the relationship between board independence and gender diversity, with a correlation of –0.0989, is weak and not statistically significant (t = –1.3979, p = 0.1637). This indicates there is no strong evidence that the proportion of independent directors is associated with board gender diversity among the companies sampled, which may be because female appointments are driven more by diversity or regulatory compliance considerations rather than by their independent status.

Table 5

Regression Analysis

Dependent Variable: ERD				
Method: Panel Generalized Method of Moments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ERD(-1)	0.435779	0.160156	2.720969	0.0236
BIND	-0.736416	0.570225	-1.291448	0.2287
BGDVT	0.415945	0.227322	1.829761	0.1005
Root MSE	0.098570	Mean dependent var		-0.013088
S.D. dependent var	0.075286	S.E. of regression		0.099402
Sum squared resid	1.748888	J-statistic		6.996762
Instrument rank	10	Prob(J-statistic)		0.429217

Source: Eviews Output, 2025

Table 5 details the findings from the panel GMM regression analysis that investigates how board characteristics influence environmental risk disclosure (ERD) among Nigeria's listed oil and gas companies. In this model, ERD serves as the dependent variable, with board independence (BIND) and board gender diversity (BGDVT) as key independent variables, and ERD(-1) included to account for prior disclosure behavior. The lagged variable, ERD(-1), has a coefficient of 0.4358 ($p = 0.0236$), which is statistically significant at the 5% level. This positive coefficient indicates that firms with a history of environmental risk disclosure are likely to continue this practice, highlighting a pattern of consistent reporting over time.

In contrast, the coefficient for board independence (BIND) is -0.7364; however, it is not statistically significant ($p = 0.2287$). Despite a negative correlation observed in earlier analysis, this result suggests that an increased proportion of independent directors does not have a meaningful impact on environmental risk disclosure in these firms. This lack of significance might be due to regulatory weaknesses, inadequate enforcement, or a stronger focus on financial metrics rather than sustainability issues within the sector. Board gender diversity (BGDVT) shows a positive coefficient of 0.4159, suggesting that a higher representation of women on boards is associated with more extensive environmental risk disclosure. Although this relationship approaches significance at the 10% level ($p = 0.1005$), it is not robust enough to be conclusive. This marginal significance implies that while gender diversity could encourage a focus on sustainability, other elements—such as corporate culture, regulatory pressures, or management incentives—may also be at play.

The model's overall validity is supported by a J-statistic of 6.9968 ($p = 0.4292$), which indicates that the instruments used in the GMM estimation are appropriate. Additionally, the Root Mean Squared Error (0.0986) and the Standard Error of Regression (0.0994) suggest a reasonable model fit. The analysis reveals that historical disclosure practices are a significant predictor of current environmental risk disclosure. However, neither board independence nor board gender diversity have a conclusively strong effect on disclosure levels, although gender diversity shows a positive trend. This indicates that while past behavior is a reliable indicator of current practices, other board attributes alone may not sufficiently drive transparency in environmental reporting within Nigeria's oil and gas sector.

Discussion of Findings

The study investigated how board characteristics affect environmental risk disclosure among Nigeria's listed oil and gas companies. The findings indicate that firms with a history of environmental risk reporting tend to maintain or even enhance their transparency over time, as evidenced by a positive and significant impact of past disclosure practices on current reporting. However, the analysis found a negative relationship between board independence and resource allocation efficiency that was not statistically significant, suggesting that having more independent directors does not markedly influence the extent of environmental risk disclosure. Likewise, although there is a positive association between board gender diversity and resource allocation efficiency, this effect was also not statistically significant, implying that simply increasing the number of women on boards does not necessarily boost environmental risk disclosure.

These results are in line with recent studies conducted in Nigeria. For example, Issa et al. (2021) observed that both board independence and gender diversity had a significantly positive effect on the quality of environmental disclosures, while Mbono and Okwi (2023) reported that greater board gender diversity positively influenced environmental sustainability reporting. The discrepancy between these studies and the current findings regarding the non-significance of board independence and gender diversity could be attributed to unique contextual factors within the Nigerian oil and gas sector, such as challenges in regulatory enforcement, prevailing cultural dynamics, and an emphasis on financial performance over sustainability issues.

Conclusion and Recommendations

This study investigated how board characteristics influence environmental risk disclosure (ERD) among publicly traded oil and gas companies in Nigeria. The findings indicate that previous disclosure practices significantly shape current reporting, demonstrating a sustained organizational commitment to sustainability. In contrast, board independence was found to have a negative yet statistically insignificant effect on ERD, implying that independent directors might not be significantly driving environmental disclosure decisions in this sector. Similarly, while board gender diversity showed a positive association with ERD, its effect was not statistically significant, suggesting that although a gender-diverse board might foster better transparency, it does not necessarily result in enhanced environmental disclosure.

Recommendations

Regulatory bodies such as the Financial Reporting Council of Nigeria (FRCN) and the Securities and Exchange Commission (SEC) should enforce stricter disclosure requirements for environmental risk reporting to ensure compliance among listed oil and gas companies.

Companies should adopt policies that promote the active involvement of independent directors in sustainability-related discussions, ensuring that they contribute meaningfully to environmental disclosure decisions.

While gender diversity alone may not significantly impact ERD, efforts should be made to empower female directors with training and strategic roles in corporate sustainability governance to enhance their influence.

Beyond mandatory disclosures, companies should be encouraged to adopt global best practices in sustainability reporting, such as the Global Reporting Initiative (GRI) standards, to enhance transparency and stakeholder trust.

Companies should engage investors, regulators, and environmental advocacy groups in discussions on improving environmental risk disclosures, ensuring that corporate sustainability practices align with global trends and expectations.

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