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Impact of Corporate Governance on Sustainable Management Practices: "A Strategy for Achieving Long-Term Success". Evidence from Selected Cement Manufacturing Companies in Nigeria (2015-2025)

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Abstract: This study examined the impact of corporate governance on sustainable management practices of cement manufacturing companies in Nigeria. Specifically, it assessed the influence of board independence, audit committee effectiveness, and gender diversity on sustainable management. An ex post facto research design was adopted, using a population of three listed cement firms, from which a sample of two firms, Dangote Cement Plc and Lafarge Africa Plc, was selected through purposive sampling. Secondary data were obtained from audited annual reports and sustainability disclosures for the period 2015 - 2025. Descriptive statistics and panel regression analysis were employed, with the Hausman specification test supporting the use of the random effects model for hypothesis testing. The findings revealed that: board independence has a significant negative effect on sustainable management; audit committee effectiveness has a significant negative effect on sustainable management; gender diversity has a significant positive effect on sustainable management. In conclusion, governance mechanisms can either constrain or enhance sustainable management depending on how they are structured and utilized within the firm's internal system of decision making and accountability. The study recommended that the board of directors of Dangote Cement Plc and Lafarge Africa Plc should ensure that board independence is not treated only as a compliance requirement but is actively integrated into sustainability decision making processes, by strengthening engagement between non- executive directors and operational sustainability units so that oversight contributes more directly to sustainable management outcomes.

Keywords: Corporate Governance Structures, Sustainable Management, Economic, Environmental and Social Sustainability Indicators.

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1. Introduction

Corporate governance has emerged as one of the contemporary issues in research and academic discourse due to its critical role in promoting effectiveness and efficiency. The internal and external mechanisms of organizations lie in the structures of corporate governance activities. Corporate governance issues are a topical area in the fields of accounting and management as they relate to the structures by which organizational

activities are managed, controlled, and structured for the effective management of organizational resources. The weakness of the internal auditing system and poor governance structures have caused huge financial losses to many entities due to institutional failures and insider dealings among corporate bodies, particularly in the banking and manufacturing sectors [1]. Governance structures of many organizations differ from one institution to another based on different lines of operation in the organizational structure. Nigerian financial and non-financial institutions are divided in are divided into units, sub-units, directorates, and departments/agencies for the government sector or public referred to as Ministries, Departments, and Agencies, otherwise known as MDAs. The governance structure, according to the Organization for Economic Cooperation and Development [2], defines it as a set of laid-down principles, rules, and guidelines that specify the organigram of any organization that comprises a management team. A corporate code of governance ensures accountability, responsiveness, and accurate reporting to the management team on a daily basis through quality financial reporting. Good governance theory develops from a set of principles or policies first introduced by the World Bank in relation to and in assisting developing or third-world countries through the issuance of a corporate governance code. OECD and the Nigerian code of corporate governance are functional in the Nigerian corporate governance ecosystem.

Oriaifoh and Lodikero [3] argued that corporate governance structures are a set of rules, processes, and practices that guide the operations of organizations. These rules define the duties and responsibilities of management and the board of directors of the organization, ensuring that corporate activities are conducted in a transparent and accountable manner. More comprehensively, corporate governance encompasses the processes and structures through which the affairs of an organization are directed and managed with the aim of enhancing long-term stakeholders' value while safeguarding the interests of relevant stakeholders [4]. Corporate governance is designed to protect the company and its stakeholders from managerial opportunism, which, if not properly controlled, may threaten the company's survival. Olayinka [5] asserts that effective corporate governance fosters economic growth and enhances organizational performance. It covers all aspects of the company's operations, including internal control systems, financial reporting processes, and compliance with regulatory requirements.

However, the purpose of corporate governance is not only to achieve effectiveness and efficiency in operations but also to facilitate the implementation of sustainable management. Sustainable management has emerged as one of the strategies for firms seeking long-term survival and competitiveness. For this reason, Poonam [6] asserts that "firms that want to succeed in the long run must practice sustainable management, which aims to maximize profits while minimizing negative impacts on the environment." For firms to practice sustainable management, they must implement protocols that focus on carbon emission control, waste reduction, renewable energy, and water management, among others. For instance, Lafarge Africa Plc introduced an eco-friendly low carbon cement in Nigeria. According to El Dokani [7], the launch of the eco-label brand was a significant milestone in the company's sustainability agenda and commitment to supporting the country's efforts towards its net-zero carbon emissions target by the year 2060.

Corporate governance mechanisms such as board independence, audit committee effectiveness, and gender diversity play a critical role in shaping the effectiveness of governance structures. These mechanisms are expected to enhance transparency, accountability, and responsible decision-making within organizations. In Nigeria, cement manufacturing companies operate in an environment characterized by environmental and social concerns. These challenges raise questions about the effectiveness of these governance mechanisms in promoting sustainable management practices. Despite the theoretical expectations that strong corporate governance should drive sustainability

practices in organizations, empirical evidence remains mixed and inconclusive. While some studies report positive relationships between corporate governance mechanisms and sustainability outcomes, others find negative or non-significant effects. Moreover, most existing studies, such as Oriaifoh & Lodikero [3], Wibisono & Honggowati [8], Okolo et al. [1], Nwankwo, et al. [9] focused primarily on the relationship between corporate governance and sustainability performance using variables such as board size, board composition, and ownership structure without considering other critical governance indicators such as audit effectiveness and gender diversity. It is against this backdrop that this study seeks to fill the gap by examining the impact of corporate governance on sustainable management practices proxied by economic, social, and environmental indicators as a strategy for achieving long-term success in cement manufacturing companies in Nigeria between 2015 and 2025. The specific objectives are to:

1. Assess the impact of board independence on sustainable management practices of cement manufacturing companies in Nigeria.
2. Determine impact of audit committee on sustainable management practices of cement manufacturing companies in Nigeria.
3. Evaluate the impact of gender diversity on sustainable management practices of cement manufacturing companies in Nigeria.

1.1 Research Hypothesis

The following null hypotheses were tested:

H_{O1}: Board independence has no significant impact on sustainable management practices of cement manufacturing companies in Nigeria.

H_{O2}: Audit committee has no significant impact on sustainable management practices of cement manufacturing companies in Nigeria.

H_{O3}: Gender diversity has no significant impact on sustainable management practices of cement manufacturing companies in Nigeria.

1.2 Corporate Governance

Corporate governance has been in existence over the years in the business world. It emerged from the need to address the separation of ownership from control. This split created a demand for mechanisms that promote transparency and accountability. As a result, many organizations have had to strengthen their boards and governance structures. On an international scale, adhering to these codes is crucial for improving financial practices and reporting. Various authors have defined corporate governance as the procedures and processes that guide how companies are managed and directed. For example, Boeva, Zhivkova, and Stoychev [10] describe corporate governance as involving procedures and processes that provide the basis for the management and control of an organization. These procedures empower organizations to be led and overseen by those who are entrusted with that responsibility. In essence, corporate governance encompasses the mechanisms, practices, and relationships that dictate how corporations are directed and controlled, focusing on accountability, fairness, and transparency among all stakeholders [11].

Corporate governance provides a framework for achieving corporate objectives and encompasses various aspects of management, including strategic planning, internal controls, performance monitoring, and corporate disclosure [12]. Claessens and Yurtoglu [13] argue that effective corporate governance systems ensure the alignment of interests between corporate managers and shareholders, particularly in emerging markets where regulatory enforcement may be weak. It includes the internal and external structures designed to minimize agency conflicts and enhance corporate efficiency [14]. Corporate governance is a combination of codes, guidelines, and rules by which the management of a corporate organization bases its operations concerning directing, controlling, monitoring, planning, and organizing organization-based activities. However, the management team, who are usually named by business owners, is controlled and directed strictly using the act of corporate governance. The essence of corporate governance is to

cited strictly using act of corporate governance. The essence of corporate governance is to ensure that companies are directed and managed in a transparent and accountable manner. From the above definitions, corporate governance can be conceptualized as the framework that determines how power is allocated and exercised among key actors particularly the board of directors and management, to ensure effective oversight and control of the organization.

1.3 Sustainable Management

Sustainable management can be conceptualized from the perspective of sustainable development. According to the World Commission on Environment and Development [15], sustainable development is described as development that meets the needs of the present generations without preventing the ability of future generations to meet their own needs. In the corporate context, the present and future generations can be regarded as shareholders and other relevant stakeholders within an organization. The needs of the present and future stakeholders are that firms protect the environment and the society in which the business is located while pursuing profitability. From the foregoing, sustainable management is therefore conceptualized as the "integration of management practices that balance economic, social, and environmental dimensions of a business" [16]. These management practices include the introduction of eco-friendly products, waste reduction practices, energy savings initiatives, and sustainability sourcing strategies, among others. According to Saquib and Zhang [17], cited in Opoku [18], sustainable management involves "key practices or processes that optimise economic, environmental, and social sustainability while meeting consumers' demands in a highly competitive business environment." The adoption of sustainable management practices affords companies the opportunity to become responsible corporate citizens by addressing stakeholders' demands and complying with regulatory requirements while enhancing profitability.

1.4 Board Independence and Sustainable Management.

Board independence is the proportion of independent directors who are not influenced by the relationship with the company or its executives [19]. They are structurally positioned to carry out their oversight functions in order to safeguard the interest of shareholders particularly those who are not involved in the management of the company. According to Ibhawah [20], "independent directors are expected to be objective and loyal to no particular group". Board independence is one of the internal corporate governance mechanisms that determine the extent to which board members can act objectively and impartially in the course of discharging their duties. The primary objective of independent directors is to ensure strict adherence to the company's protocols. Independent directors play significant role in implementing sustainable management practices.

1.5 Audit Committee Effectiveness and Sustainable Management

Audit committee is one of the statutory committees within the corporate structure of an organization. According to Etuk, Ukpong & Emenyi, [21], audit committee is "a subgroup of the company's board of directors responsible for overseeing and ensuring the accuracy, completeness and transparency of financial reporting and internal controls". The presence of an audit committee lends credence to the financial reporting quality of a company. The effectiveness of audit committee largely depends on its attributes as explained by Okeke [22] who asserts that, audit committee attributes consist of independence, financial expertise, size, frequency of meetings among others. These attributes influence the extent to which an audit committee can effectively discharge its responsibilities. Studies have shown that audit committee effectiveness influences sustainable management. For this reason, Tumwebaze, et al. [23] contends that, audit committee effectiveness and internal audit can influence sustainability practices in a company. However, in an era of increasing stakeholder demand for sustainable products, audit committee plays critical role in ensuring that companies implement sustainable

management practices as part of their environmental, social and governance (ESG) requirements.

1.6 Audit Committee Independence

Audit committee independence is one of the characteristics of effective audit committee. It refers to the proportion of the independent non-executive directors who are appointed to serve in the audit committee in a corporate entity. For private companies the Nigerian Code of corporate governance, 2018 section 11.4.3 recommends that members of the audit committee shall be responsible for audit, and shall be non-executive directors, and majority of them shall be independent non-executive directors. This underscores the importance of the role of independent audit committee members in a company. The audit committee is expected to contain a suitable number of members to enable them carry out their oversight responsibilities effectively. According to Bédard et al. [24], as cited in Almarayeh et al. [25], an effective audit committee should have an appropriate size that provides sufficient resources for effective monitoring without becoming excessively large and difficult to manage. Audit Committee expertise is very important in achieving effectiveness in the discharge of their oversight responsibilities. Section 11.4.2 of the Nigerian Codes of Corporate Governance, 2018, recommends that all members of the committee shall be financially literate. It further recommends that at least one of the members shall be a financial expert and knowledgeable in accounting and financial management. This recommendation underscores the importance of the role of audit committee experts especially in matters concerning sustainable management practices. Audit committee meetings can be described as the number times audit committee meets to deliberate on issues concerning sustainability [26]. Although the number of times the audit committee meets does not necessarily matter, but the quality of their decision. Statutorily, audit committee is expected to meet for (4) times in a year to carry out their oversight responsibilities.

1.7 Gender Diversity and Sustainable Management.

Gender diversity refers to the number of women on the board of directorship of a company. According to Madu [27], gender diversity is described as the presence of female directors on the board of a company. The inclusion of women in leadership position has gained global attention due to their perceived roles in decision making. Mushtaq [28] opines that women leaders are perceived to be thorough and can view problems from holistic and inclusive approach. This implies that diverse board of directors are likely to make sustainable decisions. Equally, Wahyu, Vide & Eko, [29] explain that the presence of women on the board of directors of a company is very important in considering environmental, social and governance (ESG) factors. Environmental, social and governance (ESG) factors are part of sustainability practices that firms in all sectors are expected to consider and integrate into their operational activities. Studies have shown that women tend to be more independent in their roles and as a result, demonstrate stronger commitment to sustainability practices. Carter, *et al* in Ilaboye and Ashofoke, [30] affirm that female directors are more independent because they are not part of the "old boys' network" This implies that gender diverse boards do not give room for a pool of old boys whose interests may not align with overall objectives of the company.

1.8 Empirical Review

Bosun-Fakunle, et al. [31] investigated the effect of corporate governance on environmental performance. They examined 27 listed manufacturing companies in Zimbabwe. The relationship between board size, board independence, gender diversity, managerial ownership, institutional ownership, and environmental performance was specifically examined using panel regression analysis to see if they were affected by the environmental performance of the manufacturing companies. According to the study, board size, gender diversity, and managerial ownership had a significant positive effect on environmental performance, whereas board independence and institutional ownership had a positive but non-significant effect on the environmental performance of

the companies. The study concluded that corporate governance variables play a significant role in achieving improved environmental performance using panel regression analysis were specifically examined to see if they were affected by environmental performance of the manufacturing companies. According to the study, board size, gender diversity and managerial ownership had significant positive effect on environmental performance, whereas board independence and institutional ownership had positive and non-significant effect on environmental performance of the companies. The study concluded that, corporate governance variables play significant role in achieving improved environmental performance.

Similarly, Surbakti, et al. [32] studied the effect of corporate governance on corporate sustainability in Indonesia. The purpose of the study was to specifically determine the effect of size, expertise, gender diversity, age and educational background of the board of commissioners and top management on the economic, social and environmental dimensions. The design of the study was *ex post-facto* research design. The study found that high level of education among the top management significantly affects sustainability performance, whereas gender diversity influences economic performance. The study concluded that, the number of board and top management members could improve economic sustainability.in a related study, Nsiah, et al. [33], examined the impact of corporate governance on the extent of sustainability reporting among State owned enterprises in Ghana. The study adopted cross-section design, data was collected through structured questionnaire and analysed using logistic regression analysis. The findings of the study indicated that board size, corporate social responsibility committee and audit committee had positive and significant impact on sustainability. The study recommended that management should consider increasing the board size of state-owned enterprises in Ghana to improve sustainability reporting. Equally, policy makers should develop governance mechanisim for establishing board sub-committees. Furthermore, Nwankwo, et al. [9] investigated corporate governance and sustainability reporting of listed oil and gas companies in Nigeria. The aim of the study was to determine the relationship between board independence and sustainability disclosure in oil and gas companies in Nigeria. The data was analysed using correlation and Generalized Method of Moment (GMM).

According to the study, the result of the data analysis showed that board independence had positive and significant effect on economic sustainability of oil and gas companies. The study concluded that board independence plays significant role in enhancing sustainability reporting of a company. The study recommended that listed oil and gas companies in Nigeria should strengthen their boards by increasing the proportion of independent directors; and forming dedicated sustainability committee to be led by those directors so as to enhance oversight and quality sustainability. Equally, the companies should ensure that independent directors with environmental and sustainability reporting expertise are appointed. Yahaya, et al. [34] equally explored the effectiveness of board and audit committee influence on environmental and sustainability performance of firms in Europe and Asia. Data for the study were obtained from 3,752 firms across Europe and Asia and was analysed using fixed and random effects models. The findings of the study showed that board size, independence, expertise and diversity significantly influence sustainability performance. The study concluded that corporate governance plays a pivotal role in steering corporation toward adopting environmentally behavior and fostering sustainability. Olotu, et al. [35], studied effect of corporate governance on sustainability performance. Data for the study was obtained from 8 listed oil and gas companies in Nigeria between 2015 and 2024. The findings of the study indicated that board size, board independence, board gender diversity and board financial expertise had significant positive effects on sustainability performance.

1.9 Theoretical Framework

The study was anchored on Agency Theory as developed by Jensen & Meckling in 1976 [36]. The theory explains management behaviour arising from the separation of

ownership from control in a business environment. An agency relationship exists when shareholders, also known as principals in a corporate organization, appoint a person or group of persons known as agents to manage and direct the affairs of the organization on their behalf. However, because of their job positions, the agents (managers) usually possess more adequate information about the business than the shareholders (principals); as a result, they may pursue personal interests at the expense of those of the shareholders (principals), thereby creating an agency problem. The assumption of the theory is that both the shareholders (principals) and the agents (managers) are individuals who seek to achieve their interests. The theory is relevant to the study, as corporate governance mechanisms such as board independence, audit committee effectiveness, and gender diversity are designed to enhance effective oversights of management, thus reducing conflicts arising from agency relationship.

2. Materials and Methods

The study adopted an *ex-post facto* research design, as it relied on historical data obtained from the annual reports of selected cement manufacturing companies in Nigeria. This design was considered appropriate because the variables of interest had already occurred and could not be manipulated by the researcher. The focus was on examining how corporate governance mechanisms influenced sustainable management practices over time. The population of the study comprised three listed cement manufacturing firms in Nigeria, namely BUA Cement Plc, Dangote Cement Plc, and Lafarge Africa Plc. However, purposive sampling was employed to exclude BUA Cement Plc from the sample because it was only listed in 2020 and did not provide sufficient longitudinal data for the study period. Consequently, the final sample consisted of Dangote Cement Plc and Lafarge Africa Plc.

Secondary data were collected from the audited annual reports and sustainability disclosures of the sampled firms for the period spanning 2015 to 2025. This period was selected to provide adequate coverage for analyzing trends in corporate governance and sustainable management practices. The dependent variable, sustainable management (SUSM), was measured using a disclosure index constructed based on relevant Global Reporting Initiative standards. Specifically, GRI 413 on local community and GRI 306 on waste management were adopted. The index consisted of six items, including disclosures on community engagement, social impact assessments, social development programmes, waste generation, waste-related impacts, and waste management practices. Each item was assigned a value of one if disclosed and zero if not disclosed. The total sustainable management index was computed as the ratio of disclosed items to the total number of items, thereby producing a value between zero and one. The independent variables captured corporate governance attributes. Board independence was measured as the proportion of non-executive directors to the total number of board members. Audit committee effectiveness was proxied by the number of audit committee meetings held within a financial year, reflecting the level of oversight and monitoring activities. Gender diversity was measured as the proportion of female directors to total board size, indicating inclusiveness and diversity in board composition. In addition, two control variables were included to account for firm-specific characteristics. Profitability was measured as net profit divided by total assets, while firm age was measured as the number of years since incorporation.

3. Result

Table 1. Measurement of Sustainable Management

Applicable GRI for Measurement of Sustainable Management	Measurement
GRI 413: Local Community	**Scale**

Applicable GRI for Measurement of Sustainable Management	Measurement
Operations with local community engagement	"1" if disclosed or "0" if not disclosed
Social impact assessments	"1" if disclosed or "0" if not disclosed
Social development Programs	"1" if disclosed or "0" if not disclosed
GRI 306: Waste Management	**Scale**
Waste generation and significant waste-related impacts	"1" if disclosed or "0" if not disclosed
Management of significant waste-related impacts	"1" if disclosed or "0" if not disclosed
Waste generated	"1" if disclosed or "0" if not disclosed
Total Sustainable Management Index	(number of items disclosed)/6

Source: GRI [37]

Data analysis was carried out using both descriptive and inferential statistical techniques. Descriptive statistics were first employed to summarise the data and provide insights into the distribution, central tendency, and variability of the variables. This included the computation of mean, standard deviation, minimum, and maximum values. The descriptive analysis helped to understand the general behaviour of the variables across firms and over time. For inferential analysis, panel regression techniques were employed to estimate the effect of corporate governance variables on sustainable management. The panel nature of the data, which combined cross-sectional and time series dimensions, allowed for more robust analysis by capturing both firm-specific and time-specific effects. Prior to model estimation, the Hausman specification test was conducted to determine the most appropriate estimation technique between fixed effects and random effects models. The result of the Hausman test indicated that the random effects model was more suitable for the study, as the probability value was not statistically significant, suggesting that the random effects estimator was consistent and efficient.

Based on this outcome, the random effects model was adopted for hypothesis testing. This model assumed that individual firm-specific effects were random and uncorrelated with the explanatory variables, thereby allowing for generalisation beyond the sampled firms. The regression analysis was conducted to estimate the coefficients of the independent variables and assess their statistical significance. The level of significance for hypothesis testing was set at 5 percent. The probability values associated with each coefficient were used to determine whether the corresponding null hypotheses should be accepted or rejected.In addition to the regression analysis, diagnostic tests were implicitly considered to ensure the validity of the model estimates. The use of panel data techniques helped to minimise issues such as omitted variable bias and unobserved heterogeneity. To examine the effect of corporate governance on sustainable management of cement manufacturing companies in Nigeria, the study specified the following panel regression model:

$$SUSM_{it} = \beta_0 + \beta_1 BIND_{it} + \beta_2 ACE_{it} + \beta_3 BGD_{it} + \beta_4 PROF_{it} + \beta_5 AGE_{it} + \mu_{it}$$

Where:

$SUSM_{it}$= Sustainable management index of firm i at time t

$BIND_{it}$= Board independence

ACE_{it}= Audit committee effectiveness

BGD_{it}= Board gender diversity

$PROF_{it}$= Profitability (control variable)

AGE_{it}= Firm age (control variable)
β_0= Constant term
$\beta_1 - \beta_5$= Coefficients of the explanatory variables
μ_{it}= Error term

3.1 Data Analysis

Descriptive Analysis and Model Diagnostics

Table 2**. Descriptive Statistics**

	SUSM	BIND	ACE	BGD	PROF	AGE
Mean	0.636364	0.857499	4.000000	0.244689	0.126855	44.50000
Median	0.833333	0.857143	4.000000	0.222527	0.145390	44.50000
Maximum	0.833333	0.916667	5.000000	0.545455	0.279595	66.00000
Minimum	0.333333	0.769231	3.000000	0.000000	-0.022671	23.00000
Std. Dev.	0.244713	0.041272	0.308607	0.164016	0.076565	17.19565
Skewness	-0.418411	-0.078649	0.000000	0.011538	-0.008311	1.69E-16
Kurtosis	1.215416	2.367253	11.00000	2.110253	2.445930	1.137676
Jarque-Bera	3.561260	0.389686	58.66667	0.726167	0.281664	3.179228
Probability	0.168532	0.822964	0.000000	0.695528	0.868635	0.204004
Sum	14.00000	18.86497	88.00000	5.383162	2.790811	979.0000
Sum Sq. Dev.	1.257576	0.035772	2.000000	0.564928	0.123107	6209.500
Observations	22	22	22	22	22	22

Source: Eviews 10 Output (2026)

Table 2 shows that sustainable management (SUSM) had a mean value of 0.636364, indicating that, on average, the sampled firms disclosed about 64 percent of the sustainability items, which suggests a moderate level of commitment to sustainable management practices. The maximum value of 0.833333 and minimum value of 0.333333 show that disclosure levels varied across firms and over time. The standard deviation of 0.244713 indicates a moderate spread around the mean, suggesting some variability in disclosure practices. The negative skewness of -0.418411 implies that most of the values were slightly concentrated on the higher side of the distribution. The kurtosis value of 1.215416 indicates a relatively flat distribution. The Jarque-Bera probability of 0.168532 shows that the variable is normally distributed since the probability exceeds 0.05. For board independence (BIND), Table 2 indicates a mean value of 0.857499, suggesting that a large proportion of board members were non-executive directors. The maximum value of 0.916667 and minimum value of 0.769231 show that board independence remained relatively high across the sampled firms. The standard deviation of 0.041272 indicates low variability, meaning that the proportion of independent directors did not vary much. The skewness value of -0.078649 suggests a fairly symmetrical distribution with a slight tilt towards higher values. The kurtosis of 2.367253 shows a distribution close to normal. The Jarque-Bera probability of 0.822964 confirms that the data is normally distributed.

Table 2 further reveals that audit committee effectiveness (ACE) had a mean of 4.000000, indicating that firms held an average of four audit committee meetings per year. The maximum and minimum values of 5.000000 and 3.000000 respectively suggest limited variation in meeting frequency. The standard deviation of 0.308607 confirms that the dispersion around the mean is low. The skewness of 0.000000 indicates a perfectly symmetrical distribution. However, the kurtosis value of 11.00000 suggests a highly peaked distribution, indicating the presence of extreme clustering around the mean. The Jarque-Bera probability of 0.000000 shows that the variable is not normally distributed. For board gender diversity (BGD), Table 2 shows a mean value of 0.244689, indicating that female representation on boards was relatively low, averaging about 24 percent. The maximum value of 0.545455 and minimum value of 0.000000 indicate that some firms had

no female directors, while others had moderate representation. The standard deviation of 0.164016 suggests moderate variability. The skewness value of 0.011538 indicates an approximately symmetrical distribution. The kurtosis of 2.110253 suggests a slightly flat distribution. The Jarque-Bera probability of 0.695528 confirms that the variable is normally distributed. The profitability variable (PROF) in Table 2 had a mean value of 0.126855, indicating that firms generated an average return of about 13 percent on total assets. The maximum value of 0.279595 and minimum value of -0.022671 show that while most firms were profitable, there were instances of losses. The standard deviation of 0.076565 indicates moderate dispersion in profitability levels. The skewness of -0.008311 suggests a nearly symmetrical distribution. The kurtosis value of 2.445930 indicates a distribution close to normal. The Jarque-Bera probability of 0.868635 confirms that profitability is normally distributed.

Finally, Table 2 shows that firm age (AGE) had a mean value of 44.50000 years, indicating that the sampled firms were relatively mature. The maximum age of 66.00000 and minimum of 23.00000 show a wide range in years of operation. The standard deviation of 17.19565 suggests a high level of dispersion, indicating differences in firm maturity. The skewness value of approximately zero indicates a symmetrical distribution. The kurtosis of 1.137676 suggests a flat distribution. The Jarque-Bera probability of 0.204004 indicates that the variable is normally distributed.

Table 3. Multicollinearity Test

Variance Inflation Factors
Date: 04/28/26 Time: 23:47
Sample: 1 22
Included observations: 22

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
BIND	2.500346	1424.543	3.143143
ACE	0.015345	190.8899	1.078474
BGD	0.271981	17.98932	5.399560
PROF	0.514930	8.634074	2.227695
AGE	2.18E-05	38.14509	4.758652
C	2.262120	1748.899	NA

Source: Eviews 10 Output (2026)

Table 3 presents the multicollinearity test using Variance Inflation Factors, which is used to examine whether the independent variables are highly correlated with each other, as high correlation can distort regression estimates and make the results unreliable. The VIF values for BIND, ACE, BGD, PROF, and AGE are 3.143143, 1.078474, 5.399560, 2.227695, and 4.758652 respectively. Since all the values are below the common threshold of 10, it indicates that there is no serious multicollinearity problem among the explanatory variables. This suggests that each variable contributes uniquely to explaining sustainable management without excessive overlap with others.

Table 4. Test of Autocorrelation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.546209	Prob. F(2,14)	0.0568
Obs*R-squared	7.397596	Prob. Chi-Square(2)	0.0248

Source: Eviews 10 Output (2026)

Table 4 shows the Breusch-Godfrey Serial Correlation LM Test, which is used to detect the presence of autocorrelation in the residuals, as autocorrelation can lead to inefficient estimates and biased statistical inferences. The result reveals an F-statistic of 3.546209 with a probability value of 0.0568. Since the probability is slightly above the 0.05 level of significance, the null hypothesis of no serial correlation cannot be rejected. This indicates that the model does not suffer from autocorrelation, and the residuals are independent across time.

Table 5. Linearity Test

Ramsey RESET Test
Equation: UNTITLED
Specification: SUSM BIND ACE BGD PROF AGE C
Omitted Variables: Squares of fitted values

	Value	Df	Probability
t-statistic	1.052081	15	0.3094
F-statistic	1.106874	(1, 15)	0.3094
Likelihood ratio	1.566310	1	0.2107

Source: Eviews 10 Output (2026)

Table 5 presents the Ramsey RESET test for linearity, which assesses whether the model is correctly specified and whether there are omitted variables or non-linear relationships not captured in the model. The result shows a t-statistic of 1.052081 with a probability value of 0.3094. Since the probability exceeds 0.05, the null hypothesis that the model is correctly specified cannot be rejected. This implies that the model is linear and properly specified, with no evidence of omitted variable bias.

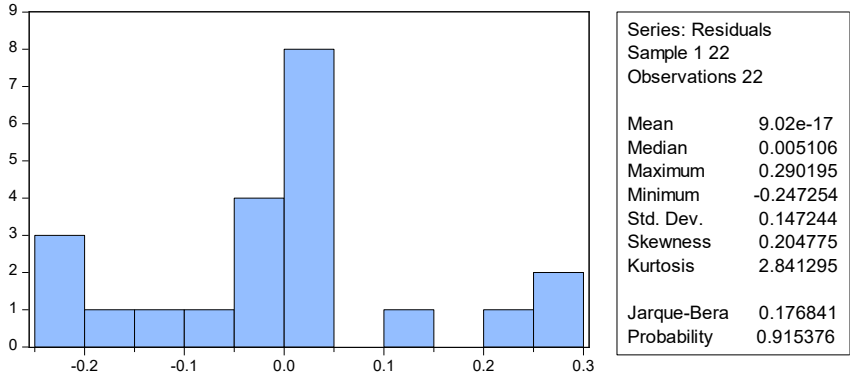


Figure 1. Normality test
Source: Eviews 10 Output (2026)

Figure 1 displays the normality test, which is used to determine whether the residuals of the model are normally distributed, an assumption necessary for valid hypothesis testing. The result indicates that the residuals follow a normal distribution, as evidenced by the Jarque-Bera probability being greater than 0.05 and the histogram appearing bell-shaped. This confirms that the normality assumption is satisfied, thereby supporting the reliability of the regression results.

Table 6. Heteroskedasticity Test

Heteroskedasticity Test: Glejser

F-statistic	13.76489	Prob. F(5,16)	0.0000
Obs*R-squared	17.85025	Prob. Chi-Square(5)	0.0031

Scaled explained SS	17.15934	Prob. Chi-Square(5)	0.0042

Source: Eviews 10 Output (2026)

Table 6 presents the Glejser test for heteroskedasticity, which is used to examine whether the variance of the error terms is constant across observations. The result shows an F-statistic of 13.76489 with a probability value of 0.0000. Since the probability is less than 0.05, the null hypothesis of homoskedasticity is rejected, indicating the presence of heteroskedasticity in the model. This suggests that the variance of the residuals is not constant, which could affect the efficiency of the estimates, hence the need for robust standard errors.

Table 7. Hausman Test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	8.656378	5	0.1236

Source: Eviews 10 Output (2026)

Table 7 reports the Hausman test, which is used to determine the most appropriate model between fixed effects and random effects in panel data analysis. The result shows a chi-square statistic of 8.656378 with a probability value of 0.1236. Since the probability is greater than 0.05, the null hypothesis that the random effects model is appropriate cannot be rejected. This implies that the random effects model is preferred, as it provides consistent and efficient estimates for the study.

3.2 Test of Hypotheses

Hypothesis I: Board independence has a positive influence on sustainable management practices of cement manufacturing companies in Nigeria.

Hypothesis II: Audit committee effectiveness has positive influence on sustainable management practices of cement manufacturing companies in Nigeria.

Hypothesis III: Gender diversity has positive influence on sustainable management practices of cement manufacturing companies in Nigeria.

Table 8. Test of Hypotheses

Dependent Variable: SUSM
Method: Panel EGLS (Period random effects)
Date: 04/28/26 Time: 23:43
Sample: 2015 2025
Periods included: 11
Cross-sections included: 2
Total panel (balanced) observations: 22
Swamy and Arora estimator of component variances
White period standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BIND	-0.178804	0.032232	-5.547346	0.0000
ACE	-0.062691	0.006746	-9.292807	0.0000
BGD	0.478526	0.091818	5.211657	0.0001

PROF	-1.985407	0.058275	-34.06940	0.0000
AGE	-0.000532	0.000577	-0.921305	0.3706
C	1.198892	0.071900	16.67442	0.0000
	Effects Specification			
			S.D.	Rho
Period random			0.000000	0.0000
Idiosyncratic random			0.159409	1.0000
	Weighted Statistics			
R-squared	0.637958	Mean dependent var		0.636364
Adjusted R-squared	0.524819	S.D. dependent var		0.244713
S.E. of regression	0.168689	Sum squared resid		0.455296
F-statistic	5.638745	Durbin-Watson stat		0.896149
Prob(F-statistic)	0.003489			

Source: Eviews 10 Output (2026)

Table 8 presents the panel regression results together with the model validity statistics. The essence of these statistics is to assess how well the model explains variations in sustainable management and whether the overall model is statistically reliable. The R-squared value of 0.637958 shows that about 63.80 percent of the changes in sustainable management are explained by the combined effect of board independence, audit committee effectiveness, gender diversity, profitability, and firm age. The adjusted R-squared of 0.524819 further confirms that even after adjusting for the number of variables, about 52.48 percent of the variation is still explained, which indicates a reasonably good fit. The F-statistic of 5.638745 with a probability value of 0.003489 shows that the model is statistically significant at 5 percent, meaning that the explanatory variables jointly have a significant effect on sustainable management. This confirms that the model is valid and suitable for drawing conclusions. Still in Table 8, the constant term has a coefficient of 1.198892 with a probability value of 0.0000. The constant represents the level of sustainable management when all explanatory variables are held at zero. The positive value suggests that, in the absence of the included factors, sustainable management would still exist at a relatively high level. Since the probability value is less than 0.05, the constant is statistically significant, indicating that there are other factors not captured in the model that contribute to sustainable management.

With respect to board independence (BIND), Table 8 shows a coefficient of -0.178804. This implies that a unit increase in board independence leads to a decrease of approximately 0.1788 units in sustainable management, holding other variables constant. This negative marginal effect suggests that increasing the proportion of non-executive directors reduces the level of sustainable management practices among the sampled firms. The probability value of 0.0000 indicates that this effect is statistically significant at the 5 percent level. Therefore, the null hypothesis is rejected, and it is concluded that board independence has a significant negative effect on sustainable management, contrary to the expected positive direction.

For audit committee effectiveness (ACE), Table 8 reports a coefficient of -0.062691. This indicates that a unit increase in the number of audit committee meetings leads to a decrease of about 0.0627 units in sustainable management, ceteris paribus. The marginal effect shows that more frequent audit committee meetings are associated with lower levels of sustainability disclosure. The probability value of 0.0000 shows that this effect is statistically significant at 5 percent. Hence, the null hypothesis is rejected, and it is concluded that audit committee effectiveness has a significant negative effect on sustainable management, which does not align with the expected positive influence. In

the case of gender diversity (BGD), Table 8 shows a coefficient of 0.478526. This means that a unit increase in the proportion of female directors leads to an increase of about 0.4785 units in sustainable management, holding other factors constant. The positive marginal effect indicates that greater female representation on the board enhances sustainable management practices. The probability value of 0.0001 is less than 0.05, showing that the effect is statistically significant. Therefore, the null hypothesis is accepted, and it is concluded that gender diversity has a significant positive effect on sustainable management. Regarding profitability (PROF), the coefficient is -1.985407, which implies that a unit increase in profitability results in a decrease of about 1.9854 units in sustainable management. This negative marginal effect suggests that more profitable firms tend to disclose less on sustainability within the study context. The probability value of 0.0000 indicates that the effect is statistically significant at 5 percent. Finally, firm age (AGE) has a coefficient of -0.000532, indicating that a one-year increase in firm age leads to a very small decrease of 0.000532 units in sustainable management. The marginal effect is negligible and negative. The probability value of 0.3706 is greater than 0.05, indicating that the effect is not statistically significant. This means that firm age does not have a meaningful effect on sustainable management in this study.

4. Discussion

Board independence has a significant negative effect on sustainable management (β = -0.178804, p-value = 0.0000). This outcome suggests that increasing the proportion of non-executive directors, as measured in the study, reduces the level of sustainability disclosure and practices among cement manufacturing firms in Nigeria by about 0.1788 units for every unit increase in board independence. The result does not align with agency theory, which expects independent directors to strengthen monitoring and improve sustainability outcomes by reducing managerial opportunism. The negative outcome may be explained by the possibility that non-executive directors in the sampled firms are less engaged in sustainability matters or lack sector-specific environmental expertise, thereby weakening their monitoring effectiveness. It may also reflect symbolic independence rather than functional independence, where board members exist in structure but do not actively influence sustainability decisions. This finding contrasts with Nwankwo et al. [9], who found that board independence improved sustainability disclosure in oil and gas firms in Nigeria, and Bosun-Fakunle et al. [31], who reported a positive but insignificant relationship in Zimbabwe. It also differs from Rubino and Napoli [38], who observed a positive influence of board independence on environmental performance. However, it aligns more closely with the mixed evidence of Yahaya et al. [34], where board independence showed varied effects across regions, suggesting contextual differences in governance effectiveness.

Audit committee effectiveness has a significant negative effect on sustainable management (β = -0.062691, p-value = 0.0000). The coefficient indicates that an increase in audit committee activity, measured by meeting frequency, reduces sustainable management disclosure by about 0.0627 units, holding other factors constant. This finding contradicts agency theory, which positions audit committees as oversight mechanisms expected to enhance transparency and accountability in sustainability reporting. The negative effect may be due to audit committees focusing more on financial compliance and internal control issues rather than environmental and social reporting, thereby diverting attention away from sustainability practices. It may also reflect inefficiencies in committee functioning, where meetings occur frequently but lack substantive influence on sustainability decisions. This result is inconsistent with Tumwebaze et al. [23], who found that audit committee effectiveness improves sustainability reporting in Uganda, and Nsiah et al. [33], who reported a positive effect of audit committees on sustainability disclosure among Ghanaian state-owned enterprises. It also contradicts Agyei-Mensah [39], who linked audit committees with improved voluntary disclosures. However, it

partially aligns with contexts where governance mechanisms exist but do not translate into improved outcomes due to weak enforcement structures or limited expertise in sustainability issues.

Gender diversity has a significant positive effect on sustainable management (β = 0.478526, p-value = 0.0001). The result shows that an increase in female representation on corporate boards enhances sustainable management practices by about 0.4785 units, indicating a relatively strong positive marginal effect. This finding supports agency theory, as diverse boards are expected to improve monitoring quality, broaden perspectives, and reduce narrow managerial decision-making, thereby enhancing sustainability outcomes. The positive effect may be explained by the tendency of female directors to be more attentive to ethical, environmental, and social concerns, which strengthens disclosure and sustainability engagement. This result is consistent with Olayinka [5], who found that female directors significantly improve sustainability reporting in Nigeria, and Bosun-Fakunle et al. [31], who reported a positive effect of gender diversity on environmental performance. It also aligns with Surbakti et al. [32], where gender diversity influenced sustainability dimensions, and Tacheva et al. [40], who found that board characteristics including diversity significantly affect sustainability outcomes. These consistent findings across different contexts suggest that gender diversity remains a strong governance mechanism for improving sustainability practices in firms.

4.1 Contribution to Knowledge

This study contributes to existing literature by addressing several gaps identified in prior studies on corporate governance and sustainability. Earlier studies were conducted in countries such as Zimbabwe, Indonesia, Ghana, and Uganda, which limits their relevance to the Nigerian context, while those carried out in Nigeria either used broad samples across multiple industries or focused on a single governance variable.

5. Conclusion

The results suggest that the way corporate governance structures are currently configured in the sampled cement firms has a mixed influence on how sustainability practices are disclosed and implemented. The presence of strong board independence and frequent audit committee meetings appears to be associated with lower levels of sustainable management disclosure, which may indicate that formal governance mechanisms are being applied in a compliance driven manner rather than being fully integrated into sustainability decision processes. This pattern may also reflect possible disconnects between oversight functions and operational sustainability priorities within firms, where governance structures exist but do not necessarily translate into stronger sustainability orientation. In contrast, the positive outcome associated with gender diversity points to the role of inclusive board composition in shaping more socially responsive and sustainability conscious organizational behavior. This suggests that diversity within leadership structures can enhance sensitivity to environmental and social reporting expectations. From a theoretical standpoint, in line with the resource-based view, governance attributes function as strategic internal resources, but their effectiveness depends on how well they are embedded in organizational processes. The mixed directions observed in the results indicate that not all governance resources are automatically productive unless properly aligned with strategic sustainability objectives. Thus, the pattern highlights that governance mechanisms can either constrain or enhance sustainable management depending on how they are structured and utilized within the firm's internal system of decision making and accountability. The study recommended that:

The board of directors of Dangote Cement Plc and Lafarge Africa Plc should ensure that board independence is not treated only as a compliance requirement but is actively integrated into sustainability decision making processes, by strengthening engagement

between non-executive directors and operational sustainability units so that oversight contributes more directly to sustainable management outcomes.

Audit committees of Dangote Cement Plc and Lafarge Africa Plc should redesign the focus of their meetings to go beyond frequency and compliance checks by embedding sustainability performance indicators into their review agenda, ensuring that discussions and monitoring activities are more directly linked to environmental and social management outcomes within the firms.

Shareholders and nomination committees of Dangote Cement Plc and Lafarge Africa Plc should strengthen gender inclusion in board appointments by actively increasing the representation of qualified female directors in leadership positions, as this would enhance diversity of perspectives in decision making and support stronger sustainable management practices across the organizations.

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