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THE INFLUENCE OF CORPORATE GOVERNANCE MECHANISMS ON CARBON EMISSION DISCLOSURE: DOES GREEN PERFORMANCE MATTER?

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Abstract

Carbon emissions disclosure has attracted researchers' attention. This study aims to provide empirical evidence on the influence of more comprehensive corporate governance mechanisms on carbon emission disclosure based on legitimacy and stakeholder theories. This study introduces virtue ethics theory, a new theory in carbon emission research, to explain the moderating role of green performance. Observational data includes 455 data from a sample of companies listed on the Indonesia Stock Exchange from 2018 to 2022. The research data was processed using multiple linear regression methods and moderated regression analysis. The study's results prove that the size of the board of commissioners, the independence of the board of commissioners, the sustainability committee, and institutional ownership positively affect carbon emission disclosure. The green performance also revealed can strengthen the influence of board of commissioners diversity on carbon emission disclosure. Corporate governance is needed to encourage companies to disclose their carbon emissions.

INTRODUCTION

The enormous impact of carbon emissions on climate change has lured the awareness of researchers over the past decade (Orazalin et al., 2024; Bedi & Singh, 2024a; Bedi & Singh, 2024b; Furlan Matos Alves et al., 2017; Gonzalez Gonzalez & Zamora Ramírez, 2016). Organizations are required to endow more concern to this important impact by enhancing the governance aspect in encouraging corporate efforts to be more transparent in disclosing their carbon emission information (Bedi & Singh, 2024a; Bedi & Singh, 2024b; Gonzalez Gonzalez & Zamora Ramírez, 2016). Transparent corporate carbon emission information demanded by various stakeholders (Cadez et al., 2019). Disclosure of carbon information is a format of organization's contribution to a more sustainable future (Al Amosh & Khatib, 2024) and has become an important communication tool and reflects corporate accountability in providing information to stakeholders (Bui, Houqe & Zaman, 2020; Cadez, Czerny & Letmathe, 2019; Liu, Bilal & Komal, 2022). Currently, studies on CED are needed in developing countries (Bedi & Singh, 2024b; Furlan Matos Alves et al., 2017; Gonzalez Gonzalez & Zamora Ramírez, 2016).

Several studies proved that governance mechanisms hold a salient part in driving organizations' commitment to disclose carbon emission information (Chakraborty & Dey, 2023; Toukabri & Mohamed Youssef, 2023; Karim et al., 2021; Cordova et al., 2020; Bedi & Singh, 2024a; Bedi & Singh, 2024b; Kılıç & Kuzey, 2019; Elsayih et al., 2018). The focus of these studies is limited to the attributes of the board of directors (Chakraborty & Dey, 2023; Toukabri & Mohamed Youssef, 2023, Bedi & Singh, 2024c, Kılıç & Kuzey, 2019, Elsayih et al., 2018), internal governance (Karim et al., 2021; Cordova et al., 2020), climate governance (Bedi & Singh, 2024a), and governance ownership structure (Bedi & Singh, 2024b, Elsayih et al., 2018). Although these studies can provide valuable insights, they do not provide a comprehensive picture of corporate governance mechanisms. Considering these limitations, this study focuses on investigating a more comprehensive corporate governance mechanism in the Indonesian context that includes the size of the board of commissioners (hereafter, BOC), the independence of the BOCs, the diversity of the BOCs, the existence of a sustainability committee, institutional ownership, and managerial ownership.

The comprehensive corporate governance mechanism chosen in this study is based on the following reasons. Indonesia adopts a two-tier governance model therefore the existence and the role of the BOCs as a governance mechanism is a major concern. The BOCs has a central role in corporate governance because they represent stakeholders and have the duty and responsibility to oversee and ensure that management policies are taken entirely in the interests of the issuer in line with applicable regulations (Ghozali, 2020). The existence of a sustainability committee can help companies take into account environmental risks and encourage efforts to reach a steadiness between environmental strategy and business performance. Exploring the existence of a sustainability committee is very necessary in developing countries (Toukabri & Mohamed Youssef, 2023). Ownership structure can impact the reasons and resolution of organizations to reveal corporate details including carbon emission disclosure (hereafter, CED) (Bedi & Singh, 2024b). Institutional ownership and managerial ownership are relevant to study in developing countries (Bedi and Singh, 2024b; Elsayih et al., 2018). Institutional investors are more important than independent investors and can significantly influence corporate disclosure policies. In addition, managerial ownership can provide incentives to management to pursue more decisions that lead to sustainable development.

Further, our study considers that there is a possibility of a moderating variable on the influence of corporate governance mechanisms on CED based on virtue ethics theory. This theory states that corporate concern for the environment is the manifestation of the virtue ethics lived by the company (Aggarwal & Agarwala, 2021). One form of this manifestation is green performance which is an indicator that the company has made efforts to perform various occupation that support sustainability such as transparency in disclosing environmental information (Ullah et al., 2024). Therefore, our study suggests that green performance as the manifestation of the virtue ethics lived by the company will be the moderating variable on the influence of corporate governance mechanisms on CED. The novelty of our research is based on virtue ethics theory by using green performance as a moderating variable. Meanwhile, preceding studies that have successfully proven the influence of governance mechanisms have not considered the existence of moderating variables (e.g. Chakraborty & Dey, 2023; Toukabri & Mohamed Youssef, 2023; Karim et al., 2021; Cordova et al., 2020; Bedi & Singh, 2024a; Bedi & Singh, 2024b). These previous studies were based on legitimacy and stakeholder theory.

This research aims to empirically prove (1) the influence of corporate governance mechanisms on CED based on legitimacy and stakeholder theory and (2) the moderating role of green performance on the influence of corporate governance mechanisms on CED based on virtue ethics theory. The following paragraphs will explain the hypotheses development based on these theories. This study is expected to provide the following three contributions. First, this study explores corporate governance mechanisms more comprehensively in the Indonesian context. Second, this study tests the moderating role of green performance. This test is expected to provide new knowledge, especially in carbon emission research. Third, this study uses a new theory, namely virtue ethics theory. Virtue ethics theory is expected to surpass other theories in explaining why companies practice virtue by pursuing environmentally friendly practices.

Legitimacy theory explains the importance for organizations to give thought to the attentiveness of stakeholders to attain communal commitment, namely the implicit and explicit expectations and social and political pressures that companies face and must fulfill to maintain the success of the company's operations (Deegan, 2019). Consideration of the composition of the BOCs is crucial to realizing this social contract. The size of the BOCs is a pivotal corporate governance mechanism to support the functions of supervision and advisory (Cunha & Rodrigues, 2018). A larger BOC in terms of the number of members is expected to increase contributions to the company because the company has more expertise, knowledge, information, and experience. Chithambo & Tauringana (2017) stated something similar, namely that corporations that have large BOCs will have diverse knowledge, experience, and skills so that they can support and support more specific disclosure of carbon emissions. Previous studies conducted by Chakraborty & Dey (2023), Iswati

& Setiawan (2020), and Tila & Augustine (2019) found empirical evidence that the size of the BOCs can have a positive impact on CED. Although Chakraborty and Dey (2023) found that larger board sizes have a positive impact on the intensity of carbon disclosure, their study was limited to firms in one developing country, Bangladesh, which may not completely seize the shades of different governance structures in other developing countries. Similarly, Iswati and Setiawan (2020) focused on a sector-specific analysis, namely the manufacturing sector, which potentially raises further questions about how their findings can be applied more broadly across industries. In addition, Tila and Agustine's (2019) study also only focused on a group of industries included in the SRI-KEHATI Index category, which places more emphasis on the focus on carbon disclosure for investors.

The existence of an independent BOCs that is free from conflict of interest issues can encourage companies to indemnify more awareness of performance, sustainability, and long-term value creation rather than just prioritizing short-term profits (Nasih et al., 2019). Referring to the legitimacy theory, independent commissioners realize that companies are an integral part of a larger social system and as issuers, companies are bound by a social contract with society so that they must proceed in line with the standards that live in humanity and encourage companies to be more sensitive to social demands and expectations of all stakeholders rather than only prioritizing shareholders. This can then change the company's perspective regarding voluntary disclosure related to corporate responsibility for sustainable development and related environmental impact management. Previous studies conducted by Chakraborty & Dey (2023); Elsayih et al. (2018), and Tila & Augustine (2019) found empirical evidence that independent boards of commissioners have a positive effect on CED. Chakraborty & Dey (2023) evidence is limited to 250 firm years of the Dhaka Stock Exchange which may not be able to capture the nuances of CED in other countries, especially in other developing countries. Likewise, Tila and Agustine's (2019) research focuses on companies in certain index categories. Meanwhile, Elsayih et al. (2018) research tries to use a sample of large companies in one developed country, Australia, which has the potential to be explored further regarding how to apply it to medium-scale companies.

Diversity of the BOCs, including those related to gender diversity, can improve the board's aggregate expertise, thereby encouraging the process of identifying the most optimal strategy for dealing with potential conflicts among stakeholders (Harjoto et al., 2015). Al-Qahtani & Elgharbawy (2020) stated that women tend to have a communal, more participatory, and democratic leadership style. The presence of female commissioners can improve communication and diversity of opinions in discussions, thereby encouraging the inclusion of various points of view in decision-making. This will encourage an increase in the quality of disclosure and reporting. Promoting greater transparency regarding corporate climate change projects depends heavily on the important role of female leaders (Mardini & Lahyani, 2023). Furthermore, Hollindale et al. (2019) stated that women are more concerned, more willing to address various environmental issues, and also have more initiative to put up to the environment and sustainable development compared to men. This is aligns with the legitimacy theory which emphasizes that organizations operate not only to gain profit but also to maximize the value of stakeholders and ensure the sustainability of the company. Previous research by Ben-Amar et al. (2017), Al-Qahtani & Elgharbawy (2020), Elsayih et al. (2018), and Monica et al. (2021) proved that CED is accelerated by a high percentage of female commissioners. The research of Ben-Amar et al. (2017), Al-Qahtani & Elgharbawy (2020), and Elsayih et al. (2018) used samples of companies in developed countries but the results still need further proof in developing countries because differences in country characteristics can affect the results. Although the research of Monica et al. (2021) used samples in a developing country, the very limited number of samples can hinder the generalization process so further research in developing countries is still very much needed.

Furthermore, the existence of a sustainability committee can also be an effective governance tool so that companies can better respond to stakeholder demands related to environmental performance, such as CED (Elsayih et al., 2018). This is similar to the statement of Liao et al. (2015) who stated that the formation of a special committee in a firm is very significant in terms of supporting the credibility of monitoring, measuring, and recording which ultimately has an impact on CED in response to changes in stakeholder expectations. Through their research, Kılıç & Kuzey (2019), Bedi & Singh (2024c), and Toukabri & Youssef (2023) revealed that the existence of a sustainability committee influences CEDs made by companies. Kılıç & Kuzey (2019) research focuses on non-financial companies in Turkey. Research by Bedi & Singh (2024) used a sample of companies in India. Meanwhile, Toukabri & Youssef (2023) used a sample of US companies that voluntarily participated in the Carbon Disclosure Project survey. Based on this, there is still potential to further research the role and existence of sustainability committees on the tendency of companies to communicate their carbon emissions in other developing countries such as Indonesia.

In addition to the BOCs and sustainability committee, another internal corporate governance mechanism that can encourage transparency of company information is the ownership structure (Humairoh & Nurulita,

2022; Chandra & Rusliati, 2019; Elsayih et al., 2018). The ownership structure is believed to be able to align the regards of managers and proprietors so that it can be a trigger to reveal more details including non-financial details to stakeholders. The ownership structure in this study includes institutional ownership and managerial ownership. Institutional ownership refers to company shares owned by investment funds, pension funds, insurance companies, investment companies, and institutions that govern investments on behalf of others (Kenton, 2021). The existence of institutional ownership is trusted to be a successful observing tool for judgment made by management (Jensen & Meckling, 1976; Schmidt and Fahlenbrach, 2017). Institutional investors can support strengthening corporate governance in the companies they invest in (Rezaee & Fogarty, 2019). This can happen because institutional investors invest large amounts to try to prevent opportunistic behavior by company managers. In addition, institutional investors have incentives and opportunities to be actively involved in corporate governance and monitor actions and decisions made by management to ensure the performance of their investments. Institutional ownership is an effective monitoring and control mechanism concerning CED. Organizations will be encouraged to meet the information needs requested by investors, including in terms of disclosing information related to carbon emissions (Halimah & Yanto, 2018). Research by Pratiwi (2018) and Wibowo et al. (2023) produced empirical evidence showing that institutional ownership positively works on the extension of CED. Although the research of Pratiwi (2018) and Wibowo et al. (2023) has used samples of companies in Indonesia, the limited amount of data can reduce the ability to generalize. Therefore, further exploration using data in Indonesia is still relevant and needs to be carried out.

Furthermore, managerial ownership can provide incentives for management to have a long-term perspective in terms of developing and thinking about the sustainability of the company (Elsayih et al., 2018). Managers who own company shares will have a strong position to control the company, so managers will carry out activities that can maximize the value of the company (Utami et al., 2017). Concerning CED, management, who are also corporate shareholders, are aware of the information needs of stakeholders and they are in a position to have the capacity to provide the information needed by stakeholders, including those related to CED. The existence of managerial ownership will further encourage decision-making that aligns with the regards of stakeholders (Chithambo & Tauringana, 2017). Research by Elsayih et al. (2018), Wibowo et al. (2023), and Budiharta & Kacaribu (2020) provide empirical evidence that managerial ownership has a positive influence on the extension of CED. Elsayih et al. (2018) proved the impact of managerial ownership on CED in one of the developed countries. Meanwhile, research by Wibowo et al. (2023) and Budiharta & Kacaribu (2020) used company data in Indonesia. However, the sample companies focused on certain industry groups. Sample expansion is possible so it can increase generalization ability.

Companies have the potential to foster good actions and encourage ethical business behavior (Wang et al., 2016). MacIntyre (2007) stated that in practice, companies pursue "external goods" such as money, power, and success. In pursuing these external goods, companies try to promote the "internal goods" they have. These internal goods can be various business practices carried out and become the driving force behind business involvement in practices that lead to environmental issues, such as environmentally friendly practices. This aligns with the virtue ethics theory, the values of virtue lived by a company can encourage the organizations to be concerned about issues related to environmental impacts and encourage the organizations to manage these environmental impacts, including striving to achieve environmentally friendly performance (Aggarwal & Agarwala, 2021). The use of virtue ethics theory in CED research provides new knowledge, considering the dominance of carbon emission research that focuses on the use of legitimacy theory (e.g., Chakraborty & Dey, 2023; Wibowo et al., 2023; Budiharta & Kacaribu, 2020) and stakeholder theory (e.g., Elsayih et al., 2018; Wibowo et al., 2023; Budiharta & Kacaribu, 2020). Virtue ethics theory is expected to surpass other theories in explaining why companies practice virtue in the form of information transparency.

Chun (2017) stated that companies with virtue ethics can encourage stakeholder satisfaction, ultimately resulting in a differentiated position for the company. This position can lead the company to achieve better performance including environmentally friendly performance. Environmentally friendly performance reflects the procedures, objectives, and strategies implemented by company management to mitigate the negative impacts of the production process and strive to switch to an environmentally friendly system (Anvarjonov et al., 2024). Chen et al. (2018) stated that green performance is a positive consequence of environmentally friendly initiatives carried out by the company. Environmental friendly initiatives are part of an environmental management system that ensures that a company has taken proactive actions to minimize environmental impacts ranging from how the company uses resources and processes waste generated to supervising environmental performance and asking for participation and environmental awareness from stakeholders. Companies that achieve green performance are predicted to succeed moderately by strengthening the execution of corporate governance. Corporate governance can influence company policies including information disclosure policies such as CEDs which have leverage on the triumph of the firm's operations in the long term (Makpotche et

al., 2024). The moderating effect of green performance reflects corporate virtue and aligns with virtue ethics theory. Green performance can encourage the implementation of governance mechanisms and will ultimately improve corporate transparency efforts, including disclosing carbon emissions.

According to the description above, the proposed hypotheses are described as: (H1) The size of the BOCs has a positive effect on CED; (H2) BOC independence has a positive effect on CED; (H3) BOC diversity has a positive effect on CED; (H4) The sustainability committee has a positive effect on CED; (H5) Institutional ownership has a positive effect on CED; (H6) Managerial ownership has a positive effect on CED; (H7) Green performance strengthens the positive effect of BOC size on CED; (H8) Green performance strengthens the positive effect of BOC independence on CED; (H9) Green performance strengthens the positive effect of BOC diversity on CED; (H10) Green performance strengthens the positive effect of the sustainability committee on CED; (H11) Green performance strengthens the positive effect of institutional ownership on CED; (H12) Green performance can strengthen the positive effect of managerial ownership on CED.

The conceptual model is presented in Figure 1.

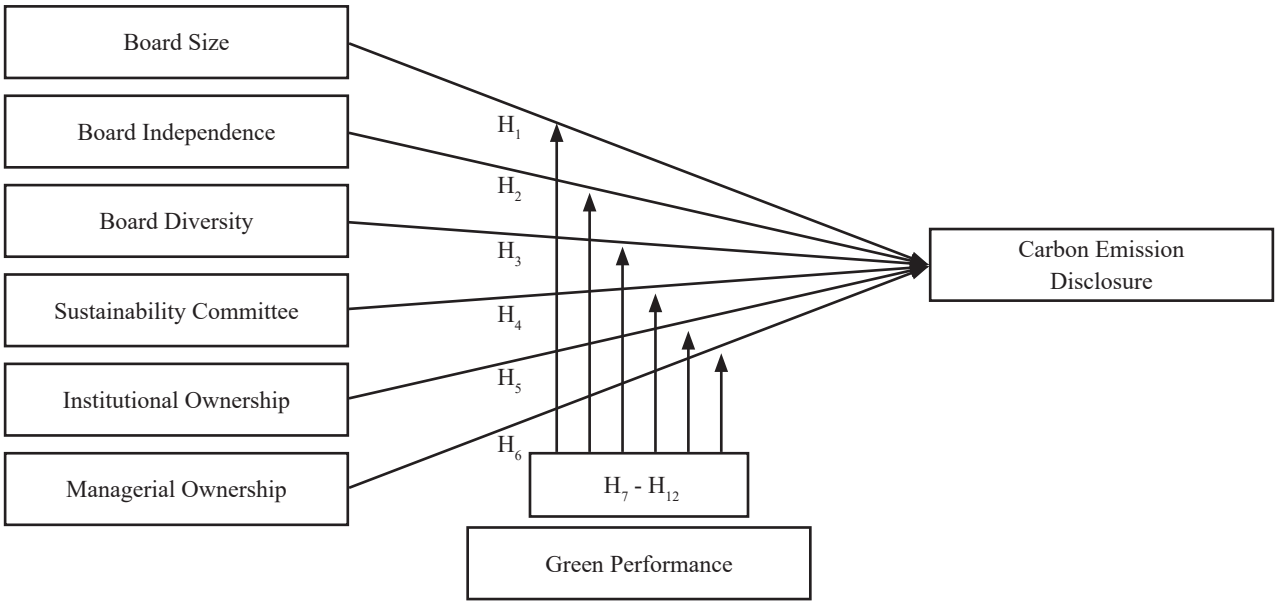

Figure 1. Conceptual Model

METHODS

Population is the entire group of people, events, or things that are of interest to researchers to be studied (Sekaran & Bougie, 2016). All companies listed on the Indonesia Stock Exchange (IDX) are the population in this study. From the existing population, the research sample will be determined (Sekaran & Bougie, 2016). Sample selection uses non-probability sampling with the purposive sampling method. This method has the potential to cause bias because the elements in the population do not have the probability of being selected as sample subjects. This has the consequence that the research results cannot be fully generalized convincingly to the entire population. However, the purposive sampling method is the only feasible sampling method to obtain the required data from a very specific industry group. In addition, the generalization process can be done by conducting further research by expanding the sample used.

The purposive sampling method determines a number of criteria in selecting samples. Companies included in the industrial sector, energy sector, and transportation and logistics sector listed on the IDX from 2018 to 2022 were selected as samples in this study. The Indonesian Stock Exchange is of interest in this research because Indonesia is ranked eighth as the country with the highest carbon emissions refers to the World Resources Institute (Friedrich et al., 2023). These sectors were chosen because they are of concern to the Indonesian government in the National Action Plan for Reducing Greenhouse Gas Emissions (Regulation of the President of the Republic of Indonesia, 2011). Data gathering was conducted by the second researcher under the supervision of the first researcher. The second researcher was briefed on the selected sector and how to obtain all data relevant to the research being conducted. All companies included in the industrial sector, energy sector, and transportation and logistics have a similar chance to be selected as samples as long as the company has the complete annual report data required in this study. Details of data acquisition are presented in Table 1.

Table 1. Research Data

Description	Total
Industrial sector listed on IDX	44
Energy sector listed on IDX	62
Transportation and logistics sector listed on IDX	23
Industrial sector companies with incomplete annual report data	(14)
Energy sector companies with incomplete annual report data	(16)
Transportation and logistics sector companies with incomplete annual report data	(8)
Total sample	91
Year of observation	5
Firm-years observation	455

Source: Processed Data (2024)

The measurement of all variables in this research is adopted and validated from previous studies. The formula used to measure each proxy is presented completely in Table 2. All proxies used in this study use ratio scales. All of the scales have been validated by previous studies in the context of CED research. The dependent variable in this study is CED. Carbon emission measurement uses an instrument developed by Choi (2013). This instrument consists of 18 statement items covered in 5 broad categories relevant to climate change and carbon emissions, namely climate change risks and opportunities (2 items), greenhouse gas emission accounting (7 items), energy consumption accounting (3 items), greenhouse gas reduction (4 items), and carbon cost and emission accountability (2 items). These five factors are factors identified by the Carbon Disclosure Project (CDP). Company responses to CDP are recognized as reliable in reflecting carbon emissions disclosure (Kılıç & Kuzey, 2019; Bui et al., 2020; Budiharta & Kacaribu, 2020). Data collection was carried out by creating a checklist to determine the extent of voluntary disclosures related to climate change and carbon emissions included in sustainability reports and annual reports. The carbon disclosure score was calculated by dividing the items disclosed by the company by the maximum number (18 items) of disclosures.

Corporate governance as an independent variable is measured by the proxy of the BOC size, BOC independence, BOC diversity, sustainability committee, institutional ownership, and managerial ownership. The proxy used to measure the size of the BOCs is the number of members All proxies used in this study use ratio scales. All of these scales have been validated by previous studies in the context of CED research. The independence of the BOCs refers to the proportion of independent BOCs. This proportion is calculated by dividing the number of independent commissioners by the total BOCs as a whole (Iswati & Setiawan, 2020; Kılıç & Kuzey, 2019; Tila & Agustine, 2019). The diversity of the BOCs in this study is diverse in terms of gender. A larger composition of the BOCs will encourage more disclosure of carbon emissions. Therefore, the measure of board diversity is proxied by dividing the number of female BOCs by the total BOCs as a whole (Kılıç & Kuzey, 2019). Sustainability committees are formed to develop programs and draw up directions associated with sustainability strategy. Sustainability committees are measured using the proxy of the number of sustainability committees held by the company (Chakraborty & Dey, 2023; Elsayih et al., 2018; Kılıç & Kuzey, 2019). Institutional ownership represents the company's shares held by institutional investors such as governments, financial institutions, mutual funds, pension funds, insurance companies, legal entities, foreign institutions, financing institutions, and other institutions. Institutional ownership is calculated by dividing institutional share ownership by the number of shares outstanding (Halimah & Yanto, 2018; Pratiwi, 2018). Managerial ownership represents the percentage of company shares owned by management who roundly elaborate on the decision-making process in an entity. Dividing the number of shares held by management by the total number of outstanding shares is the proxy used to measure managerial ownership (Budiharta & Kacaribu, 2020; Elsayih et al., 2018; Wibowo et al., 2023).

The moderating variable is green performance. Green performance measurement is measured using a dummy variable where a value of 1 will be given if the company has International Organization for Standardization (ISO) 14001 certification and 0 otherwise. Obtaining ISO 14001 reflects that the company commits to improving its environmental performance sustainably (Wang, 2019). This research uses four control variables which consist of firm size, leverage, profitability, and capital expenditure. The natural logarithm of total assets was used to determine firm size (Abang'a & Simbi, 2023; Cordova et al., 2020). Leverage is quantified by dividing total liabilities by total assets (Abang'a & Simbi, 2023). Profitability is quantified using the Return on Assets (ROA) ratio (Abang'a & Simbi, 2023; Chakraborty & Dey, 2023; Cordova et al., 2020). Capital expenditure is quantified by dividing capital expenditure by total revenue (Choi et al., 2013; Elsayih et al., 2018).

Table 2. Measurement of Variables

Variable	Formula	Sources
	Dependent Variable	
CED (CED)	$CED_{i,t} = \frac{\Sigma X_{i,t}}{N}$	Choi et al. (2013)
	Independent Variables	
Board Size (BOARDSZ)	BOARDSZ = Σ Member of the BOCs	Chakraborty & Dey (2023)
Independence of the BOCs (BOARDIND)	$BOARDIND = \frac{\Sigma \text{ Independent Commissioner}}{\Sigma \text{ Member of the BOCs}}$	Iswati & Setiawan (2020), Kılıç & Kuzey (2019), Tila & Agustine (2019)
Diversity of the BOCs (BOARDDIV)	$BOARDDIV = \frac{\Sigma \text{ Female Commissioner}}{\Sigma \text{ Member of the BOCs}}$	Kılıç & Kuzey (2019)
Sustainability Committee (SUSCOM)	SUSCOM = Σ Sustainability Committee Member	Chakraborty & Dey (2023), Elsayih et al. (2018), Kılıç & Kuzey (2019)
Institusional Ownership (INSOWN)	$INSOWN = \frac{\Sigma \text{ Shares Owned by Institutions}}{\Sigma \text{ Number of Shares Outstanding}}$	Halimah & Yanto (2018), Pratiwi (2018)
Managerial Ownership (MANOWN)	$MANOWN = \frac{\Sigma \text{ Shares Owned by Management}}{\Sigma \text{ Number of Shares Outstanding}}$	Budiharta & Kacaribu (2020), Elsayih et al. (2018), Wibowo et al. (2023)
	Moderating Variable	
Green Performance (GP)	Dummy variable (value of 1 if the company has implemented or has ISO 14001 certification and 0 otherwise).	Wang (2019)
	Control Variables	
Firm Size (FSIZE)	FSIZE = Ln (Total Asset)	Abang'a & Simbi (2023), Cordova et al. (2020)
Leverage (LEV)	$LEV = \frac{\text{Total Liabilitas}}{\text{Total Asset}}$	Abang'a & Simbi (2023)
Profitability (ROA)	$ROA = \frac{\text{Net Income}}{\text{Total Asset}}$	Abang'a & Simbi (2023), Chakraborty & Dey (2023), Cordova et al. (2020)
Capital Expenditure (CAPEX)	$CAPEX = \frac{\text{Capital Expenditure}}{\text{Total Revenue}}$	Choi et al. (2013), Elsayih et al. (2018)

Source: Processed Data (2024)

The empirical model of this research consists of 2 models. The first hypothesis to the sixth hypothesis were examined through the first model. Meanwhile, the seventh hypothesis to the twelfth hypothesis were examined through the second model.

Model 1:

$$CED_{i,t} = \alpha_0 + \beta_1 BOARDSZ_{i,t} + \beta_2 BOARDIND_{i,t} + \beta_3 BOARDDIV_{i,t} + \beta_4 SUSCOM_{i,t} + \beta_5 INSOWN_{i,t} + \beta_6 MANOWN_{i,t} + \beta_7 FSIZE_{i,t} + \beta_8 LEV_{i,t} + \beta_9 ROA_{i,t} + \beta_{10} CAPEX_{i,t} + \varepsilon_{i,t}$$

Model 2:

$$CED_{i,t} = \alpha_0 + \beta_1 BOARDSZ_{i,t} + \beta_2 BOARDIND_{i,t} + \beta_3 BOARDDIV_{i,t} + \beta_4 SUSCOM_{i,t} + \beta_5 INSOWN_{i,t} + \beta_6 MANOWN_{i,t} + \beta_7 GP_{i,t} + \beta_8 BOARDSZ*GP_{i,t} + \beta_9 BOARDIND*GP_{i,t} + \beta_{10} BOARDDIV*GP_{i,t} + \beta_{11} SUSCOM*GP_{i,t} + \beta_{12} INSOWN*GP_{i,t} + \beta_{13} MANOWN*GP_{i,t} + \beta_{14} FSIZE_{i,t} + \beta_{15} LEV_{i,t} + \beta_{16} ROA_{i,t} + \beta_{17} CAPEX_{i,t} + \varepsilon_{i,t}$$

To ensure data quality, this study conducted a classical assumption test before conducting hypothesis testing. The classical assumption test is one of the prerequisites that must be met in multiple linear regression analysis. This test is deliberate to warrant that the model used is capable so the estimation results obtained are accurate and are the best linear unbiased estimator (BLUE). The classical assumption test consists of normality, heteroscedasticity, multicollinearity, and autocorrelation tests. The normality test uses the Shapiro – Wilk W and Shapiro – Francia W' tests. The White test detects the heteroscedasticity problem. The multicollinearity test is guided by the value inflation factor (VIF) and tolerance values. The autocorrelation test uses the Breusch – Godfrey test.

Multiple regression analysis and moderated regression analysis using STATA software version 17 was used to test the hypotheses. Multiple regression analysis is a statistical technique for analyzing the relationship between one dependent variable and several independent variables (Hair et al., 2014). The value of a single selected dependent variable can be predicted using the known values of the independent variables. Multiple regression analysis is appropriate to use because this study has 6 independent variables and 1 dependent variable. Multiple regression analysis was used to test the first to sixth hypotheses. To test the seventh to twelfth hypotheses, this study uses moderated regression analysis because there are moderating variables.

RESULTS

The data used in this study amounted to 455 observations. This number comes from the number of samples of 91 multiplied by the observation period of 5 years. The sample size can be said to be adequate. Samples that are too large (for example, more than 500) are prone to Type II errors. This means that research findings are accepted when they should be rejected.

Table 3 shows the result of the descriptive statistical test. According to this table, CED has an average value of 0.3377 with a maximum value of 0.8889. Referring to these results, it is known that there are samples of companies that have achieved a CED level of 88.89%.

Table 3. Descriptive Statistics

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
CED	455	0.3377	0.2541	0	0.8889
BOARDSZ	455	3.7802	1.7090	2	10
BOARDIND	455	0.4266	0.1091	0.25	1
BOARDDIV	455	0.1257	0.1932	0	1
SUSCOM	455	0.6989	1.9224	0	12
INSOWN	455	0.7241	0.2314	0.0078	1
MANOWN	455	0.0515	0.1149	0	0.6018
GP	455	0.6198	0.4860	0	1
FSIZE	455	13.7776	1.7414	10.4237	19.8397
LEV	455	0.5681	0.3570	0.0064	3.1386
ROA	455	0.0221	0.1856	-1.0225	2.0718
CAPEX	455	0.1148	0.2966	0	3.9641

Source: Processed Data (2024)

Classical assumption testing is performed before hypothesis testing. The normality test uses the Shapiro – Wilk W and Shapiro – Francia W' tests. The test results show a probability value above 0.05, which means that there is no normality problem in this study. The White test is used to test the heteroscedasticity problem. The test results show that this study is free from heteroscedasticity issues because the Prob values <chi2. The multicollinearity test is guided by the value inflation factor (VIF) and tolerance values. Model 1 testing is free from multicollinearity problems because all variables have values less than 10 and tolerance values more than 0.1. Meanwhile, in model 2, there was a multicollinearity problem in the interaction variable between the independent variable and the moderating variable. However, this cannot be avoided and inherently occurs in research that uses moderating variables. The autocorrelation test uses the Breusch – Godfrey test. The test results show a Prob value < chi2 so this study does not suffer autocorrelation problem.

The results of hypothesis testing of model 1 and model 2 are presented in Tables 4 and 5. Model 1 shows the results of testing hypotheses 1 to 6. Meanwhile, model 2 shows the results of testing hypotheses 7 to 12.

Table 4. Hypotheses Test Results - Model 1

Variables	Coefficient	Significance	Conclusion
BOARDSZ	0.0288304	0.000***	H1 supported
BOARDIND	0.3502425	0.000***	H2 supported
BOARDDIV	-0.0484173	0.185	H3 not supported
SUSCOM	0.0362706	0.000***	H4 supported
INSOWN	0.1115642	0.018**	H5 supported
MANOWN	-0.1127256	0.151	H6 not supported
FSIZE	0.0294769	0.000***	
LEV	-0.0326934	0.125	
ROA	0.1132036	0.021**	
CAPEX	-0.0443764	0.014**	
_cons	-0.3998614	0.000***	
R Squared		0.313	

Source: Processed Data (2024)
Note: *** significance level at 0.01
** significance level at 0.05

The results in Table 4 show that the coefficient determination value (R2) is 0.313. This means that the variation of the independent variable can explain the variation of the dependent variable by 31.30%, the rest is explained by other variables not examined in this study. According to table 4, the size of the BOCs has a positive effect on CED with a p-value and coefficient value of 0.000 and 0.029, respectively. The p-value is less than 0.01 and the coefficient value shows a positive value. This result supports hypothesis 1. The results of the second hypothesis test show a p-value of 0.000 with a coefficient value of 0.350. The p-value is less than 0.01 and the coefficient value shows a positive value. It means that this research supports hypothesis 2 which states that the independence of the BOCs has a positive effect on CED. The third hypothesis which assumes that the diversity of the BOCs has a positive effect on CED cannot be supported by the results of this study. The test results show a p-value and coefficient value of 0.185 and -0.369, respectively. The p-value is more than the permissible values to be referred to in social research (namely 0.01, 0.05, and 0.10) and the coefficient value shows a negative value. The test results provide support for the fourth hypothesis with a p-value of 0.000 and a coefficient value of 0.036. The p-value is less than 0.01 and the coefficient value shows a positive value. This means that the sustainability committee has a positive effect on CED. This research provides support for the fifth hypothesis. The p-value is 0.018 (less than 0.01) and the coefficient value shows a positive value of 0.111. Companies will increasingly disclose their carbon information when they have high institutional ownership. This study failed to support the sixth hypothesis which assumes the positive effect of managerial ownership on CED. The resulting p-value and coefficient value are 0.151 and -0.113 respectively.

Table 5. Hypotheses Test Results - Model 2

Variables	Coefficient	Significance	Conclusion
BOARDSZ	0.0307816	0.026**	
BOARDIND	0.4302054	0.002***	
BOARDDIV	-0.0969278	0.056*	
SUSCOM	0.0350396	0.000***	
INSOWN	0.1018612	0.110	
MANOWN	0.0008315	0.498	
GP	0.2258093	0.025**	
BOARDSZ*GP	-0.0156676	0.179	H7 not supported
BOARDIND*GP	-0.1926174	0.150	H8 not supported
BOARDDIV*GP	0.1570276	0.055*	H9 supported
SUSCOM*GP	-0.0001614	0.495	H10 not supported
INSOWN*GP	0.0507309	0.319	H11 not supported
MANOWN*GP	-0.0337302	0.443	H12 not supported
FSIZE	0.0297136	0.000***	
LEV	0.0102712	0.369	
ROA	0.1082842	0.013**	
CAPEX	-0.0120620	0.265	
_cons	-0.5449970	0.000***	
R squared	0.384		

Source: Processed Data (2024)
Note: *** significance level at 0.01
** significance level at 0.05
* significance level at 0.10

The results in Table 5 show that the coefficient determination value (R2) is 0.384. This means that the variation of the independent variable can explain the variation of the dependent variable by 38.40%, the rest is explained by other variables not examined in this study. The R2 value in model 2 is higher than the R2 value in model 1. In model 2, there is an additional green performance variable as a moderating variable and the interaction between independent and moderating variables. The increase in the R2 value indicates that the variables added to model 2 contribute to the model.

Table 5 shows the results of testing the seventh to twelfth hypotheses. Acceptable p-values to support a hypothesis in social research are 0.01, 0.05, and 0.10. The seventh hypothesis which assumes that green performance can strengthen the positive influence of the size of the BOCs on CED has not been proven through this study. The p-value and coefficient are 0.179 and -0.016, respectively. Testing the eighth hypothesis also shows that the eighth hypothesis is not supported. The p-value and coefficient are 0.150 and -0.193, respectively. The results of testing the ninth hypothesis show a p-value of 0.055 and a coefficient of 0.157. This means that this study successfully supports the ninth hypothesis, that green performance can strengthen the positive influence of the diversity of the BOCs on CED. The test results show that it cannot provide support for the tenth hypothesis. This result is indicated by the coefficient and p-value of -0.000 and 0.495, respectively. The eleventh hypothesis was not successfully supported in this study. This result is indicated by the coefficient and p-value of 0.319 and 0.050, respectively. Green performance is not proven to moderate the effect of institutional ownership on CED. This study has also not succeeded in proving the twelfth hypothesis. The coefficient and p-value are 0.443 and -0.033, respectively. Green performance is not proven to moderate the effect of managerial ownership on CED.

The sensitivity test in this study uses the Bonferroni test. The test result is presented in Table 6. The Bonferroni test shows the same results as the results of the hypothesis testing that has been carried out except for the sixth hypothesis. The Bonferroni test results show that it successfully supports the sixth hypothesis. Managerial ownership influences carbon emission disclosure.

Table 6. Bonferroni Test Results

Variables	Significance
BOARDSZ	0.057*
BOARDIND	0.084*
BOARDDIV	0.137
SUSCOM	0.042**
INSOWN	0.000***
MANOWN	0.000***
BOARDSZ*GP	0.160
BOARDIND*GP	0.300
BOARDDIV*GP	0.078*
SUSCOM*GP	0.768
INSOWN*GP	0.774
MANOWN*GP	0.507

DISCUSSION

The results support hypothesis 1. The size of the BOCs has a positive effect on CED. This result aligns with research conducted by Chakraborty & Dey (2023), Iswati & Setiawan (2020), and Tila & Augustine (2019) which proves that the firm tends to disclose more carbon emissions if the firm has larger BOCs. This result is according to the legitimacy theory which explains the importance for an organization to consider the interests of all stakeholders to fulfill the social contract stated in the form of explicit and implicit expectations from stakeholders to the company. A larger BOCs in terms of the number of members has been shown to increase the contribution of the BOCs to the corporation. With a larger number of BOCs, indirectly the company has more and more diverse knowledge, experience, and skills so these can support and encourage the company in disclosing carbon emissions.

Hypothesis 2 which states that the independence of the BOCs has a positive effect on CED is also successfully supported. Chakraborty & Dey (2023), Elsayih et al. (2018), and Tila & Augustine (2019) show the same result. The more independent members of the BOCs, the more CEDs the company will make. Concerning legitimacy theory, companies need resources to operate and only organizations that are considered legitimate can ultimately obtain the rights to the resources they need. In the context of BOC independence, an independent BOC is one of the key resource providers because it can connect with external resources needed by the company. In addition, independent commissioners also realize that the company is part of a wider social system and is bound by a communal agreement with society. Companies are intended to act in line with the rules that exist in the community and encourage companies to be more sensitive to the social demands and expectations of all stakeholders rather than just prioritizing shareholders. This is what then triggers companies to disclose carbon emissions.

Testing has not supported hypothesis 3 which assumes that the diversity of the BOCs has a positive effect on CED. Chakraborty & Dey (2023), Kılıç & Kuzey (2019), and Tila & Augustine (2019) revealed the same result. The assumption that board diversity, especially related to gender diversity, can have a positive effect on CED has not been proven in this study. Female board members have not been able to influence companies' disclosure of carbon emissions. In this study, according to the data, from a total of 455 observations, 286 observations are periods that have no female commissioners on the BOCs. The low number of female commissioners is thought to be the cause of the failure to support this third hypothesis.

The test results support the fourth hypothesis. The sustainability committee has a positive effect on CED. Kılıç & Kuzey (2019) proved the same result. This is in line with the legitimacy theory, companies need to meet stakeholder expectations to obtain and maintain corporate legitimacy. One way to demonstrate corporate commitment to environmental issues is by forming a sustainability committee. The more sustainability committees a company has, the more CEDs the company will make. Corporations that have a sustainability committee are more motivated to proactively address environmental issues and increase awareness for the company as a whole regarding their responsibilities related to environmental aspects which can ultimately encourage companies to disclose carbon emissions.

The results of the study support the fifth hypothesis. CED can be influenced by institutional ownership. The results of this study are consistent with the research of Pratiwi (2018) and Wibowo et al. (2023). The greater the amount of institutional ownership, the more the disclosure of carbon emissions information. Legitimacy theory suggests that companies endeavor to obtain and keep legitimacy to support corporate sustainability, one of which is by paying attention to environmental issues. Through its institutional investors, companies are required to disclose information including CED. In addition, institutional investors also have incentives and opportunities to be actively involved in enforcing corporate governance and monitoring actions and decisions made by management to ensure the performance of the investments they make. Therefore, the greater the share ownership of the issuer owned by institutional investors, the greater the supervision of the issuer. The high level of institutional ownership in the company encourages the company to become more transparent, including disclosing carbon emissions to form a positive image for the company and contribute to the sustainability of the company.

This study cannot provide support for the sixth hypothesis which assumes that managerial ownership has a positive effect on CED. High managerial ownership levels have not yet had an impact on CED. Managerial ownership is insufficient or cannot align management interests with shareholders and other stakeholders. In general, stakeholders have a long-term perspective. They focus more on environmental impacts and the firm's long-term sustainability. On the other hand, management tends to think more about the company's short-term performance which has a direct impact on the incentives they receive. This difference in interests between management and stakeholders is what causes different views on the urgency of CED from the perspective of stakeholders and managers.

This study has not succeeded in proving the seventh hypothesis. Green performance has not been proven to moderate the positive influence of the size of the BOCs on CED. This result has implications that although the company has achieved green performance, this does not have a significant impact on the disclosure of carbon emissions made by the company. Green performance is one indicator that reveals that the company is becoming more aware to environmental issues that occur. However, the green performance that has been achieved is not able to immediately strengthen the positive influence of the size of the BOCs on CED. This is thought to be due to the existence of other factors such as the knowledge and special expertise of the BOCs that are needed to support CED.

The eighth hypothesis that assumes that green performance can moderate the positive influence of the independence of the BOCs on CED has not been proven through this study. This result has implications that although empirical evidence has been obtained that the independence of the BOCs has a positive influence on CED, it was also found that green performance was not significant enough to strengthen the positive influence of the independence of the BOCs on CED. Based on virtue ethics theory, it can be seen that virtue or moral values lived in a company can encourage the company to pay notice to issues related to the environment. Virtue or values held by the company can be reflected in the achievement of environmentally friendly performance. However, the green performance that has been achieved has not been proven to be able to strengthen the efforts of the independence of the BOCs in disclosing carbon emissions.

This study has succeeded in proving the ninth hypothesis. Green performance can strengthen the positive influence of the diversity of the BOCs on CED. Female BOCs are more able to adopt environmentally aware and sustainability-oriented values. The achievement of green performance by the company has encouraged the initiative of female BOCs to further increase concern for sustainability issues. The presence of female commissioners can also increase diversity of opinions in discussions, encourage the inclusion of various points of view in decision-making, and improve communication that occurs so that this encourages collaboration from various experts in an organization which can ultimately encourage the realization of CED.

The test results showed that they could not provide support for the tenth hypothesis. Green performance was unable to moderate the influence of the sustainability committee on CED. The sustainability committee is an optional corporate governance mechanism because its formation is not required by regulators, so relatively few companies have formed sustainability committees. Referring to research data from 91 issuers that were the research sample, only 24 issuers have sustainability committees and of the 24 issuers that formed sustainability committees, only 11 issuers have formed sustainability committees since 2018 while the rest have only formed sustainability committees in 2019 to 2022. Referring to the existing data, it can be seen that issuers that have sustainability committees are very limited so even though the company has achieved green performance, this achievement failed to moderate the positive influence of the sustainability committee on CED.

This study has not succeeded in supporting the eleventh hypothesis. Green performance has not been proven to moderate the influence of institutional ownership on CED. Green performance achieved by the company reflects that the company cares about environmental aspects including paying attention to CED. Institutional investors can take part in supporting the strengthening of corporate governance and become a control and monitoring mechanism for the company so that it can encourage the company to meet the information needs they need including those related to CED. However, these investors do not pay attention to whether the company has or has not achieved green performance.

This study has also not succeeded in proving the twelfth hypothesis. Green performance has not been able to prove that it can moderate the influence of managerial ownership on CED. Decisions related to CED are not only under the discretion of management but are also influenced by various other factors such as examples of resources owned by the company and the knowledge and expertise of the organization related to CED. The achievement of green performance does indeed encourage companies to carry out responsible business practices and prioritize environmental sustainability, although this does not specifically encourage the role of managerial ownership in CED.

CONCLUSIONS

This study successfully proves the positive influence of board size, board independence, sustainability committee, and institutional ownership on CED based on legitimacy theory and stakeholder theory. These results imply that the number and existence of the BOCs can encourage various company activities including carbon emission information disclosure activities. In addition, companies that have a sustainability committee will also be more motivated to disclose carbon emissions. Furthermore, the greater the share ownership of the issuer owned by institutional investors, the greater the supervision of the issuer. This condition can increase the company's transparency in disclosing various information including carbon emission information as an effort to contribute to the company's sustainability.

Thus, companies can participate in handling negative climate change by implementing good governance mechanisms, namely the size of the BOCs, the independence of the BOCs, the sustainability committee, and institutional ownership. In line with the legitimacy and stakeholder theory, these governance mechanisms

encourage companies to disclose their carbon emission information. For example, the greater the number of independent board members, the more they will be encouraged to seek legitimacy from the community that the company adheres to applicable rules. The larger number of board members will encourage each other to pay more attention to the stakeholders' interests.

This study also successfully proves the role of green performance moderation in strengthening the positive influence of BOC diversity on CED. The diversity of the BOCs in this study is reflected through diversity in terms of gender. The existence of female BOCs will be more motivated to encourage the realization of CED because women are more able to adopt insights and values toward sustainability. The concern of the female BOCs will be further strengthened by the condition of the company's achievement of green performance. This achievement makes female commissioners think that their environmental orientation aligns with the firm's perspective and achievements that prioritize environmental concerns, including concerns about the need for CED.

This study provides theoretical contributions by examining the moderating role of green performance and introducing virtue ethics theory that can provide new insights, especially in carbon emission research. This study also provides practical contributions in the form of a more comprehensive exploration of corporate governance mechanisms in the Indonesian context. Furthermore, the results of this study have implications that corporate governance is needed to encourage companies to disclose their carbon emissions. In addition, the study results also promote awareness of the need for companies to achieve green performance. This achievement can also positively impact the disclosure of company information, especially those related to carbon emissions. Company management needs to be aware of the expectations of stakeholders who are currently not only focused on profit or the company's financial performance alone.

This study has limitations, especially those related to the measurement of CED. This measurement contains the subjectivity of the researcher. This is an inherent consequence that occurs as a result of the implementation of content analysis. This is because, in terms of determining whether or not there is a CED point, depends on the researcher's understanding of the CED checklist. Choi et al. (2013) developed this checklist based on the Carbon Disclosure Project information request sheet. Further research can explore and use other proxies that are considered more objective. Furthermore, this study is a quantitative study using archival data. The characteristic of archival data research is to use of several measurements to measure variables. The measurement of variables in this study combines several proxies adopted from previous studies. This measurement process may not reflect actual business conditions and practices. Future research can enrich this archival data by conducting case studies and comprehensive interviews with parties in companies that are authorized to disclose carbon emissions. Finally, the industrial, energy, and transportation sectors in Indonesia are the sectors chosen to be the focus of our study. Future research can expand the company sector and explore other developing countries.

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