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Carbon Emission Disclosure Evidence from Listed Companies in Indonesia: How Green Culture Moderate Leverage and The Green Strategy

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Abstract: This study examines the influence of green strategy and leverage on carbon emission disclosure, as well as the moderating role of green culture in strengthening this influence. Data were analyzed using linear regression modeling. This model tests the direct and indirect effects of green strategy and leverage on carbon emission disclosure, and explores the interaction effect of green culture. The results show that the green strategy has a significant positive effect on carbon emission disclosure, and the green strategy is proven to be an important strategy indicator in increasing corporate transparency regarding environmental impacts. Furthermore, the influence of green strategy is strengthened by the existence of a strong green culture, which reflects an organization's internal commitment to environmental issues across the company's operations. In contrast, leverage and its interaction with green culture do not significantly affect the variability of carbon emission disclosure, suggesting that financial pressure from debt does not encourage more transparent corporate environmental reporting behavior. This study provides practical implications for stakeholders; investors are encouraged to consider green strategy and green culture when assessing a company's long-term impact on the environment. This study offers a more comprehensive theoretical contribution: green strategy, as a corporate strategic choice, is proven to be a key determinant of carbon disclosure compared to financial pressures such as high leverage. These results demonstrate the company's strategic commitment to environmental issues. Future research is recommended to use a longer observation period, add other financial and non-financial variables, and explore the long-term financial impact of environmental initiatives.

Keywords: Carbon emission disclosure, green culture, green strategy, leverage, listed companies in Indonesia, financial and non-financial factors

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INTRODUCTION

In Indonesia, carbon emissions are increasing annually, with 2025 projected to be the hottest year on record, according to the Meteorology, Climatology, and Geophysical Agency (BMKG). High emissions indicate energy-intensive and environmentally unfriendly processes, while low emissions reflect the optimal implementation of green technologies and the intensification of energy efficiency improvements. Because carbon emissions

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reflect the environmental footprint of a company's operational processes, the next crucial issue is how carbon emissions are transparently disclosed as evidence of the company's commitment to managing the risks and impacts of climate change.

In recent years, corporate performance assessments have expanded beyond financial performance to include non-financial performance, including the disclosure of carbon emissions as a corporate responsibility for environmental issues (Hardiyansah, Agustini, & Purnamawati, 2021; Perera, Jubb, & Gopalan, 2019; Pratiwi, Maharani, & Sayekti, 2021; Ratmono, Darsono, & Selviana, 2021). Transparent and credible disclosure of non-financial performance reflects a company's strong ecological and social responsibility, which ultimately strengthens the company's reputation or value in the eyes of stakeholders (social legitimacy), expands access to funding at lower capital costs, and increases competitiveness (Bofinger, Heyden, & Rock, 2022; Edmans, 2023; Nishitani, Jannah, Kaneko, & Hardinsyah, 2017; Starks, 2021). Recent developments have seen carbon emissions as a crucial non-financial issue, not only impacting a company's operational activities but also serving as an indicator of environmental performance closely linked to reputational risk, regulation, and business sustainability (Radu & Maram, 2021; Saraswati, Puspita, & Sagitaputri, 2021; Wang, 2019). This situation requires company management to more comprehensively understand the financial and strategic factors that could potentially accelerate or hinder carbon emission reduction efforts, including their disclosure.

From a financial perspective, leverage represents a form of external oversight from creditors, who are increasingly sensitive to environmental issues (Hanifah & Gunaningrat, 2022; Meiryani et al., 2023). Companies with high levels of leverage indicate a heavy reliance on creditors for operational and investment financing. When companies are highly dependent on creditors, they face greater pressure. Therefore, companies need to manage risks from all aspects, including environmental risks, which directly impact their ability to repay debt. One way companies manage environmental risks is through disclosure mechanisms, such as ESG disclosure, CSR disclosure, and carbon emissions disclosure (Afrizal, Safelia, & Muda, 2023; Nisak & Yuniarti, 2018; Ulupui et al., 2020). High leverage pressure is believed to reduce carbon emissions through disclosure mechanisms, which demonstrate corporate transparency in managing long-term environmental risks to maintain their capacity to repay obligations and sustain operational stability.

From a non-financial perspective, companies are increasingly encouraged to develop strategic frameworks to reduce their operational carbon footprint. Increasingly stringent regulatory requirements regarding emission limits, carbon taxes, carbon trading, and carbon emissions reporting standards are forcing companies to innovate in various ways, including the use of more efficient technologies, alternative raw materials, more environmentally friendly products, and changes to processes and business models. A strategic framework that companies can develop is a green strategy. Through a green strategy, companies are expected to be better prepared to face new regulations through concrete programs that are not sporadic and reactive. Previous studies, Luo, Lan, and Tang (2012) and Song and Yu (2018), have shown that implementing a green strategy can improve environmental performance and strengthen corporate competitiveness. These research findings indicate that companies committed to implementing a green strategy tend to disclose carbon emissions more transparently. Conversely, disclosing carbon emissions without a robust green strategy potentially increases the risk of greenwashing (Treepongkaruna, Au Yong, Thomsen, & Kyaw, 2024).

High levels of leverage require companies to adopt green strategies as a strategic step to reduce carbon emissions and demonstrate the company's ability to manage long-term operational risks. However, the effectiveness of leverage pressure and green strategies on carbon emissions will depend heavily on the strength of a company's green culture. A strong green culture can be reflected in employee values, norms, and behaviors that support well-being. A green culture serves to accelerate the internalization of green strategies and ensure that corporate emissions reduction initiatives are consistently implemented across the organization (Hartino et al., 2021). In companies with a strong green culture, leverage pressure is not simply interpreted as a drive to achieve short-term financial performance, but rather as an effort to manage environmental risks more seriously through more comprehensive carbon emissions disclosures to reassure creditors and investors (Wang, 2019). The same applies to green strategies, which encompass everything from policy documents to systems, procedures, and day-to-day behaviors that encourage companies to measure, integrate, and report their carbon footprints more transparently (Al-Mesaiadeen, Mili, & AL-Soud, 2023). Thus, green culture plays a

moderating role that will strengthen the relationship between leverage and green strategy on the quality of carbon emission distribution because companies not only implement green strategies as a response to external pressures but also as an integration process of identity and daily work practices.

Several studies on carbon emissions as part of ESG have been conducted (Abdullah, Musriani, Syariati, & Hanafie, 2020; Hapsoro & Falih, 2020; Hardiyansah et al., 2021; Iswati & Setiawan, 2020; Lu & Taylor, 2018; Nasih, Harymawan, Paramitasari, & Handayani, 2019; Okudo & Ndubuisi, 2021) some literature shows gaps, namely (1) research related to carbon emissions still focuses on technical implementation, and there is still a lack of research that examines how green culture makes green strategies more effective in reducing carbon emissions. This study offers a theoretical contribution related to green culture as a cultural element that clarifies the direction of carbon emission disclosure; (2) there is still a lack of research that integrates financial pressure through leverage with environmental strategies through green strategies in one test model. This study offers an integrative framework that combines leverage and green strategies as different driving factors, but is predicted to influence more transparent carbon emission disclosure; (3) the context of developing countries such as Indonesia, which has lower ESG pressure, a looser regulatory framework compared to developed countries, and a gradual adoption of carbon emission disclosure, has not been represented in existing research. Therefore, this study aims to fill these gaps through a more integrative approach by linking leverage, green strategy, and green culture in influencing corporate carbon emission disclosure. Figure 1 illustrates the research model.

This model provides a more comprehensive theoretical contribution by considering the interaction between a company's financial condition, strategic choices, and internal value. This research also contributes to the broader literature, using green culture as a relatively rarely tested moderator in the context of carbon disclosure. Therefore, the hypothesis proposed in this study is.

H_1: Leverage has a positive effect on carbon emission disclosure.
H_2: Green strategy has a positive effect on carbon emission disclosure.
H_3: Green culture strengthens the influence of leverage on carbon emission disclosure.
H_4: Green culture strengthens the influence of green strategy on carbon emission disclosure.

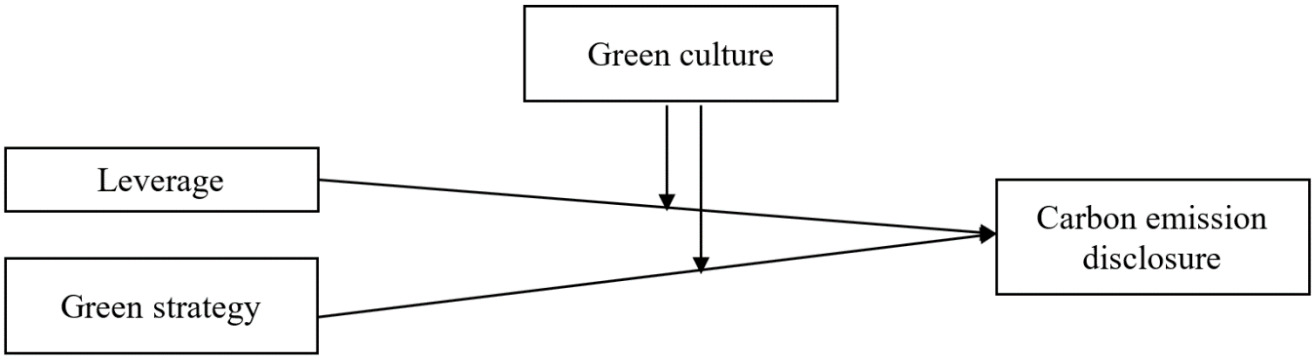

Figure 1: Research Framework

METHODS

This research employs a quantitative approach, utilizing secondary data collected from company reports, including both financial and non-financial reports. The focus is on data related to carbon emission disclosures, green strategies, green culture, and leverage. The selection of company samples in this study used a purposive sampling method, with the population consisting of all companies listed on the IDX, to produce results that are more generalizable and descriptive of carbon emission disclosures. Table 1 describes the company selection process with four main criteria:

Table 1: Sample Selection

Criterion	Number of Companies
Companies listed on BEI for the 2024 period	864
Companies that don't issue reports annually on the BEI during 2024	(89)
Companies that don't upload sustainability reports on the company website or BEI during 2024.	(53)
Companies that do not have complete data for the 2024 period.	(150)
Companies with outlier data	(22)
Number of Companies in the study	**550**

Operational Definition of Research Variables

Green strategy will be measured through the fulfillment of 18 indicators. Companies that disclose and implement a green strategy in their annual reports will be assigned a score of 1, and those that do not will receive a score of 0; the scores are then averaged. The higher the average green strategy score, the greater the extent of carbon emissions disclosure. Table 2 presents an analytical framework for understanding the implementation of green strategies in companies. Within this framework, the success of a green strategy is determined by the alignment between strategy formulation, management involvement, business model changes, and the company's ability to manage change.

Table 2: Green Strategy Criteria

Indicator Formulating and Pursuing Green Strategies	Level of Management Involvement in Green Strategy	Changes in the Company Business Model	Setting and Managing Green Strategy
Does the company have a green strategy in place?	Management's understanding of environmental issues.	The influence of environmentally friendly policies on current business models.	Changes in the company's organization.
Actively develop plans to adopt sustainable strategies.	Management meetings discussing environmental topics.	Management involvement in business model transformation.	Changes in management style.
Operational areas impacted by the green strategy.	Leadership commitment to developing a green strategy.	The company's interest in implementing environmental sustainability.	Lack of employee resistance.
Establishing and implementing a green strategy is crucial.	Development of a management plan for the green strategy.	Possible opportunities to introduce innovative business models.	Lack of management resistance.
	Estimate of the duration required to plan and implement the green strategy.		The length of time it takes to adopt a green strategy in the company.

$$Green\ Strategy\ Score = \frac{\text{Score of Green Strategy Criteria}}{Maximum\ Criteria\ Score}$$

The measurement of "green" culture is based on the extent to which the company adopts environmental values and implements them in its operations. A score of 1 is assigned when the indicator is met, and a score of 0 when it is not. The total scores are summed and then averaged. The six criteria are outlined in Table 3, which presents concrete indicators for assessing a company's orientation and commitment to environmental conservation, focusing on specific practices and organizational values reflected in the company's daily

operations. These indicators are used to evaluate the extent to which environmental concerns have been internalized in employee awareness, company values, strategic objectives, and operational practices.

Table 3: Green Culture Criteria

Indicator
The company makes efforts to encourage employees to understand the importance of environmental conservation.
The company has a clear policy regarding environmental awareness in every area.
Environmental conservation is a high-priority activity.
Environmental conservation is one of the company's core values.
The company can link environmental goals to corporate objectives.
The company can develop products and production processes that reduce environmental impact.

$$Go\ Green\ Culture\ Score = \frac{\text{Score of Green Culture Criteria}}{Maximum\ Criteria\ Score}$$

Leverage is a financial ratio used to assess a company's financial condition in relation to how much debt the company has compared to the assets it owns. The higher the level of leverage a company has, the higher the pressure to pay off debt rather than disclose carbon emissions, which only increases the company's financial burden. Companies with a high level of leverage will be very vulnerable to reputation risk; therefore, carbon emission disclosure can be used as an effort to mitigate this reputation risk. The higher the leverage ratio, the higher the carbon emissions disclosure will be, because the company seeks to strengthen carbon emissions disclosure in response to stakeholder expectations with increasing social and environmental responsibility.

$$Debt\ Assets\ Ratio = \frac{\text{Total Debt}}{Total\ Assets}$$

Disclosure of carbon emissions uses measurements through an information request sheet which employs five points: recording GHG, GHG reduction and costs, calculating energy consumption, assessing risks and opportunities for climate change, and accountability for carbon emissions (Bae Choi, Lee, & Psaros, 2013). Disclosure of carbon emissions is calculated from the total score related to the fulfillment of each criterion. A score of 1 is assigned if the company meets the criteria, and a score of 0 if it does not. Table 4 presents a comprehensive set of indicators to assess a company's carbon accountability, emphasizing not only emission recording but also the entire carbon management cycle, including measurement, reduction, energy management, and managerial accountability.

Table 4: Carbon Emission Disclosure Criteria

Indicator Greenhouse Gas Recording	Greenhouse Gas Reduction and Cost	Energy Consumption Calculation	Climate Change Risk and Opportunity Calculation	Carbon Emission Accountability
An explanation of the method used to calculate greenhouse gas emissions (e.g., the GHG or ISO protocols). Who conducts external verification of GHG emissions, and based on what criteria?	Details of actions or steps to reduce GHG emissions	The amount of energy used (e.g., tera-joules or peta-joules).	An evaluation or description of the risks, regulatory, physical, or general, associated with climate change and the steps taken or to be taken to manage those risks.	Signs regarding the board committee (or other executive body) that has overall responsibility for climate change-related actions.

The total amount of greenhouse gas emissions per metric ton of CO_2 produced.	Details regarding the target level of GHG reductions and the target year.			
State scope 1, 2, or 3 of carbon emissions.		The energy used is measured from renewable energy sources.	Evaluation/description of the financial implications, business implications, and current and future opportunities associated with climate change.	An explanation of how the board of directors (or other executive body) reviews the company's progress on climate change impacts.
Disclosure of GHG emissions by source (e.g., coal, electricity, etc.).	To date, emission reductions and cost savings have been achieved as a result of the reduction plan.			
GHG reporting based on facility or segment level.	Calculation of future emission costs is included in capital expenditure planning.	Delivery based on facility, segment, or type.		
Regarding GHG emissions compared to the previous year.				

In this study, the researchers recognized that the measurement of carbon emission disclosure, green strategy, and green culture contained subjective assessment elements. Therefore, the researchers implemented a series of control procedures to ensure the consistency, reliability, and trustworthiness of the resulting data, minimizing differences in interpretation. This study used a coding protocol in which each indicator was operationally defined and accompanied by clear assessment criteria to limit the scope for subjective interpretation and increase consistency among observational data. Furthermore, the indicator assessments were conducted by more than one independent assessor to reduce individual bias and tested using intercoder reliability.

This research data uses a documentation method, with data sources coming from company financial information published on the IDX website and company websites. The data analysis technique used is regression analysis. The regression equation tested in this study is as follows.

$$CED = \beta_0 + \beta_1 LEV + \beta_2 GS + \varepsilon \quad (1)$$

$$CED = \beta_0 + \beta_1 LEV + \beta_2 GS + \beta_3 GC + \beta_4 LEV*GC + \beta_5 GS*GC + \varepsilon \quad (2)$$

RESULTS AND DISCUSSIONS

Results

The data in this research have undergone the classic assumption tests, which include the normality test, multicollinearity test, and heteroscedasticity test. In this study, the normality of the data was assessed using the one-sample Kolmogorov-Smirnov Test, with a significance value of 0.367. This indicates that the data follow a normal distribution, making the linear regression model suitable for further analysis. Subsequently, the data were tested for meeting classical assumptions through a multicollinearity test, with all Variance Inflation Factor (VIF) values below 10. This suggests that there are no symptoms of multicollinearity among the independent variables and the dependent variable. The heteroscedasticity test employed in this research was the Glejser test, and the results showed that all variables had significance values above 0.05. This indicates that there are no signs of heteroscedasticity in the regression model of this research.

After fulfilling the classical assumption test for all data in this study, the next data analysis is related to descriptive analysis. Descriptive statistical analysis in this research is shown in Table 5. With a total of 190 observation data, the results of descriptive statistical analysis show that the Green Strategy carried out by the company is very comprehensive, and all companies implement a green strategy. Leverage is a financial ratio that indicates the company's ability to fulfill its debt obligations. The average leverage value in this study is 0.46, which shows that 46% of the company's assets in this study are pledged as collateral to pay debts. This also indicates that the company has a relatively high investment risk. Green Culture in this study has an average

value of 0.67, suggesting that the companies in this study have implemented a green culture in their operations. Finally, carbon emission disclosure has an average value of 0.31, indicating that the carbon emissions disclosures made by the companies in this study are still relatively low.

Table 5: Descriptive Statistical Analysis

Variable	Min.	Max.	Mean
Green Strategy	0.33	0.78	0.58
Leverage	0.00	2.27	0.46
Culture	0.17	1.00	0.67
Carbon Emission Disclosure	0.06	0.78	0.31

Table 6: Hypothesis Test

Variable	Sign	Model 1		Model 2	
		Coefficient	Prob.	Coefficient	Prob.
Green Strategy	+	0.250	0.001	0.266	0.040
Leverage	+	0.060	0.400	0.343	0.590
Green Culture				-0.266	0.594
Green Strategy*Green Culture				0.196	0.015
Leverage*Green Culture				0.047	0.593
R-Squared		0.098		0.146	
Adjusted R-Squared		0.084		0.126	
F-Statistic		6.750		6.613	
Prob (F-Statistic)		0.000		0.000	
Number of Observations		**550**		**550**	

In Table 6, it can be seen that the F-statistical probability value in this study is 0.000. This value is lower than 0.05, so it can be concluded that the variables in this study are worthy of research. Additionally, this value indicates that the independent variables have a simultaneous influence on the dependent variable. Looking more closely at the data in Table 6, model 1 shows that the probability value of the green strategy variable is 0.001, which is less than 0.05, indicating that the green strategy influences the disclosure of corporate carbon emissions. Conversely, the probability value of the leverage variable is 0.400, which is greater than 0.05, suggesting that leverage does not affect carbon emission disclosure. Green strategy has a significant positive effect on carbon emission disclosure, implying that companies in this study adopt a strong green strategy and view carbon emission disclosure as a means of external legitimacy that can enhance the company's competitive advantage (Bofinger et al., 2022; Edmans, 2023). Meanwhile, leverage has no effect on carbon emission disclosure, which means that leverage is not a strong determinant of carbon emission disclosure because it is worried that negative information related to carbon emissions worsens its perception of credit risk (Afrizal et al., 2023; Ulupui et al., 2020).

Table 6 shows that the R-squared value is 0.098. This value indicates that the green strategy and leverage variables (in model 1) can only explain 9.8% of the variance in carbon emission distribution. Meanwhile, 90.2% is explained by other variables. Additionally, this study used two models to test the presence of the green culture variable as a moderating variable. The results of the moderating variable test can be seen from the interaction test results in Table 6 (in model 2). Based on Table 6 (in model 2), it can be observed that green culture has no effect on carbon emission diversity, because the probability value is 0.594 > 0.05. This insignificant result indicates that a green strategy does not automatically encourage the disclosure of carbon emissions. Meanwhile, the interaction value between the green strategy and green culture variables has a probability value of 0.015 < 0.05, and the interaction value between leverage and green culture variables has a probability value of 0.593 > 0.05. These results suggest that green culture can strengthen the influence of green strategy

on carbon emission disclosure, and that green strategy is a consistent factor in increasing carbon emission transparency. The coefficient value of 0.196 in the green strategy*green culture interaction indicates that the relationship between green strategy and carbon emission disclosure increases by 0.196 with each increase in green culture. When green culture is low, the effect of green strategy is weakened, and when green culture is high, the effect of green strategy is strengthened. These results also demonstrate how green culture influences the implementation of green strategy. Meanwhile, the leverage variable remains insignificant, indicating that green culture does not change behavior related to debt structure (Sekarini & Setiadi, 2021). In this interaction test, green culture is considered a pure moderating factor.

The increase in R^2 and Adjusted R^2 values indicates that the model with green culture as a moderator (in model 2) better explains carbon emission disclosure. The significant F-statistic also indicates that this research model has an overall good fit and is suitable for use.

Discussion

The findings of this study indicate that corporate leverage does not affect corporate carbon emission disclosure; therefore, the hypothesis is rejected. Leverage reflects the funding structure and financial risk borne by the company. In this study, leverage, which reflects funding structure and financial risk, does not directly encourage increased carbon emission disclosure practices. These results are inconsistent with legitimacy theory, which states that higher leverage increases a company's tendency to disclose transparent information to seek legitimacy from stakeholders (Wiratno & Muaziz, 2020). Referring to the results of descriptive statistical analysis, the average leverage value of the sample companies was 0.46, indicating that the funding structure of these companies was not dominated by debt. Companies may experience pressure from regulators and the public regarding carbon emission reporting, but this pressure has not been observed from the creditor perspective. Therefore, carbon emission disclosure is not primarily driven by financial pressure from the company's funding structure.

In contrast to leverage, the green strategy in this study had a positive effect on carbon emission disclosure. This is illustrated by the highest descriptive statistic value of the green strategy, namely 0.78, which indicates that the green strategy has been implemented by the majority of sample companies in this study. From these results, it can be explained that the stronger a company's commitment to green strategy, the greater the impact on the disclosure of the amount of carbon emissions produced by the company more widely and transparently. This result is consistent with the testing of models 1 and 2 of the study. Referring to the coefficient values, probabilities, and statistical values that indicate green strategy influences carbon emission disclosure, the results of this study support the theory of legitimacy, where green strategy and carbon emission disclosure are implemented by companies transparently and proactively, as a tangible manifestation of the company's commitment to aligning its operational activities with social and environmental norms. Companies with a green strategy orientation will focus on developing environmental capabilities as a means to demonstrate the company's competitive advantage in the form of green differentiation (Barney & Arikan, 2005).

With a green strategy, a positive relationship between the company and its stakeholders is established because stakeholders' expectations are met, which ultimately impacts the company's image. The results of this study also support several previous studies that stated that implementing a green strategy increases carbon emission disclosure (Latan, Jabbour, de Sousa Jabbour, Wamba, & Shahbaz, 2018; Li, Huang, Ren, Chen, & Ning, 2018; Yang & Zhang, 2021). These results also indicate that a company's green strategy is not only related to the formulation and implementation of green strategies but also considers management involvement and business model changes, reflecting the extent of the company's commitment to addressing environmental sustainability issues.

The following discussion addresses the green culture variable as a moderating factor. However, the direct influence of green culture on carbon emissions is also essential. Table 6 indicates that the presence of a green culture alone is insufficient to motivate companies to reduce carbon emissions. The results of this study demonstrate that even when pro-environmental values and norms are embedded within a company, without a clear strategic drive, this green culture does not necessarily translate into formal and well-structured

reporting practices. This is particularly evident when green culture functions as a moderator. Table 6 shows that the green culture variable can enhance the influence of green strategy on carbon emission reduction, with a p-value of 0.015. This suggests that green culture amplifies the impact of green strategy on carbon emissions. In other words, a green strategy has a more significant effect when a company possesses a strong green culture. When a perceived green culture is robust, companies experience internal institutional pressure. This green strategy is then transformed into collective behavior, leading to alignment between strategic commitments and more comprehensive, transparent carbon emission reporting. Often, a green strategy without a corresponding strong culture remains merely a policy. Therefore, a green culture promotes more consistent implementation of the green strategy and results in more transparent carbon emission reporting. Conversely, companies with a strong green strategy but a weak green culture tend to produce limited reductions in carbon emissions.

Different results were shown in the interaction test between leverage and green culture. In this study, green culture was not proven to moderate the relationship between leverage and carbon emission disclosure. The existence of a green culture within a company was not strong enough to change the direction of the relationship between leverage and carbon emission disclosure practices. Fundamentally, leverage is an external pressure originating from the company's relationship with creditors, while green culture is an internal force that shapes the organization's values, norms, and habits. Therefore, green culture does not have a direct influence on how companies manage pressure from creditors, especially regarding non-financial reporting such as carbon emission disclosure. The results of this study are consistent with previous studies (Afni, Gani, Djakman, & Sauki, 2018; Al-Mesaiadeen et al., 2023; Li et al., 2018; Wang, 2019; Zheng & Jin, 2023) which showed that green culture will effectively moderate the relationship with variables that have value alignment, such as green strategy, green innovation, and environmental performance, rather than in relationships based on economic interests, such as creditors. Overall, the results of this study indicate that green culture is effective and significantly strengthens the relationship between green strategy and carbon emission disclosure, but is not effective in leveraging.

CONCLUSION

From the overall results of this study, it can be concluded that the green strategy has a significant positive influence on carbon emissions, and the influence of this green strategy is further strengthened by the existence of a green culture, which is a company's commitment to disclosing environmental issues that impact the company's operations. In this study, the leverage variable and its interaction do not affect the company's carbon emissions. The results of this study provide several practical contributions for stakeholders, namely: (1) for company management, the need to institutionalize green strategy into company culture by integrating green strategy targets and indicators into company strategic planning, performance measurement systems, and operational decision-making. Furthermore, carbon emissions should be part of strategic disclosure to ensure consistency between strategy, operational practices, and reporting. (2) For regulators, the results of this study indicate that carbon emission policies that only emphasize compliance aspects do not demonstrate their effectiveness. Therefore, regulators can develop disclosure guidelines that better reflect sustainable environmental commitments and governance strategies. (3) For investors and creditors, the results of this study can be used as a basis for differentiating companies that only make symbolic disclosures from those that have a commitment strategy with a strong corporate culture. Additionally, investors and creditors can incorporate green strategy and green culture dimensions into non-financial risk assessment models and financing and capital allocation decisions.

The results of this study have several limitations in answering the research problem, namely (1) the observation year in this study only uses 1 observation year, namely 2024. This is because the researcher believes that all companies are more exposed to issues related to the global agenda regarding the low-carbon transition. Therefore, the 2024 data provides a more representative picture of leverage, green strategy, and leverage in the context of relatively more mature distribution demands. In addition, this study does not focus

on the dynamics before and after regulation, but focuses on the structural relationship between variables. Furthermore, in 2024, the availability and completeness of annual reports and subscription data are higher compared to previous years, so the number of samples used remains adequate. For further research, it is possible to extend the observation period of the study to obtain results that better describe carbon emissions and test the stability of the relationships found. (2) This research is limited to analyzing 1 financial variable and 1 non-financial variable. This is due to the researcher's limited time in carrying out the data collection process. Future research could consider adding other variables that can describe a company's carbon emissions disclosure. In addition, further research can examine carbon emissions from the perspective of analyzing the long-term financial impact of investment in environmental activities.

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