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Carbon Emission Disclosure and Firm Value: Do Corporate Characteristics Matter? Evidence from Listed Companies in Kenya

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ABSTRACT

The fluctuation of firm value of companies listed in Nairobi Securities Exchange (NSE) has been a consequence of a number of determinants. Carbon emission disclosure has been a subject of concern by many stakeholders since the advent of global warming aspect worldwide. On this basis this study investigated the effect of carbon emission disclosure on firm value of listed companies in the NSE and further, interrogated the moderating role of corporate characteristics (firm size, leverage and profitability) on this relationship. The inquiry focuses on listed companies in the NSE for the period 2022 to 2024. Anchored on the stakeholder, legitimacy and resource-based-view theories, the study combined explanatory longitudinal and ex-post-facto research designs. From a population of 64 listed companies by December 2024, an initial sample of 54 companies was purposively selected. The final response rate was 43 (80%) firms that entered the final analysis. Secondary data obtained from the sampled company annual integrated reports and/or sustainability report for the 3-year period was described using descriptive statistics and analyzed using hierarchical regression methods in SPSS version 27. From the study findings it is revealed that carbon emission disclosure has a statistically significant negative effect on firm value. While corporate characteristics of firm size and leverage were found not to significantly influence the relationship, profitability was found to moderate the relationship between carbon emission disclosure and firm value. The negative interaction with profitability does not however support the argument that firms can buffer profitability through carbon disclosure. There is a need for enhanced assurance and comparability in carbon disclosure by regulators. Firms should also endeavor to link carbon disclosure to credible transition plans and financially responsible decarbonization strategies.

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1. Introduction

Carbon disclosure has progressed from an issue on corporate responsibility to a significant issue in capital markets. Stakeholders now demand data regarding climate risks, decarbonisation costs, transition strategies, GHG (greenhouse gas) emissions and response to climate change. IFRS S2 has defined disclosure of climate related risks and opportunities that could impact the cost of capital, financing or cash flows. It also connects GHG accounting to the GHG Protocol (IFRS Foundation, 2023, 2025a). The ESG Disclosures Guidance Manual was released by the Nairobi Securities Exchange (NSE) in 2021. The manual offers a local requirement for uniform disclosure of sustainability information to issuers in Kenya (NSE, 2021). These initiatives are creating greater relevance to the impact of carbon disclosure on valuation in emerging capital markets.

Carbon disclosure refers to a company's approach to planning, tracking and managing its environmental footprint. Typical disclosures include governance aspects, accounting scope, Scope 1-3 emissions, baselines, emissions intensity, targets and progress towards transition goals (Choi et al., 2013; GRI, 2016; IFRS Foundation, 2023). Disclosure can enhance information transparency, demonstrate managerial competence and enhance institutional integrity. Disclosure may also highlight environmental risks, transition costs or exposure to operational and regulatory risk for investors. As a result, the value of disclosure is theoretically indeterminate and may be influenced by disclosure quality, investor time horizon and firm resources.

Kenya is interesting as there are emerging demands for sustainability disclosure whilst the capital market is relatively small and unstable. Although emissions from Kenya are less than 0.1% of total global GHG emissions, the country is highly vulnerable to the effects of climate change. Inadequate adaptation to climate change could significantly impact long term productivity (World Bank,

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2023). Disclosure may help firms obtain sustainable finance but implementation costs associated with transition, technology, assurance and data may be important to investors. There is also an increasing importance of sustainability reporting through the adoption of IFRS S1 and IFRS S2 worldwide and the introduction of sustainability reporting by the NSE. Thus, evidence specific to Kenya is required rather than reliance on evidence from either Asia or developed markets.

Existing studies have shown mixed results and are also sensitive to the type of disclosure. For example, Kurnia et al. (2021) found a positive link between disclosure and value in Indonesia, but found no significant link in Australia. Additionally, Rachmadhika and Firmansyah (2025) found a negative link between disclosure and value in energy firms in Indonesia. Bedi and Singh (2024) found a negative link between disclosure and financial performance, which showed positive moderation due to firm size. Studies analyzing emissions also highlight the importance of not making cross-border inferences (Han et al., 2023). In East Africa, studies have analyzed factors affecting the level of disclosure rather than the current value relation (Githaiga, 2025). One study has also analyzed the moderation of profitability on the disclosure relation and found no evidence for this relationship (Nabila & Wardhani, 2025). Therefore, this study analyses the moderating effects of firm size, financial risk and profitability in Kenya's listed firms.

This study contributes by analyzing the relationship between carbon emission disclosure and Tobin's Q while also analyzing the moderating effects of three firm attributes. This study makes three contributions. First, this study provides information from Kenya for the years 2022-2024 when both the international framework for sustainability reporting and local ESG regulations were being implemented. Second, this study separates the effects of firm size, financial risk and profitability as opposed to analyzing all firm attributes as one construct. Finally, this study uses a disclosure that incorporates the IFRS S2, GHG Protocol, GRI 305 standards and links capital market research to the current reporting standards for climate information.

This paper is organized as follows: following the introduction part, a second part is a literature review with theoretical and empirical studies that shed a light on linkage between theory and practice. The third part introduces the background information on research and methodology. After analysis and findings of the study, authors provide discussions and implications. Finally, this paper concludes with key points, recommendations, future research directions and limitations.

2. Literature Review

This literature review is conducted to examine the role of corporate characteristics in the relationship between carbon emission disclosure and firm value. To attain a comprehensive overview, the theoretical framework was synthesized and empirical review conducted for studies covering the period 2020-2026. The discussion is organized thematically by first reviewing the theories on which the paper is anchored, followed by empirical review, identification of research gaps and hypothesis development.

2.1 Theoretical and Conceptual Review

The stakeholder approach provides the foundation for this research as it has been found by Freeman (1984) and Donaldson and Preston (1995) to be important to value creation and organisational survival through relationships with stakeholders such as communities, employees, regulators, lenders, investors and others. With regard to carbon information, stakeholders may use data on carbon emissions, carbon reduction goals and involvement in the governance of the carbon system in order to make assessments about future exposure and managerial accountability. This disclosure may aid in building reputation, access to finance and cooperation from stakeholders. However, disclosure of carbon information may also expose previously unanticipated risks. For this reason, stakeholder theory provides importance to value relevance but not all disclosures need to provide value to the firm.

Legitimacy theory can help explain different reactions to seemingly comparable disclosure as well as the social influences on when disclosure occurs. Organizations strive to align their behavior with existing social norms (Dowling & Pfeffer, 1975; Suchman, 1995). Disclosure of carbon information can signal attention to the issue of climate change as well as help maintain resource access. However, legitimacy-focused communication may also be symbolic if narrative commitments do not result in behavioral change (Deegan, 2002; O'Donovan, 2002). Therefore, a higher level of carbon disclosure does not necessarily equate to more exposure, greater accountability or more extensive impression management. This is significant since this index measures the amount and level of quantification of information disclosed about carbon rather than actual sequestration or emissions reductions that have been independently verified.

The resource-based view provides insight into firm differences. Barney (1991) proposes sustainable competitive advantage stems from resources that are valuable and difficult to imitate. Helfat and Peteraf (2003) proposes capabilities evolve over time. Stakeholder relationships, governance processes, technical know-how, climate-data systems and other factors can aid firms in making reporting choices that have value within the firm. Firm profitability and firm size may provide insight into resource availability while leverage may limit financial flexibility. However, these factors are not perfect measures of capabilities. For example, firm strength or profitability does not necessarily mean that the firm has strong climate management. Thus, the moderating effects of these factors should be examined rather than assumed.

These theories provide insight into the information that stakeholders demand, the trustworthiness of organizational reactions to that information and the resources that enable the implementation of those reactions. Also, they suggest two potential value paths. Trustworthy information may decrease uncertainty. Disclosure of expensive or transition obligations may decrease the expected net

cash flow. Firm specific factors may affect the weighting of these value paths. Below value evidence that is directly tested is reviewed followed by hypotheses of moderation by firm size, leverage and profitability separately.

2.2 Empirical Review and Hypothesis Development

2.2.1 Carbon Emission Disclosure and Firm Value

Carbon performance is to be separated from carbon disclosure in investigating the relationship with firm value. Disclosure is about the amount of information shared by a firm while performance relates to intensity, absolute or reduction in carbon emissions. A firm may provide extensive disclosure whilst still being highly emissions-intensive. Accounting profitability relates to realised profits while Tobin's Q includes market implied perceptions of future risk and return (Tobin, 1969; Chung & Pruitt, 1994). Thus, data on emissions or return cannot be used to infer market implications for disclosure. This research uses a disclosure index and a market value measure to investigate this relationship.

There is direct evidence that disclosure is not valued uniformly across markets. Kurnia et al. (2021) investigated 25 manufacturing firms in Australia and 39 manufacturing firms in Indonesia using a carbon disclosure index and Tobin's Q. They found a positive relationship between disclosure and value in Indonesia but not in Australia. This study is relevant as it employs measures similar to this research. However, the focus on manufacturing and the use of relatively small economies limits the ability to extend the findings to a multi-industry market such as the Kenyan market. Instead, the study provides evidence on the impact of institutional differences rather than the universal value of disclosure.

There is also recent evidence to support this uncertainty. Rachmadhika and Firmansyah (2025) examined 80 carbon disclosures of energy firms in Indonesia for the years 2019-2022 and found a negative relationship between carbon disclosure and firm value. They also found that institutional ownership reduces the negative relationship. They provide evidence that investor attributes may affect the meaning of disclosed information. However, due to the industry specific nature of their study, external validity is limited. Bedi and Singh (2024) also found a negative relationship between carbon disclosure and financial performance for BSE 100 firms in India from 2018-2019 to 2020-2021. This study provides some evidence for a cost explanation but their use of financial performance as a measure of the value of information should not be assumed to be equivalent to Tobin's Q in this study.

Evidence regarding the nature of information being priced can be found in studies of emissions rather than studies of the amount of disclosure. Han et al. (2023) examined carbon disclosures of listed firms in Taiwan for the years 2012-2016 and found a positive relationship between emissions and firm value which is not typically observed in the developed world. This study provides evidence that all investors do not place the same value on carbon emissions. This evidence, along with Lee and Cho's (2021) separation of carbon disclosure and emissions in Korea, provides evidence for separating emissions information from the act of disclosure. It also provides evidence that expectations of firm growth and firm composition may cause conflicting studies.

Though East African studies provide relevance to the study area, they do not address the valuation issue. Githaiga (2025) used the system generalized method of moments and studied the firm level and board level factors that influence carbon disclosure among 73 listed firms in the period 2016-2022. The study found carbon disclosure as opposed to Tobin's Q. Hence, it does not indicate if there is a market valuation for enhanced disclosure or if firm level factors influence this valuation. With respect to Kenya, there is institutional context associated with the 2021 disclosure guidelines issued by the NSE and there is also an evolving disclosure framework for investor use through IFRS S2 (NSE, 2021; IFRS Foundation, 2023). However, both these frameworks do not inherently imply a market valuation for such disclosures.

Overall the existing research has revealed knowledge gaps in the following areas: conceptual, empirical and contextual. Some studies look at varying dimensions of carbon related behaviour, some use different measures of firm performance and some look at varying markets with different disclosure and investing environments. As a result, some studies find positive results, others negative results while some do not find a significant relationship and these findings need to be validated in a study specific to Kenya and not just picked based on a single piece of evidence. The current study aims to examine the relationship between the disclosure index and Tobin's Q for firms listed on the NSE for the years 2022-2024. Given the existence of both information value and cost due to exposure, the following non-directional hypothesis is proposed based on the literature review conducted:

H1: Carbon emission disclosure has a statistically significant effect on firm value of listed companies on Nairobi Securities Exchange.

2.2.2 Moderating Role of Corporate Characteristics

Firm characteristics can influence firm value or disclosure directly, without influencing the relationship between those variables. A moderating influence means that the relationship between disclosure and firm value changes depending on the level of the firm characteristic. In this section, research that examines the direct influence of disclosure factors or financial consequences is separated from research that tests for an interaction effect. Firm size is the physical size of the firm. Financial leverage represents the amount of financial obligations the firm has. Profitability reflects the profitability of the firm's operations. This research can test for unique conditional effects rather than presume all more profitable firms receive the same benefits from disclosure.

2.2.3 Firm Size

Firm size can influence the level of disclosure made and the level of attention paid to the firm making the disclosure. On the resource-based view, larger firms are able to spread the costs of carbon measurement, expert employees and disclosure systems over a larger number of products. On the legitimacy and stakeholder views, firms with larger footprints in the community and number of stakeholders are more likely to come under increased attention. All of these arguments support the possibility that firm size can enhance the value of trustworthy disclosure. On the other hand, firms with complex supply chains and complicated operations may complicate the disclosure and verification of carbon information as well as the magnitude of transition costs. As a result, firm size can magnify either the benefits or costs depending on the nature of the additional information (Barney, 1991; Deegan, 2002).

Bedi and Singh (2024) offer evidence of moderation. Firm size was found to positively moderate the negative relationship between disclosure and financial performance for their firms in India. This lends credence to the potential effect of firm size on disclosure and financial performance but does not provide clarity on the effect in the Kenyan market for value. Githaiga (2025) found the opposite in East African firms; the larger the firm the more carbon disclosure was made. However, this result relates to the level of disclosure and not moderation in relation to value. This is also relevant since the ability to disclose does not necessarily imply an increasing value per additional disclosure.

The question then becomes whether firm size has an effect on the value reaction after controlling for the individual relationships between firm size/disclosure and value. The Kenyan paper addresses this by having the product term used in the hierarchical regression. If an interaction exists then the relationship between disclosure and value does vary across firm size. Merely having a relationship between firm size and value would not indicate moderation. Due to the conflicting effects of resource availability and exposure the following hypothesis was put forward without a specified direction.

H2a: Firm size significantly moderates the relationship between carbon emission disclosure and firm value of listed companies on Nairobi Securities Exchange.

2.2.4 Leverage

The impact of carbon disclosure on firms may be influenced by leverage via financial flexibility and creditor scrutiny. Creditors are interested in data that impacts on debt repayment. Reliable carbon data may help reduce uncertainty regarding transition and operating risks. Debt servicing also uses resources that could be utilized in reducing emissions and emissions measurement. Therefore, disclosure of additional liabilities may increase attention on financial risk. There is thus an apparent balancing of the impact of leverage on the relevance of carbon data to investors. However, neither of these effects provides a clear direction to the relationship between carbon data and firm value (Freeman, 1984; Barney, 1991).

Nasih et al. (2024) provide a recent study of the financing channel using 216 firms from Indonesia and employing year and industry fixed effects in the regressions. The authors found a negative relation between carbon disclosure and the cost of borrowing. The main relationship was significant at 10%, though additional analyses provided more robust support. However, the evidence is not uniformly significant at 5%. Also, the cost of borrowing is not firm value. Nasih et al. (2024) do not find evidence that leverage moderates the relationship between disclosure and Tobin's Q. Githaiga (2025) has also found a negative relationship between leverage and disclosure in East Africa. This suggests a limitation in disclosure rather than a condition on firm value.

There is a distinct gap in the literature between the incentives for disclosure regarding financing and firm value. Potential shareholder value from lower debt costs may be negated by the costs associated with large amounts of debt that are revealed through disclosed transition costs. Thus, the impact of leverage on the relationship between disclosure and Tobin's Q is examined while also accounting for the main effects. Also, firm value, debt intensity, and cost of debt are differentiated such that related financial factors are not lumped together. The following hypothesis was proposed on this theoretical and empirical foundation:

H2b: Leverage significantly moderates the relationship between carbon emission disclosure and firm value of listed companies on Nairobi Securities Exchange.

2.2.5 Profitability

There is potential for profitability to influence the relationship between disclosure and value. Operating profitability represents the resources within the firm that can be allocated towards emissions reduction and disclosure. A profitable firm can also demonstrate its environmental initiatives through credible allocations which can alleviate implementation doubts held by stakeholders. However, current profitability does not necessarily suggest low levels of emissions. Holders of information might believe that the high level of emission disclosure implies costs to future profitability due to transition spending. Alternatively, higher profitability may be associated with greater environmental performance. Profitability thus provides for potential conflicting interpretations rather than necessarily protecting firms from the costs associated with emissions disclosure. (Barney, 1991, Donaldson & Preston, 1995)

Nabila and Wardhani (2025) specifically tested the moderating effect of profitability on value using Tobin's Q, moderated regression analysis, data on 76 firms across 19 companies. Their results showed the effects of green innovation and disclosure on firm value to be significant, but profitability was not found to moderate either of these effects. This result is important in the construction of hypotheses as it shows that the ability to generate profitability does not always enhance the value of disclosure. Additionally, due the

small sample size the external validity of the results to other contexts is somewhat constrained. Githaiga (2025) found a positive relationship between profitability and the level of disclosure which is not equivalent to testing for an interaction effect.

Thus, the research gap focuses on testing if profitability moderates the relationship between the level of carbon emission disclosure and firm value in the context of Kenya. It does not focus on whether profitability is associated with a greater level of disclosure or greater firm value. In this study profitability is measured using operating earnings divided by total assets and an interaction between profitability and the level of disclosure is included in the analysis. This allows for the specific moderation effect to be tested. Additionally, the causal nature of the relationship cannot be determined using a small within sample study. Instead, due to conflicting predictions related to greater expectations of change and the availability of resources, the following non-directional hypothesis was proposed:

H2c: Profitability significantly moderates the relationship between carbon emission disclosure and firm value of listed companies on Nairobi Securities Exchange.

Table 1: Summary of Literature Review

Author(Date)/Country	Subject	Variables	Methods	Findings
Kurnia et al. (2021) Australia	Carbon Emission and firm value of manufacturing companies	Carbon Emission Disclosure, Firm Value,	Descriptive and multiple regression techniques	Positive effect for Indonesian firms, while the Australian firms exhibit negative non-significant relationship.
Lee & Cho's (2021) Korea	firm-value effects of carbon emissions and carbon disclosure of Korean Chaebol- affiliated and non – Chaebol- affiliated firms	Carbon emissions, Carbon disclosure., firm-value, Environmental performance	Regression analysis methods	Positive relationship between carbon emissions and firm value
Han et al. (2023) Taiwan	Carbon disclosures of listed firms in and firm value	Carbon disclosures, firm value	Regression analysis	Positive association between carbon emissions and firm value
Nasih et al. (2024) Indonesia	Carbon Emission Disclosure and the Cost of Debt	Carbon Emission Disclosure, Cost of Debt. Leverage	Regression models.	Moderating effect of Leverage is not supported
Bedi & Singh (2024) India	Carbon emission disclosure and firm financial performance	Carbon Emission Disclosure, financial performance, Firm size	Regression models.	Negative effect of Carbon emission disclosure on firm financial performance moderated by firm size
Rachmadhika & Firmansyah (2025) Indonesia	Carbon disclosure and firm value of the energy sector companies listed on the Indonesia Stock Exchange	Carbon Emission Disclosure, Firm Value, Institutional ownership	Descriptive and multiple regression model	Negative effect of carbon disclosure on firm value, moderated by institutional ownership
Nabila and Wardhani (2025) Indonesia	Carbon emission disclosure and green innovation on firm value of transportation and logistics sector	Carbon emission disclosure, green innovation, firm value. Profitability(moderator)	Regression models.	Negative and positive effect of Carbon emission disclosure and green innovation on firm value. Moderation effect unsupported.

Source: Authors, 2026

2.2.6 Conceptual Framework

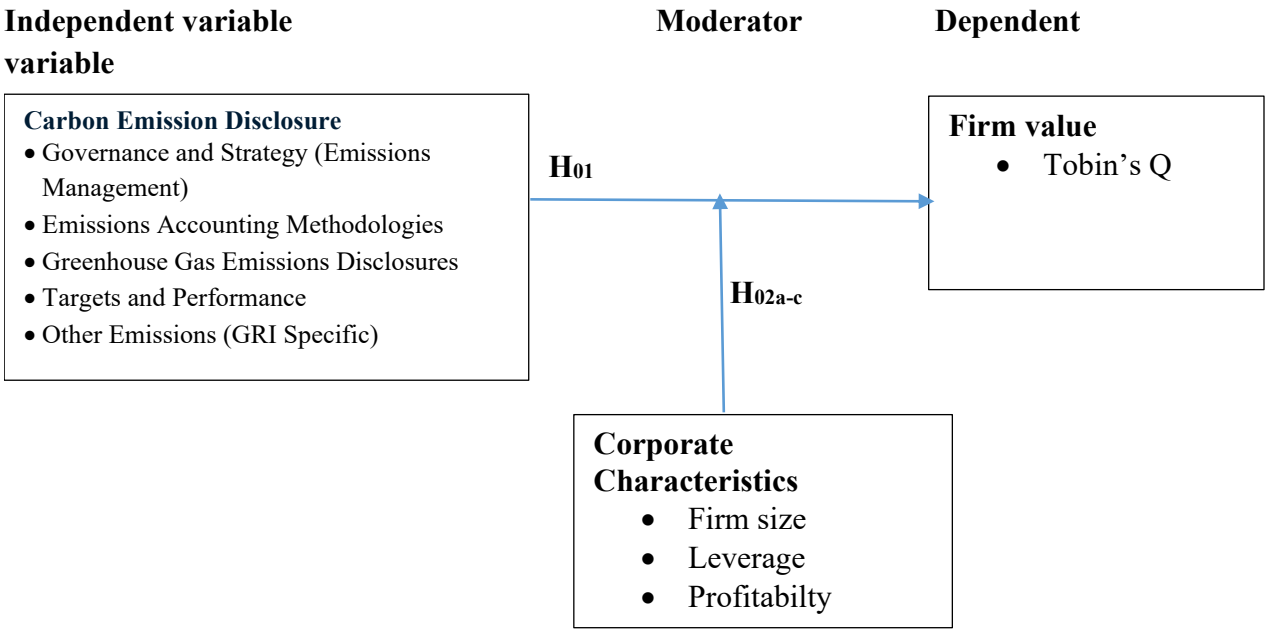


Figure 1: Conceptual framework.

Source: Authors, 2026

3. Research and Methodology

3.1 Research Design, Population, and Sample

The study adopted an explanatory longitudinal and ex-post-facto research designs using secondary panel data. The target population was composed of 64 firms listed in NSE. Using purposive criterion sampling, a set of inclusion and exclusion criteria was applied to select the final sample. To be included in the initial sample, a firm had to (a) be actively listed on the NSE. Applying this criterion yielded an initial sample of 54 firms; 10 firms were eliminated on the ground that, they were either, delisted, under administration, suspended, under receivership, acquired or failed to provide annual integrated or sustainability reports during the study period. To be included in the final analysis phase firms had to meet two additional criteria, (b) prepare and publish integrated annual reports or sustainability reports accessible via the NSE or corporate websites, and (c) actively practice carbon disclosure. Consequently, 11 firms were excluded from the initial sample. This resulted in a final sample of 43 firms observed over a three-year period (2022–2024), yielding 129 firm-year observations. The sampled firms cut across multiple sectors ranging from energy, financials, industrials, materials, utilities, consumer discretionary, consumer staples, communication services and real estate.

3.1.1 Measurement of Variables

Carbon emission disclosure index (CEDI) was measured through quantitative content analysis of publicly available corporate reports. This study applied a combined carbon emission disclosure checklist by mapping the Global Reporting Initiative (GRI 305: Emissions) standards with the IFRS S2 Climate-related Disclosures. The use of the combined checklist was motivated by release of IFRS S2 standard in June 2023, the subsequent interoperability guidance published by the GRI and IFRS Foundation in early 2024 and the GRI 102 and IFRS S2: Statement on reporting on both standards and equivalence for IFRS S2 on GHG Emissions Disclosures jointly published on 26 June 2025. Further, consequent to disclosure gaps identified between GRI and IFRS S1 and IFRS S2 standards on sustainability reports as evaluated in prior studies (Modjaningrum & Hermawan, 2025; Teixeira, 2025). Combined adoption (GRI + IFRS S1/S2) is currently the emerging best practice, as it simultaneously serves investors and civil society, balancing economic relevance and social responsibility (Harvard Law School Forum, 2023; Wahyuni, 2025).While the GRI Standards (305), Covers Emissions, Waste, and Impact on Biodiversity, IFRS S2-Climate-related Disclosures Covers Governance, Strategy, Risk Management, and Targets (focusing on financial materiality in respect to carbon emission). The instrument comprised 21 items grouped into governance and strategy, emissions-accounting methodologies, GHG emissions, targets and performance, and other emissions. Each item received 0 where it was absent, 1 for qualitative disclosure, and 2 for quantitative disclosure. The unweighted index equaled the sum of item scores divided by the number of applicable items, producing a theoretical range from 0 to 2. The checklist was informed by GRI 305, the GHG Protocol, and IFRS S2 (Choi et al., 2013; GRI, 2016; IFRS Foundation, 2023). (Refer Appendix I for Carbon Emission Disclosure Combined Checklist)

Table 2: Variable measurement

Variable	Operational measure	Role	Prior studies
Firm Value (FV)	Tobin's Q = [(market price per share × ordinary shares outstanding) + total debt] / book value of total assets	Dependent	Niresh, 2024 Anderson, et al. ,2004
Carbon Emission Disclosure Index (CEDI)	CEDI =$\frac{\sum \text{Number of items effectively disclosed}}{n}$ 0 = absent, 1 = qualitative, 2 = quantitative n= Total number of applicable disclosure items (21)	Independent	(Askiah & Valdiansyah, 2025; Ardelia et al., 2026
Firm size (FS)	Company Size = Natural Logarithm of Total Assets	Moderator	Yauri & Widianingsih, (2023)
Leverage (LEV)	Debt to Total Equity Ratio =Total Liability/Total Equity	Moderator	(Yauri & Widianingsih, 2023; Isaboke et al., 2023)
Profitability(PT)	Return on assets = EBIT/Total Assets	Moderator	(Yauri & Widianingsih, 2023; Issa et al., 2024)

Source: Authors, 2026

3.3 Model specification and analysis

Descriptive statistics and Pearson correlations were computed before hypothesis testing. Regression diagnostics assessed linearity, multicollinearity, autocorrelation, normality, and homoscedasticity. The direct effect was estimated using:

$$FV_{it} = \beta_0 + \beta_1 CEDI_{it} + \varepsilon_{it}$$

Moderation was assessed through hierarchical regression following Aiken and West (1991):

$$FV_{it} = \beta_0 + \beta_1 CEDI_{it} + \beta_2 M_{it} + \beta_3 (CEDI_{it} \times M_{it}) + \varepsilon_{it}$$

Where, M represents firm size, leverage, or profitability, and b denotes coefficients in the original measurement units. Hypothesis testing is reported using the standardized coefficients (β). For a predictor X, β = B × SD(X)/SD (FV); for an interaction, X is the actual product term entered in that model. The original product-term betas are retained rather than recomputed from the marginal standard deviations of their components. Statistical significance is evaluated using the corresponding t tests at α = .05, alongside incremental R^2 for moderation. Rescaling a coefficient does not change its t statistic or hypothesis decision. Interaction betas should not be interpreted as percentages or as simple slopes at particular moderator values (Aiken & West, 1991).

4. Findings and Discussions

4.1 Descriptive Statistics

Descriptive statistics conducted on the data was as prescribed in Table 3 below.

Table 3: Descriptive statistics

Variable	N	Minimum	Maximum	Mean	SD
CEDI	129	0.52	1.90	1.2901	0.26549
Firm size	129	0.00	22.70	16.3979	3.37781
Leverage	129	−4.65	7.36	2.2406	2.59697
Profitability	129	−0.10	0.40	0.0680	0.09360
Firm value	129	0.14	3.93	0.9876	0.55297

CEDI = carbon emission disclosure index; firm value = Tobin's Q. Source: Study data (2026).

The mean *CEDI* score was *M*=1.290 (*SD* = 0.265), indicating that disclosure typically lay between qualitative narrative and quantified reporting. Corporate characteristic of firm size recorded the highest mean *M* = 16.397(*SD* =3.378), however, the minimum value .00 was associated with cases where data was represented by 1 unit of currency .Profitability recorded the lowest mean *M* = .0680 (*SD*=.0936). Average Tobin's Q was *M*=.988 (*SD* = .553), suggesting that the typical firm was valued close to the book value of its asset base, although values ranged widely from .14 to 3.93.

4.2 Diagnostic and Correlation Results

Tolerance values exceeded .20 and VIF values were below 10, indicating that multicollinearity was not material. The Durbin–Watson statistic was 1.635. The Breusch–Pagan test was not significant (χ^2 = 1.706, P = .191), supporting homoscedasticity. Although Kolmogorov–Smirnov and Shapiro–Wilk tests were significant, skewness and kurtosis were within the study's stated acceptable ranges for a sample exceeding 50 observations. Residual plots supported an approximately linear relationship. These diagnostics were treated as sufficient for the reported regression models.

Table 4: Pearson correlations

Variable	1	2	3	4	5
1. CEDI	1				
2. Firm size	.073	1			
3. Leverage	−.130	.193*	1		
4. Profitability	−.124	−.163	−.184*	1	
5. Firm value	−.226**	−.177*	−.033	.592**	1

*N = 129. * P < .05; ** P < .01 (two-tailed). Source: Study data (2026).*

CEDI was weakly and negatively correlated with firm value (r = −.226, P = .010). Profitability had a strong positive correlation with firm value (r = .592, P < .001). Firm size was weakly negatively correlated with firm value (r = −.177, P = .045), while leverage was not significantly correlated with firm value (r = −.033, P = .710). The negative firm-size sign reported here follows the underlying correlation table and corrects the contradictory positive wording in the source narrative.

4.3 Direct Effect of Carbon Emission Disclosure

Table 5: Direct-effect regression

Predictor	B	SE	β	t	P
Constant	1.595	.237	—	6.729	< .001
CEDI	−.471	.180	−.226	−2.617	.010

R = .226; R^2 = .051; adjusted R^2 = .044; F (1, 127) = 6.850, p = .010. Dependent variable: firm value, β = standardized coefficient; B and SE retain the original-unit coefficient and its standard error for reproducibility. Hypothesis interpretation uses β.

Source: Study data (2026).

Carbon emission disclosure explained 5.1% ***(****R^2 = .051*) of the variance in firm value, and the model was statistically significant, *(F* (1, 127) = 6.850, P = .010). The unadjusted standardized disclosure coefficient was negative (β = −.226, t = −2.617, P = .010). Thus, a one-standard-deviation increase in the disclosure index was associated with a .226-standard-deviation decrease in Tobin's Q in the direct-effect model. **H1** was supported because the association was statistically significant; the hypothesis did not specify a direction. The modest R^2 indicates that disclosure alone explains a limited proportion of valuation differences. However, this baseline model does not account for critical confounding firm characteristics. The resultant model is expressed as;

$$FV_{it} = 1.595 - .226CEDI_{it} + \varepsilon_{it} \quad (1)$$

4.4 Moderating Effects of Corporate Characteristics

Table 6: Hierarchical moderation model summaries

Moderator	Step	R^2	Adjusted R^2	ΔR^2	ΔF	P for ΔF
Firm size	CEDI	.051	.044	.051	6.850	.010
	+ Firm size	.077	.062	.026	3.540	.062
	+ CEDI × Firm size	.091	.069	.014	1.942	.166
Leverage	CEDI	.051	.044	.051	6.850	.010
	+ Leverage	.055	.040	.004	.528	.469
	+ CEDI × Leverage	.056	.033	.001	.084	.773
Profitability	CEDI	.051	.044	.051	6.850	.010
	+ Profitability	.374	.364	.374	37.663	< .001
	+ CEDI × Profitability	.422	.408	.048	10.415	.002

Dependent variable: firm value. Source: Study data (2026).

Table 7: Hierarchical Moderation model coefficients

Moderator	Step	B	SE	β	t	P
Firm size	(Constant)	.783	.926		.846	.399
	CEDI	.531	.724	.255	.734	.464
	+ Firm size	.049	.056	.297	.874	.384
	+CEDI× Firm size	-.060	.043	-.690	-1.394	.166
Leverage	(Constant)	1.666	.266		6.254	.000
	CEDI	-.515	.204	-.247	-2.524	.013
	+ Leverage	-.015	.031	-.155	-.472	.638
	+ CEDI × Leverage	.008	.028	.095	.290	.773
Profitability	(Constant)	.888	.213		4.174	.000
	CEDI	-.074	.162	-.035	-.455	.650
	+ Profitability	8.517	1.641	1.441	5.190	.000
	+ CEDI × Profitability	-4.523	1.402	-.890	-3.227	.002

a. Dependent Variable: Firm value. F (3, 125), β = standardized coefficient; B and SE retain the original-unit coefficient and its standard error for reproducibility. Hypothesis interpretation uses β.

Source: Study data (2026).

Firm size did not significantly moderate the carbon emission disclosure-firm value relationship (interaction $\beta = -.690$, t = −1.394, $P = .166$). Adding the interaction increased explained variance by 1.4 percentage points, but the increment was not statistically significant; **H2a** was not supported. The analysis was modelled as;

$$FV = .783 + .255CEDI_{it} + .297FSit - .690\ CEDI_{it} * FS_{it} + \varepsilon_{it} \qquad (2)$$

Leverage also did not significantly moderate the relationship (interaction $\beta = .095$, t = .290, $P = .773$; $\Delta R^2 = .001$), and **H2b** was not supported. These results indicate no statistically detectable variation in the disclosure slope with asset scale or leverage in the reported models. They do not establish that moderation is absent in all periods or populations. The established model was as under;

$$FV = 1.666 - .247CEDI_{it} - .155LEV_{it} + .095CEDI_{it} * LEV_{it} + \varepsilon it \qquad (3)$$

Profitability positively influenced firm value ($\beta = 1.441$, t = 5.190, $P < .001$). Further, profitability significantly moderated the relationship (interaction $\beta = -.890$, t = −3.227, $P = .002$). The model containing CEDI unadjusted explained 5.1% ($R^2 = .051$) of the variation in firm value, CEDI and profitability explained 37.4% ($R^2 = .374$) of firm-value variance; adding the interaction increased explained variance by 4.8 percentage points to 42.2 % ($R^2 =. 422$), which represented a significant improvement in model fit, $(\Delta F\ (3,125) = 10.415$, $P = .002$). **H2c** was therefore supported. In the final model, the standardized CEDI main coefficient was still negative but not significant ($\beta = -.035$, t = −.455, $P = .650$). The negative relationship still remained even after adjusting for firm profitability and accounting for year differences. The negative interaction indicates that the disclosure slope became more negative as profitability increased under the reported specification. Its magnitude is not a percentage change in firm value. Conditional slopes and their significance at particular profitability levels require additional probing of the original fitted model. The arrived at model was;

$$FV = .888 - .035CEDI_{it} + 1.441PT_{it} - .890CEDI_{it} * Profitability_{\ it} + \varepsilon_{it} \qquad (4)$$

The summary of the Moderating effects of corporate characteristics on the various hypothesis tests conducted is as indicated on Table 8 below.

Table 8: Final interaction-model coefficients

Model term	B	SE	β	t	p	Decision
CEDI × Firm size	−.060	.043	−.690	−1.394	.166	H2a not supported
CEDI × Leverage	.008	.028	.095	.290	.773	H2b not supported
CEDI × Profitability	−4.523	1.402	−.890	−3.227	.002	H2c supported

Source: Study data (2026).

5. Discussion

The modest negative direct relationship carbon emission disclosure and firm value implies that increased carbon transparency was not uniformly perceived by Kenyan investors as generating short term value over the period 2022-2024. This could be due to the short-term cost path associated with greater transparency. The extent of carbon transparency is likely to be associated with costs related to monitoring, verification, compliance, technology, transition and implementation costs. Alternatively, the exposure path could suggest that numeric carbon transparency can help expose previously hidden carbon risks. In a relatively immature disclosure and investor perception landscape, the exposure of transition risks could outweigh the longer-term effects of reputational gain. This finding is also in line with the negative relationship identified by Bedi and Singh (2024) and other research that has found a negative relationship between carbon exposure and firm value. It contrasts with research that has found an advantage to transparency (Kurnia et al., 2021; Niresh, 2024).

However, the findings do not suggest that disclosure should be decreased across firms. IFRS S2 was created to deliver information that is relevant for decision-making regarding climate-related risks and opportunities. There is a trend towards improved alignment in disclosure across jurisdictions (IFRS Foundation, 2023). A negative relationship could suggest that disclosure is actually having an impact as market participants are incorporating information on risk and transition costs into prices. Alternatively, it could suggest a trust issue where narrative disclosure is occurring in excess of actual proven emissions reductions. Reducing this trust issue could be accomplished through tying specific disclosures to financial impacts, targets, capital deployment, progress, governance, and/or corporate accountability.

The lack of moderation across firm size suggests that firm size by itself does not have an impact on the valuation relationship. This contrasts with the positive moderation of firm size observed by Bedi and Singh (2024) and supports the role of institutional factors. While firm size could have an impact on the level of disclosure, it could also create greater visibility and organizational complexity. These effects could cancel each other out. Leverage was also not found to moderate the relationship. While the level of debt within a firm could impact firm value either directly or via surveillance by lenders, it does not appear to significantly impact the market's reaction to disclosure within this study. The rationality of either firm size or leverage in relation to the level of disclosure (Githaiga, 2025) should not be viewed as evidence against the current study as the factors impacting disclosure are distinct from the moderators of valuation. Nasih et al. (2024) also look at the cost of debt but not in relation to valuation.

Profitability emerged as the key firm attribute. The large positive main relationship with firm value does indicate that operating performance is important to value. However, the negative relationship suggests that greater profitability also did more than merely attenuate the impact of carbon disclosure. Profitable firms may be expected to perform at a greater level with respect to environmental performance and thus a penalty may attach to disclosure indicating exposure but lacking the amount of transition achieved. Or, profitable firms with a high level of carbon intensity may disclose more accurately due to a greater level of exposure. However, because this is an observational study the relationship presented should be understood as a conditional relationship and not as causal. This significant moderation relationship differs from Nabila and Wardhani's (2025) study which found no moderation by profitability. Potential reasons for this discrepancy include different markets, methods of calculating profitability, and different samples. The current study does not separately address which of the explanations above may be at play.

6. Conclusions

The results indicate that carbon emission disclosure is negatively related to firm value for Nairobi Securities Exchange (NSE) listed firms during the 2022–2024 period. Tests of moderation reveal that the relationship between carbon emission disclosure and firm value is not significantly modified by firm size or financial leverage. However, profitability significantly moderates this relationship. Consequently, while firm size and financial leverage do not exert a statistically significant direct influence on firm value or moderate the carbon disclosure–firm value nexus, profitability emerges as a significant conditional factor in this relationship

For practitioners, the key implication is that carbon disclosure should be linked to performance and strategy, not performed as a compliance activity in isolation. Data on Scope 1-3 emissions should be provided alongside credible baselines, transition plans, capital implications, governance roles, and progress towards goals. For profitable firms, there should also be an explanation of how profitability enables decarbonisation and how transition activities enable the retention of future cash flows. These components could allow investors to differentiate between effective carbon investment and excessive environmental risk.

For the NSE, the Capital Markets Authority and other professional organizations, this study provides a basis for enhancing comparability, industry specific guidance and assurance. Interoperable GRI requirements and a path that adheres to IFRS S2 can aid in alleviating boilerplate text and inconsistent definitions. The 2025 implementation material from the IFRS Foundation and any updates to address practical aspects of GHG disclosure should be utilized in local guidance and for issuer education (IFRS Foundation, 2025a, 2025b). Consistent reporting of organizational boundaries and scopes, financed emissions (when applicable), relationships between climate-related information and financial information, estimation methods, and Scope 3 emissions should also be encouraged by regulators.

6.1 Limitations and Future Research

The study is subject to a number of limitations. Firstly, the three-year length of the study is relatively small and takes place at a time when disclosure standards for climate and sustainability information are still evolving. This may have affected the way companies disclose their information. Secondly, the number of firms (43) and firm year data (129) in this study have restricted the ability to make firm by industry inferences and has limited statistical power. Thirdly, the content analysis used assesses the extent and level of disclosure of carbon information but does not necessarily reflect on the accuracy, truthfulness, external verification or emissions performance of the companies. Hence, there is a risk of green washing or selective disclosure that is not fully addressed in this study. Fourthly, the use of hierarchical ordinary least squares regression methods does not adequately address the panel nature of the data and do not allow for causal inferences.

A longer study duration with a distinction between mandatory and voluntary disclosure practices is recommended. Panel regression methods (random or fixed effects) can be used with industry and time fixed effects and firm level clustering of standard errors. There is also opportunity to examine non-linear effects and use suitable methods for addressing endogeneity. Additionally, isolating the importance of carbon intensity, external verification, credibility of transition reports, disclosure quality can enhance analysis to determine if capital markets penalize either climate risk communicated through transparency or transparency itself.

6.2 Contribution of the Study

This study contributes to the literature by analyzing the relationship between carbon emission disclosure and firm value (Tobin's Q), while assessing the moderating effects of 3 corporate firm attributes (Firm size, Leverage and Profitability). This study makes three contributions. First, this study provides timely empirical evidence from Kenya for the years 2022-2024. This period captures a critical transitional phase characterized by the simultaneous implementation of international sustainability frameworks and local Environmental, Social, and Governance (ESG) regulations, sharing fresh perspectives into an emerging market context. Second, rather than treating firm characteristics as a homogenous, composite construct, this study explicitly separates the distinct moderating effects of firm size, leverage, and profitability**.** This disaggregated approach isolates how individual structural and financial attributes uniquely influence the relationship between carbon transparency and market valuation. Finally, this study constructs a novel combined Carbon Emission Disclosure Index (CEDI) integrated directly from the provisions of IFRS S2, the GHG Protocol, and GRI 305 standards. By doing so, it bridges the gap between capital market research and contemporary regulatory frameworks for climate-related financial disclosures**.**

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Appendix I: Carbon Emission Disclosure Checklist Based on the GHG Protocol, GRI 305 standards and IFRS S2- Climate related disclosure

S/No.	Category		Standard	Information
1.	Governance and Strategy (Emissions Management)	1	IFRS S2/ GRI 3-3	Management Approach -Describe how the organization manages emissions-related impacts, risks, and opportunities.
		2	(IFRS S2/GRI 2-12):	Governance Bodies- Identify the governance body(s) or individual(s) responsible for oversight of climate-related risks/opportunities, including emissions targets.
		3	(IFRS S2/GRI 102-1):	Transition Plan- Disclose the climate-related transition plan, including key assumptions, dependencies, and alignment with scientific evidence.
		4	(IFRS S2/GRI 102-4):	Carbon Pricing & Credits- Disclose the use of carbon credits to achieve net-zero targets, including the type, amount, and scheme.
2.	Emissions Accounting Methodologies	5	(GRI 305-1/IFRS S2(Par. 29(a)(ii–iii), B23–B31)	GHG Protocol Compliance - Measure emissions in accordance with the GHG Protocol Corporate Standard
		6	(GRI 305/IFRS S2 Par. 29(a)(iii)(1–3)	Consolidation Approach- Disclose the consolidation approach used (equity share, financial control, or operational control).
		7	(GRI 305/IFRS S2)	GWP Rates-Disclose the Global Warming Potential (GWP) rates used and their source (e.g., latest IPCC Assessment Report).
		8	(GRI 305/IFRS S2):	Base Year -Disclose the base year, rationale for choosing it, and emissions in that year
		9	(GRI 305/IFRS S2 Par. 29(a)(iii)(2)	Recalculation Policy- Disclose the policy for recalculating base year emissions in the event of significant changes.
3.	Greenhouse Gas Emissions Disclosures (Metric Tonnes)	10	(GRI 305-1/IFRS S2 (Par.29(a)(i)(1)	Scope 1 - Direct Emissions - Report gross direct emissions.
		11	(GRI 305-2/IFRS S2(Par.29(a)(i)(2)	Scope 2 - Location-Based Report gross location-based energy indirect emissions.
		12	(GRI 305-2):	Scope 2 - Market-Based -Report gross market-based energy indirect emissions (if applicable).
		13	(GRI 305-3/IFRS S2(Par.29(a)(i)(3)	Scope 3 - Total Value Chain -Report gross other indirect emissions
		14	(IFRS S2 Par.29(a)(vi)/GRI 305-3)	Scope 3 Categories -Specify the categories included (e.g., Upstream, Downstream).
		15	(IFRS S2- Par.29(a)(vi)/Amendments)	Financed Emissions: Report Scope 3 Category 15 emissions (for financial institutions).
		16	(GRI 305-1,3)	Biogenic Emissions: Report biogenic emissions separately from Scope 1 and Scope 3.
4.	Targets and Performance	17	(GRI 305-5/IFRS S2 Par. 33(a–h)	GHG Emission Targets- Disclose quantitative targets (absolute or intensity) to reduce GHG emissions, including interim targets.
		18	(IFRS S2 Par. 36(a–c)	Target Progress- Disclose progress made towards meeting the target
		19	(GRI 305-4)	Emissions Intensity: Report intensity ratios (e.g., tons of per revenue, per employee).
5.	Other Emissions (GRI Specific)	20	(GRI 305-6)	Ozone-Depleting Substances- Report production, imports, and exports of ODS in CFC-11 equivalent
		21	(GRI 305-7)	Air Pollutants- Report

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