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Green Governance and Carbon Emission Transparency: Does Firm Age Matter?

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ABSTRACT

Purpose : The research aims to examine the influence of an independent board of commissioners, green strategy, and green investment on Carbon Emission Disclosure (CED), and to analyze the role of firm age as a moderating variable among the relationships.
Method : The research uses a quantitative approach with object is non-financial companies listed on the IDX from 2021 to 2024 with total of 800, sampling using purposive sampling with a total of 204 observations units. This research was analyzed using Moderated Regression Analysis (MRA) with E-views tools.
Findings : The results show that independent boards of commissioners and green investments significantly and positively influence CED. Meanwhile, the green strategy does not have a significant impact. Also, firm age can strengthen the influence of independent boards of commissioners and green investments on CED but not on the influence of green strategy.
Novelty : These findings provide theoretical contributions in enriching the literature related to carbon disclosure in developing countries by combining the perspectives of Stakeholder Theory, Legitimacy Theory, and Resource-Based View. Originally, this research offered the latest empirical evidence on the role of organizational characteristics in moderating the effectiveness of sustainability strategies on carbon emission reporting.

INTRODUCTION

Climate change remains an urgent global issue. It forces many countries to set strict regulations on reducing carbon emissions. Companies as major economic entities play a crucial role in reducing environmental impacts through sustainable business practices. One step in increasing environmental transparency and accountability is the carbon emissions disclosure. Carbon Emission Disclosure (CED) refers to the voluntary or mandatory reporting of a company's greenhouse gas (GHG) emissions, including both direct and indirect emissions, as part of its environmental performance (CDP, 2023). CED has emerged as a critical component of corporate accountability in addressing climate-related issues. It is integral part of Environmental, Social, and Governance (ESG) reporting. It has been a major concern for investors, regulators, and the public in general. Transparency in reporting carbon emissions helps stakeholders assess a company's environmental risk, the effectiveness of its sustainability strategy, and a strong commitment to climate change mitigation. Some findings show that carbon emissions disclosure can improve a company's reputation and reduce carbon-related risks. In turn, it can lower capital costs and improve financial performance (Singhania & Bhan, 2024).

The Global Carbon Budget 2023 reported that global carbon emission from fossil fuel use has been increasing significantly, reaching 36.8 gigatons of CO_2 in 2022, with significant growth in developing countries such as Indonesia (Friedlingstein et al., 2023). Indonesia is one of the largest carbon emitters in the world, with the energy, industrial, and deforestation sectors as the main contributors (World Bank, 2023). Besides, Woldometers (2016) showed that Indonesia is in the 10th place among the largest carbon-emitting countries (Figure 1).

Although the Indonesian government has implemented some policies such as Nationally Determined Contributions (NDCs) in the Paris Agreement, the emission reduction efforts still face various challenges. They include

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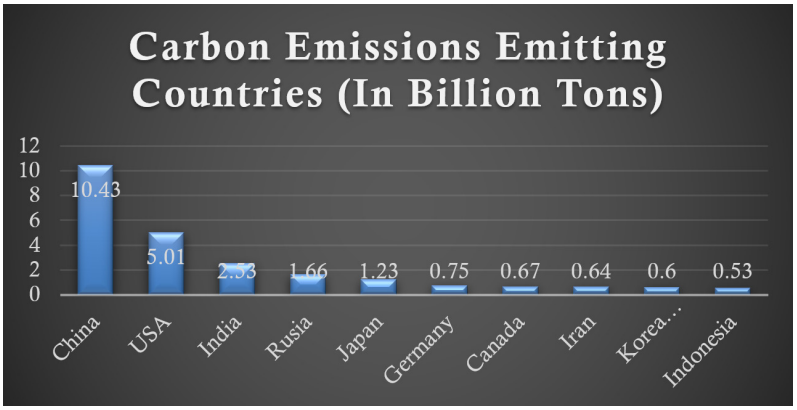

Figure 1. Carbon Emission Producers
Source: worldometers.info (2016)

high dependence on coal-based energy and weak industrial supervision (Ministry of Environment and Forestry, 2022). Internationally, companies must be more transparent in disclosing their carbon footprint through Carbon Emission Disclosre (CED) as an integral part of sustainability reporting. Some developed countries like the UK and the European Union have required companies to report their carbon emissions in their annual reports. Meanwhile, in Indonesia, this obligation is still voluntary, with regulations such as the Financial Services Authority (OJK) Regulation No. 51/POJK.03/2017. It has not been fully effective in increasing corporate transparency regarding their carbon emissions (Otoritas Jasa Keuangan, 2022).

There have been many negative environmental issues related to emissions in Indonesia. An example is that occurred in West Cikarang in 2022 by PT Kimu Sukses Abadi (PT KSA). The company was deemed to have committed several environmental violations, such as not having documents and approvals, discharging wastewater as mixed with rainwater drainage into water bodies, not having a technical permit to meet wastewater quality standards, storing B3 waste in open areas, and not having a place and technical details for storing B3 waste (Newsroom Diskominfosantik, 2022). There was also PT SIPP (PT Sawit Inti Prima Perkasa). In 2021-2022 the Living Environmental Service (LHK)reported it in terms of alleged watershed pollution. The pollution was in the form of waste dumping disposed of directly. The IPAL (Wastewater Treatment Plant) also did not comply with UKL/UPL (Environmental Management Efforts and Environmental Monitoring Efforts) and did not have a permit for waste management and B3 waste (Kasih, 2024). Also, the Ministry of Forestry and Environment (KLHK) has released eleven companies sanctioned for air pollution cases in the Special Region of Jakarta and its surroundings. Four of them were temporarily suspended.

To understand firm-level drivers of CED, the current study integrates insights from multiple grand theories. First, stakeholder theory (Freeman, 1984) argues that firms must respond to the interests of all stakeholders, including those concerned with environmental outcomes. Independent commissioners, as part of good governance, can represent stakeholder voices and enforce accountability. Second, institutional theory (DiMaggio & Powell, 1983) posits that firms adopt socially legitimized practices in response to regulatory, normative, and mimetic pressures, which may shape their carbon disclosure behavior. Lastly, organizational dynamics theory (Freeman, 1984) emphasizes how firm characteristics, such as age and structural maturity, influence adaptability and strategic implementation.

Past studies also showed that companies in developing countries have lower levels of CED compared to those in developed areas. It is due to less pressure from regulators, investors, and the public (He et al., 2013; Singhania & Bhan, 2024). Previous findings show the average level of CED in Indonesia is also low. Ummah & Setiawan (2021) studied financial and non-financial companies for the 2015-2019 period and found a CED rate of 47.90 percent. Wahyuningrum et al. (2025) explained the 23.28 percent CED rate in non-financial companies from 2016-2022. Next, Meiryani et al. (2023) and Wahyuningrum et al. (2024) showed that the average level of CED in companies listed on the Indonesia Stock Exchange for the 2016-2020 period is only 20.50 percent and 37.47 percent, respectively. These figures come from some sectors where the companies have high levels of carbon emissions due to their business activities that consume a lot of energy.

On the other hand, despite growing research on sustainability strategies, such as green strategy and green investment, their effectiveness in driving CED remains mixed. Some studies find positive associations (He et al., 2013; Yu et al., 2020), while others report insignificant effects (Sari & Susanto, 2021; Setiawan et al., 2022). Similarly, governance mechanisms like independent boards have shown inconsistent influence on CED across contexts (Amaliyah & Solikhah, 2019; Liao et al., 2015).

Based on the inconsistency of the results, firm age emerges as a potentially moderating variable. Older firms are often assumed to have more stable structures, better reporting systems, and greater exposure to stakeholder scrutiny, which may enhance the implementation of sustainability strategies and disclosure practices (Andreeva & Ritala, 2016). However, other studies argue that mature firms may also exhibit inertia or symbolic compliance (Li et

al., 2023; Mahmood et al., 2018), limiting the actual impact of green strategies on disclosure outcomes. This study presents novelty by providing new empirical evidence on how organizational characteristics, particularly firm age, can moderate the relationship between sustainability strategy and carbon emissions disclosure, which is still rarely discussed in the context of developing countries.

The stakeholder theory proposed by Freeman (1984) underscores that companies do not solely exist to maximize shareholder wealth, but rather have a broader responsibility to fulfill the interests and expectations of various stakeholders. These include not only investors and employees, but also regulators, environmental advocates, and society at large. In the context of heightened environmental awareness and global climate concerns, stakeholders are placing increasing emphasis on corporate accountability, particularly regarding environmental impacts such as carbon emissions. As transparency becomes a cornerstone of stakeholder trust, companies are expected to demonstrate genuine commitment to sustainability by disclosing their carbon footprints.

One critical governance mechanism that has gained attention in this regard is the role of independent boards of commissioners. Unlike internal board members, independent commissioners are unaffiliated with the firm's executive management, enabling them to carry out their oversight function more objectively. Their independence allows them to represent external stakeholder interests more effectively, and to challenge management decisions when environmental transparency is lacking. Consequently, they serve as an institutional safeguard to ensure that companies comply with stakeholder demands for environmental disclosure. This aligns with the notion of organizational legitimacy, wherein firms seek to maintain alignment with societal expectations through mechanisms of accountability.

Empirical studies across various jurisdictions reinforce this theoretical perspective. Liao et al. (2015) revealed that in the United Kingdom, companies with a higher proportion of independent board members were significantly more likely to engage in carbon emission disclosure, suggesting that board independence enhances environmental transparency. Similarly, Lahyani (2022) found that French firms with stronger board independence were more inclined to voluntarily report their carbon emissions, despite the absence of strict regulatory requirements. In developing country contexts, Chakraborty & Dey (2023) assert that in the context of developing countries, governance mechanisms with independent oversight play a significant role in influencing the level and quality of carbon disclosure.

Further support comes from studies conducted in the Indonesian setting and similar developing markets. For instance, Guenther et al. (2016) emphasized the role of stakeholder expectations in pressuring firms toward carbon transparency, while Yustina et al. (2024), Ardillah & Rusli (2022), and Solikhah et al. (2020) highlighted the contribution of independent commissioners in bridging stakeholder demands with managerial actions. These studies collectively suggest that board independence is a pivotal factor in fostering a culture of accountability and disclosure, particularly concerning environmental performance.

Based on these theoretical and empirical insights, it is reasonable to hypothesize that companies with a greater presence of independent commissioners are more likely to engage in carbon emission disclosure. Hence, the first hypothesis proposed in this study is that the independent board of commissioners has a positive and significant influence on carbon emission disclosure.

H_1: The independent board of commissioners positively influences CED

The green strategy is a managerial approach that integrates environmental considerations into the company's overall business strategy. Olson (2008) identifies three core dimensions of this strategy: the role of leadership, the role of policy, and illustrative actions. These dimensions reflect how a company's internal commitment to sustainability is translated into concrete practices. Leadership plays a crucial role in embedding environmental values at the strategic level, while environmental policy refers to the internal rules and systems that support sustainable operations. Illustrative actions represent measurable initiatives and innovations aimed at minimizing environmental impact. The consistent application of these dimensions encourages companies not only to affirm their commitment to sustainability but also to increase their tendency to disclose environmental information, especially that related to carbon emissions, as a form of accountability to stakeholders.

According to stakeholder theory (Freeman, 1984), a company's responsibility extends beyond its shareholders to include all parties affected by its operations, such as regulators, the local community, and investors. Within this framework, green strategy serves as a bridge between corporate operations and stakeholder expectations for sustainability and transparency. Companies that actively adopt green strategies tend to show greater motivation to disclose their environmental impact, including carbon emissions, as a reflection of their ethical and social responsibility. Fernando & Lawrence (2014) emphasize that stakeholder pressure is a key driver that compels companies to improve the quality of their environmental reporting. Similarly, Darlis et al. (2020) finds a positive correlation between green strategy and carbon emission disclosure, indicating that companies pursue such disclosures to maintain legitimacy and enhance their environmental reputation.

These findings are reinforced by numerous recent studies that highlight the significant link between sustainability strategy and carbon disclosure. Latip et al. (2022), Haleem et al. (2022), and Kuo & Chen (2013) show that firms with stronger green strategies are more likely to disclose their carbon emissions, especially under regulatory pressure and growing social accountability demands. In the Indonesian context, Yuliana & Wedari (2023), Linda

& Shanti (2022), as well as Ramadhani & Astuti (2023), find that companies implementing sustainability strategies tend to be more transparent in reporting their carbon emissions. This suggests that the effectiveness of green strategy depends not only on the internalization of sustainability values but also on a company's responsiveness to external pressures. Therefore, green strategy plays a crucial role in improving the quality of carbon emission disclosure, while simultaneously supporting corporate legitimacy and long-term sustainability.

H_2: Green strategy positively influences CED

Green investment reflects a company's proactive strategy to internalize environmental values into its capital allocation decisions by funding projects or technologies that minimize ecological harm. Rather than being influenced solely by voluntary idealism, investment is often a response to institutional pressures, including regulatory mandates, professional norms, and competitive dynamics within the industry. According to Institutional Theory (DiMaggio & Powell, 1983), organizations operate within a social framework that compels them to adopt structures and behaviors perceived as legitimate by external institutions. In this context, green investment is not merely an economic or ethical choice, but a rational response to coercive pressures from regulators, normative expectations from environmental standards, and mimetic tendencies to align with practices adopted by peer companies.

As environmental concerns become increasingly institutionalized, companies that fail to demonstrate visible action on sustainability risk being perceived as lagging or non-compliant. By allocating financial resources to green projects, firms can signal their alignment with institutional expectations and bolster their credibility in the eyes of stakeholders. This signaling process naturally extends to carbon emission disclosure (CED), which serves as a formal channel through which companies articulate their environmental performance. Studies by Afni et al. (2018), Syabilla et al. (2021), and Maharani et al. (2023) consistently show that companies investing in environmental initiatives are more likely to disclose their carbon emissions, reflecting both a commitment to sustainability and responsiveness to institutional environments. More recently, Herold et al. (2019) and Li et al. (2018) affirmed that higher green capital expenditure is positively associated with transparency in carbon reporting, particularly in sectors with rising environmental scrutiny.

Thus, from an institutional perspective, green investment acts as both a means of compliance and a strategic adaptation to maintain legitimacy in a changing regulatory and social climate. As pressure from governments, industry associations, and socially conscious investors intensifies, companies are increasingly incentivized to not only undertake sustainable initiatives but also to disclose them openly through mechanisms such as CED. This reflects a broader institutional isomorphism, in which organizations converge toward similar sustainability practices and reporting standards to maintain legitimacy and ensure survival within their operational environments.

H_3: Green investment positively influences CED

Resource Dependence Theory, as proposed by Pfeffer & Salancik (1978), highlights the strategic role of the independent board of commissioners in securing vital external resources for the company. These resources include legitimacy, broader access to information, and the ability to carry out effective oversight, especially in enhancing accountability and transparency in environmental reporting. An independent board serves as a vital bridge between the company and its external environment. It is instrumental in responding to institutional pressures such as regulatory demands and public expectations by improving the quality of environmental disclosures, including Carbon Emission Disclosure (CED) (Li et al., 2023). Companies that establish a strong and independent governance structure are generally better positioned to maintain legitimacy and public trust amid growing concerns about sustainability.

The growth of a company is usually accompanied by a strengthening of its organizational structure, expansion of its experience, and consolidation of its external network, which together enhance the effectiveness of board oversight. Older firms often face greater scrutiny from stakeholders due to their long-standing presence and reputation, compelling them to demonstrate more concrete commitments to environmental and social responsibility (Meiryani et al., 2023). Consequently, mature companies are typically more responsive to external pressures and are better equipped to deliver high-quality disclosures, particularly regarding carbon emissions. Sembiring (2020) found that the positive influence of the independent board on corporate social responsibility disclosure becomes more pronounced in well-established companies. Similarly, Jizi et al. (2014) noted that the effectiveness of independent commissioners in shaping environmental reporting is strongly influenced by organizational characteristics, including firm age. Therefore, company age may act as a moderating variable that enhances the relationship between the presence of an independent board and the level of carbon emission disclosure.

H_4: Firm age strengthens the influence of an independent board of commissioners on CED

According to Hannan & Freeman (1984) Organizational Ecology Theory, the survival and adaptability of organizations are determined by structural inertia, age, and their ability to respond to environmental changes. As organizations mature, they tend to develop more stable structures, routinized decision-making processes, and accumulated experience, all of which enhance their capacity to manage external pressures, including those related to environmental sustainability. In this context, the adoption of a green strategy, a company's strategic approach to reducing environmental impact is not implemented in a vacuum but shaped by the organization's ecological cha-

racteristics, particularly its age. Older companies, having withstood competitive selection over time, are more likely to possess the internal capacity and institutional resilience needed to execute sustainability strategies consistently and transparently.

Green strategy, when embedded in mature organizations, reflects not only a response to stakeholder expectations but also an evolutionary outcome of organizational learning and adaptation. These firms are typically better positioned to align their operations with public values and to disclose their carbon emissions systematically as part of maintaining legitimacy. Their experience in managing complex regulatory environments and stakeholder relationships contributes to more credible and structured CED practices. Empirical studies support this logic: Kuo & Chen (2013) found that environmental strategy has a significant effect on carbon disclosure, while Luo et al. (2022) noted that older firms are more responsive to external environmental pressures due to their governance maturity. Thus, firm age can strengthen the influence of green strategy on CED, acting as a moderating factor that reinforces the transparency and accountability of sustainability reporting. This relationship aligns with the ecological perspective that organizational survivability and legitimacy are shaped through long-term structural adaptation rather than short-term strategic shifts.

H_5: Firm age strengthens the influence of green strategy on CED

The Resource-Based View (RBV) theory, introduced by Barney (1991) , posits that a firm's ability to secure and sustain a competitive advantage depends on the uniqueness, rarity, and inimitability of its internal resources and capabilities. Among these, long-term commitment to environmentally sustainable investments, commonly referred to as green investment can be viewed as a strategic resource that reflects the firm's values, vision, and orientation toward long-term sustainability. Companies that have maintained their presence in the market for a longer period typically accumulate distinctive organizational competencies, such as deeper managerial experience, financial resilience, and institutionalized governance systems. These attributes enable them not only to allocate funds for green investment more effectively but also to integrate environmental considerations into their core business strategy in a way that is systematic, measurable, and well-documented. In this sense, green investment becomes a vehicle for translating sustainability commitments into measurable environmental performance, especially in the form of transparent carbon emission disclosure.

Older firms, having developed these internal strengths over time, are often better equipped to manage the complexities of environmental data collection and reporting. Their experience allows them to implement monitoring frameworks, internal controls, and external communication processes that support greater accountability in disclosing the environmental impacts of their operations. Moreover, firms with a long-standing reputation often face stronger public scrutiny and possess reputational incentives to signal their environmental responsibility to stakeholders through detailed and credible disclosure practices. This is supported by empirical research: Maharani et al. (2023) found that green investment significantly enhances the quality and extent of environmental disclosure, while Al-Alawi (2023) showed that firm age acts as a contextual factor that amplifies the influence of organizational attributes on environmental reporting outcomes. Thus, it is logical to conclude that older firms are more likely to reinforce the relationship between green investment and carbon emission disclosure (CED), as their organizational maturity and institutional readiness enable them to transform investment actions into transparent, stakeholder-oriented disclosures.

H_6: Firm age strengthens the influence of green investment on CED

RESEARCH METHODS

This research uses a quantitative approach with a hypothesis-testing study design. Data analysis uses Moderated Regression Analysis (MRA), utilizing data from annual reports and sustainability reports of non-financial

Table 1. Sample Selection Process

Sample Criteria	Total
Non-financial companies listed on the Indonesia Stock Exchange (IDX) for the period 2021-2024.	800
Non-financial companies not consistently publishing annual reports and sustainability reports presented in an integrated manner in 2021-2024	(721)
Number of sampled companies	79
Years of research	4
Total analysis units (79 companies x 4 years)	316
Analysis units providing required information	(75)
Outlier data	(37)
Final Analysis Units	204

Source: Processed secondary data (2025)

Table 2. Operational Definition of Research Variables

No	Variable	Definition	Indicator
1.	Carbon Emission Disclosure (Y)	Carbon emission disclosure is a disclosure related to a company's CSR regarding environmental pollution which includes carbon emissions (Hapsoro & Ambarwati, 2018)	CED = (Total Disclosure Score / Total Maximum Score) x 100% (Bae Choi et al., 2013)
2.	Independent Commissioner (X_1)	Independent commissioners are individuals who are not affiliated in any way, especially with the owner company (Trufvisa & Ardiyanto, 2019).	IC = Total Independent Commissioner / Total Board of Commissioner (Trufvisa & Ardiyanto, 2019)
3.	Green Strategy (X_2)	Green strategy is a strategy that complements business and operational strategies, including company assets that can help companies make decisions that have a positive impact on the environment (Abidin, 2021).	GS = (Total Implemented Score / Total Maximum Score) x 100% (Olson, 2008)
4.	Green Investment (X_3)	Green investment is a company's effort to preserve the environment and prevent environmental pollution by spending money to achieve good environmental performance (Syabilla et al., 2021).	GI = (Total Environment Cost / Total Cost) x 100% (Chen & Ma, 2021)
5.	Company Age (Z)	Company age is the length of time a company has been established and survived on the Indonesian Stock Exchange (BEI) and is able to compete in the business world (Dewinta & Setiawan, 2016).	AGE = Ln (Total Age) (Elshabasy, 2018)

Sources: Previous Research (2025)

companies listed on the Indonesia Stock Exchange (IDX) from 2021–2024 with total 800. These companies were chosen because they have operational activities that directly impact carbon emissions, so their emissions disclosures are more relevant for analysis. The sampling method is purposive with balanced panel data. It is used so that each company in the sample has the same number of observations during the research period, thus allowing consistent comparisons and increasing the validity of the analysis results. It results in 204 analysis units as selected samples. The analysis process is assisted by E-Views software. Table 1 presents details of the sample selection process. The research variables adopt the measurements of several previous studies, with the proxies shown in Table 2, while the research model is presented in Equation 1.

$$CED=\alpha + \beta_1 IC+ \beta_2 GS + \beta_3 GI+\beta_4 AGE+\beta_5(IC\times AGE)+\beta_6(GS\times AGE)+\beta_7 (GI\times AGE)+e \quad \text{.....1}$$

RESULTS AND DISCUSSIONS

Table 3 presents the results of the descriptive statistical analysis regarding CED, independent board of commissioners, green strategy, green investment, and firm age. The descriptive statistical analysis presented in Table 3 provides an overview of the distribution and central tendencies of the variables used in this study. The mean value of Carbon Emission Disclosure (CED) is 0.6180, indicating that, on average, companies disclose approximately

Table 3. Results of Descriptive Statistical Test

	N	Minimum	Maximum	Mean	Std. Deviation
CED	204	0.2222	0.9444	0.6180	0.1516
IC	204	0.2500	0.7500	0.4372	0.1179
GS	204	0.3000	1.0000	0.7382	0.1476
GI	204	0.0000	0.0079	0.0014	0.0020
AGE	204	2.0794	4.2905	3.5054	0.5195
Valid N (listwise)	204				

Source: Processed secondary data

Table 4. Moderated Regression Analysis (MRA)

Variable	Coefficient	Std Error	t-Statistic	Prob.
C	0.369209	0.061545	5.999014	0.0000
IC	1.443232	0.606937	2.377894	0.0188
GS	-0.582239	0.602262	-0.966754	0.3354
GI	116.4215	38.79603	3.000861	0.0032
IC_AGE	0.408647	0.170434	2.397686	0.0179
GS_AGE	0.261097	0.170733	1.529269	0.1286
GI_AGE	35.22008	11.81402	2.981209	0.0034

Source: Processed secondary data (2025)

61.8% of the expected carbon emission information. However, the wide range between the minimum (0.2222) and maximum (0.9444) values, along with a standard deviation of 0.1516, suggests heterogeneity in disclosure practices among firms. The Independent Commissioners (IC) variable shows a mean of 0.4372, which reflects that around 43.7% of the board members are independent on average. This is relatively in line with the minimum regulatory requirements in Indonesia, though the variation (SD = 0.1179) implies differing governance practices across companies.

The Green Strategy (GS) variable exhibits a relatively high average score of 0.7382, indicating that most firms claim to have implemented a substantial portion of environmentally oriented strategies. Yet, the variation across firms (SD = 0.1476) reveals room for improvement in uniformly applying sustainability strategies. In contrast, Green Investment (GI) remains significantly low, with a mean of only 0.0014 (or 0.14% of total cost), and a maximum value of just 0.0079, suggesting that firms are still reluctant or limited in committing substantial financial resources to environmental investments. Lastly, the firm age (AGE), measured using the natural logarithm, has a mean of 3.5054, indicating that the average firm age in this study is approximately 33 years. This reflects a mature sample with varied historical backgrounds, which may influence organizational capacity and institutional responses to environmental accountability. Collectively, these descriptive results indicate that while some aspects of environmental governance and strategy are relatively developed, financial commitment through green investment remains a major gap among non-financial companies.

These findings meet the classical assumption test, including normality multicollinearity, autocorrelation, and heteroscedasticity tests. The normality test was conducted using the one-sample Kolmogorov-Smirnov test, resulting in an Asymp. Sig. result of 0.073, so it can be concluded that the data meets the normality assumption. The multicollinearity test used the VIF and tolerance values for each variable. All independent variables had VIF values less than 10.0 and tolerance values greater than 0.1, indicating that all variables were free from multicollinearity symptoms. The results of the autocorrelation test show a Durbin-Watson (DW) value of 2.020, and a du value of 1.80305 and a 4-du value of 2.19695. Thus, the result obtained is $1.80305 < 2.020 < 2.19695$ which indicates that the regression model in this study has met the requirements to be free from autocorrelation problems. Meanwhile, the heteroscedasticity test shows that all the significance values of the independent variables exceed 0.05 so that the regression model is free from heteroscedasticity symptoms and the regression model can be said to be a good model. The MRA test conducted for this study used the Fixed Effect Model (FEM) as follows in Table 4 and the summary of hypotheses testig in Table 5.

The Influence of Independent Board of Commissioners on CED

The hypothesis testing results show that the independent board of commissioners significantly and positively affects CED so the first hypothesis (H_1) is accepted. This result is in line with the stakeholder theory. With a high proportion of independent commissioners, supervision can run more effectively. Therefore, management should pay more attention to the stakeholders' needs and expectations, especially regarding carbon impact reporting and business sustainability. The independent commissioners may act as a governance mechanism that bridges the needs

Table 5. Summary of Hypotheses Testing

Variable	Correlation	Coefficient	Prob.	Conclusion
Independent Commissioners (H_1)	Positive	1.443232	0.0188	Accepted
Green Strategy (H_2)	Positive	-0.582239	0.3354	Rejected
Green Investment (H_3)	Positive	116.4215	0.0032	Accepted
IC_age (H_4)	Strengthening	0.408647	0.0179	Accepted
GS_age (H_5)	Strengthening	0.261097	0.1286	Rejected
GI_age (H_6)	Strengthening	35.22008	0.0034	Accepted

Source: Processed secondary data (2025)

of various parties to generate more transparent and reliable carbon reporting. Independent commissioners, as parties without a direct relationship with management, thus have a more objective position in overseeing company policies, including carbon emissions reporting. Independent commissioners are generally more sensitive to external pressures, such as investor, community, and regulatory demands, and therefore tend to encourage management to be more transparent about the environmental impact of business activities. Their presence can strengthen corporate accountability and ensure that sustainability issues, including carbon emissions disclosure, are not overlooked in strategic decision-making. The findings support Ardillah & Rusli (2022), Trufvisa & Ardiyanto (2019), Liao et al. (2015), Jizi et al. (2014), and Astuti & Setiany (2021) who found that an independent board of commissioners can improve supervision's quality and positively influences the disclosure of environmental aspects, including carbon emissions. However, Sari & Susanto (2021), Setiawan et al. (2022), and Amaliyah & Solikhah (2019) found insignificant results.

The Influence of Green Strategy on CED

Hypothesis 2 in this study is rejected. This is because the significance level is higher than 0.05 (Table 5). This means the green strategy does not affect CED. Green strategy consists of various environmentally friendly policies and initiatives at the corporate level. It should be able to encourage more transparent CED. However, in some contexts, this strategy does not always have a significant impact on the level of carbon disclosure. The Legitimacy Theory (Suchman, 1995) explains that environmental disclosure can be used as a tool to gain or maintain legitimacy from stakeholders, but does not guarantee that an environmentally friendly strategy will be fully reflected in an adequate reporting level. In other words, green strategy is not necessarily followed by the quality or intensity of carbon disclosure, especially when there is no institutional pressure, mature governance values, or strong monitoring mechanisms.

This is due to the gap between formally formulated strategies and actual implementation at the operational level. Many companies may have developed green strategy documents in response to external pressures, but have not yet fully integrated them into concrete reporting systems and implementation practices. Furthermore, in developing countries like Indonesia, stakeholder pressure for environmental disclosure remains relatively weak, so green strategies tend to be symbolic and do not automatically encourage companies to disclose emissions data transparently and measurably. This suggests that the existence of a strategy alone is insufficient without a commitment to implementation and the support of a robust reporting system.

This finding supports Seroka-Stolka, et.al (2020) who found that adopting a green strategy does not significantly affect the quality of carbon disclosure, especially when stakeholder pressure is weak. Iatridis (2013) also reported that in some contexts, companies with a green strategy have not fully internalized the need to fully disclose carbon information. On the other hand, He et al. (2013) found that a mature environmental strategy can positively influence carbon disclosure, especially in countries with strong institutional pressure. The effects of a green strategy are highly contextual and depend on the value system, regulations, and stakeholder expectations.

The Influence of Green Investment on CED

The results in Table 5 show a positive effect of green investment on CED. It means H_3 is accepted. Green investment reflects the company's commitment to sustainable development by allocating resources to environmentally friendly technologies, energy efficiency, and reducing the impact of carbon emissions. Within the framework of Stakeholder Theory (Freeman, 1984), green investment is a strategic response of companies to meeting the stakeholders' expectations such as investors, consumers, and regulators who demand transparency and environmental responsibility. This kind of investment does not only show good intentions. It also encourages companies to communicate their environmental impacts openly through CED (CED).

The positive influence of green investment on carbon emissions disclosure can be explained by the direct link between environmental investment and the need for companies to demonstrate accountability for allocated funds. When companies spend resources on environmentally friendly technologies, energy efficiency, or emissions management systems, they are encouraged to report their impacts openly to stakeholders as a form of accountability and proof of sustainability commitment. Furthermore, green investment is generally associated with international reporting standards or sustainability programs that require information disclosure. Therefore, the larger the investment, the greater the tendency for companies to systematically disclose emissions data in their annual reports or sustainability reports.

This conclusion is similar to He et al. (2013) and Monteiro et al. (2021). They showed that companies that increase capital expenditure for green projects have a higher tendency to report detailed carbon emission data for their accountability and reputational image. Indriastuti & Chariri (2021) also emphasized that green investment plays a vital role in improving sustainability performance and encouraging more structured carbon reporting, especially in the energy and manufacturing sectors. However, Dissanayake et al. (2021) and Andrew & Baker (2020) remind us that without strong governance oversight, such disclosures can be symbolic and do not reflect the company's real efforts. Therefore, the success of green investment in encouraging carbon disclosure is highly dependent on the integration of environmental strategies with an accountable reporting system.

The Role of Firm Age in Moderating the Influence of Independent Board of Commissioners on CED

Hypothesis 4 is statistically accepted (Table 5). It means that the firm age can strengthen the influence of the independent board of commissioners on CED. The firm age supports the relationship between the effectiveness of the board of commissioners and CED. This is because more mature companies tend to have more established governance systems, reporting infrastructure, and stakeholder relationships. The Resource-Based View Theory (Barney, 1991) explains that the firm age reflects the accumulation of organizational resources, including knowledge, reporting processes, and strategic experience that enable the implementation of sustainability practices more effectively. When an old company has an independent and well-functioning board of commissioners, the influence of board supervision on CED becomes more significant due to the structural readiness and reporting culture.

Companies that have been operating for longer typically have more established governance systems, more stable organizational structures, and greater experience in addressing external dynamics, including sustainability demands. In this context, the presence of independent commissioners will be more optimal in carrying out their oversight function, supported by a well-established corporate infrastructure and culture. Independent commissioners in older companies also tend to have broader access to the company's historical information and a more comprehensive understanding of long-term strategies, making them better able to promote accurate and relevant carbon emissions reporting. Thus, company age is a factor that strengthens the effectiveness of independent commissioners' role in promoting environmental transparency through CED.

Some recent studies support this view, Ratmono et al. (2021) found that older companies tend to be more transparent in environmental disclosure because they have a reputation to maintain and stronger stakeholder pressure. Besides, Erin, et al. (2022) showed that the effect of board independence on sustainability disclosure increases in older and mature companies. In contrast, Sembiring (2020) noted that younger companies often experience limitations in implementing carbon reporting despite having an independent board structure due to a lack of experience or prioritizing short-term financial aspects. This suggests that firm age can act as an important moderating variable in the relationship between governance and CED.

The Role of Firm Age in Moderating the Influence of Green Strategy on CED

The results of hypothesis testing in Table 4 and Table 5 show that the fifth hypothesis is rejected due to insignificance. Green strategy is a strategic step for companies to reduce environmental impacts and increase social legitimacy through reporting, including CED (CED). However, the effectiveness of a green strategy in encouraging emission reporting does not always depend on the firm age. Within the framework of Institutional Theory (DiMaggio & Powell, 1983), companies do not only act based on economic rationality. They also respond to institutional pressures from regulations (coercive), professional norms (normative), and dominant industry practices (mimetic). In this context, older companies tend to have established stable organizational structures, work cultures, and reporting practices. Unfortunately, this stability does not always lead to adaptability. Those established for a long time often experience institutional isomorphism. It is a tendency to maintain outdated and "safe" practices based on market or regulator expectations, without making significant innovations in carbon reporting even though they have adopted a green strategy.

The insignificant moderating role of company age in the relationship between green strategy and carbon emission disclosure may be due to the fact that an organization's age does not always reflect its readiness to implement an environmental strategy effectively. Older companies may have established a strong organizational culture and bureaucratic processes, but these conditions can actually slow the adoption and implementation of new strategies, including sustainability strategies. Furthermore, without strong external pressure or clear internal impetus, a company's green strategy remains merely a formal document with no direct influence on carbon emission reporting practices. This suggests that company age alone is not sufficient to ensure the effectiveness of a green strategy in promoting environmental transparency.

Li et al. (2023) and Lutter (2000) found that older companies are slower to respond to external pressure to report green initiatives due to the more complex process of internalizing sustainability strategies. Mahmood et al. (2018) also showed that older companies carry out environmental reporting symbolically (greenwashing) to meet institutional pressures, rather than as a reflection of strategic commitment. Some established organizations show resistance to pressures for more transparent reporting. This is especially true when the green strategy is not supported by an institutional structure that supports environmental information disclosure. Firm age is not a moderating factor in the effect of green strategy on CED.

The Role of Firm Age in Moderating the Influence of Green Investment on CED

Tables 3 and 4 show that H_6 is accepted. It means firm age strengthens the influence of green investment on CED. Resource-Based View (RBV) theory (Barney, 1991) states that companies with a longer life have advantages in the form of accumulated knowledge, mature organizational processes, and strong supporting infrastructure, including in environmental investment management. The established experience allows them to channel green investment more strategically and measurably, which in turn increases the effectiveness of CED. In other words, well-established companies can better manage the risks and opportunities of environmentally friendly investments

and make them part of transparent and sustainable governance.

Companies that have been operating for longer periods generally have more experience, reporting systems, and established organizational structures, enabling them to manage and communicate the impact of their environmental investments more effectively. When companies undertake green investments, older companies tend to have internal mechanisms in place to assess and report the results of those investments, including carbon emissions disclosure. Furthermore, the long-standing reputations companies have built encourage greater vigilance and transparency in sustainability reporting to maintain public and investor trust. Therefore, a company's age can strengthen the relationship between green investment and CED, as its reporting capacity and commitment are more robust than those of newly established companies.

Yu et al. (2020) showed that long-lived companies have had better preparations to implement sustainability strategies. It is because they have more complex organizational structures and more established reporting systems. Similarly, Radaelli & Sitton-Kent (2016) confirmed that experienced companies are more likely to internalize the value of environmental investments into non-financial reporting processes, including carbon emissions. In contrast, relatively young companies may have limitations in resources and systems. Even though they make green investments, the resulting disclosures are not optimal. Therefore, firm age can act as a positive moderating factor that strengthens the relationship between green investment and CED.

CONCLUSIONS

The research findings conclude with the following points: (1) independent board of commissioners and green investment have a positive influence on CED; This implies that firms should not only ensure regulatory compliance regarding board composition, but also enhance the capacity of independent commissioners to understand, evaluate, and monitor environmental performance effectively. It also highlights the need for firms to treat environmental investments as strategic tools for enhancing transparency and stakeholder trust (2) green strategy does not have an influence on CED; It suggests that environmental strategies must be translated into measurable actions, rather than remaining symbolic commitments. (3) firm age strengthens the influence of independent board of commissioners and green investment on CED, but does not moderate the influence of green strategy on CED. It indicates that older firms, due to their established systems and longer institutional memory, are better positioned to translate sustainability investments into credible disclosures.

This research has some limitations. First, the research focuses solely on non-financial firms listed on the Indonesia Stock Exchange, which limits the generalizability of the findings to financial institutions or firms in other countries. Second, the use of balanced panel data required consistent reporting across all observation years, resulting in the exclusion of firms with missing data in any given period. This constraint may reduce the overall sample size and affect the representativeness of the results. Third, carbon disclosure was manually assessed from annual and sustainability reports, which may introduce subjectivity in the scoring process. Lastly, the study considers only firm age as a moderating variable, while other external factors, including regulatory pressure and investor expectations, could also shape the effectiveness of sustainability strategies on disclosure practices. Future research is encouraged to explore broader sectoral and institutional contexts and to include a wider range of moderating or mediating variables.

The research authors suggest that companies improve their green strategy to create environmentally friendly and low-emission companies and can increase their level of CED. Investors should also pay attention to green strategy in companies. A green strategy can increase the percentage of CED and mitigate future risks. Regulators are expected to strengthen carbon emissions reporting policies by the organizational characteristics, such as company age, to be more adaptable and encourage greater transparency. Also, there should be future studies using other proxies to measure independent boards of commissioners and green investment and add other variables such as carbon performance, stakeholder pressure, media exposure, and so on.

REFERENCES

Abidin. (2021). Designing Strategies and Green Business Models in the Coconut Oil Industry. *Primanomics : Jurnal Ekonomi dan Bisnis*, *19*(2), 2614–6789. https://doi.org/10.31253/pe.v19i2.583

Afni, Z., Gani, L., Djakman, C. D., & Sauki, E. (2018). The Effect of Green Strategy and Green Investment Toward Carbon Emission Disclosure. *The International Journal of Business Review (The Jobs Review)*, *1*(2), 97–112. https://doi.org/10.17509/tjr.v1i2.13879

Al-Alawi, A. I., BinZaiman, F. A., & Elnaggar, N. F. (2023). Factors related to corporate social responsibility implementation: the case of mobile operators in the Kingdom of Bahrain. *Arab Gulf Journal of Scientific Research*, *41*(3), 315–337. https://doi.org/10.1108/AGJSR-07-2022-0122

Amaliyah, I., & Solikhah, B. (2019). Pengaruh Kinerja Lingkungan dan Karakteristik Corporate Governance Terhadap Pengungkapan Emisi Karbon. *Journal of Economic, Management, Accounting and Technology*, *2*(2), 129–141. https://doi.org/10.32500/jematech.v2i2.720

Andreeva, T., & Ritala, P. (2016). What are the sources of capability dynamism? Reconceptualizing dynamic capabilities from the perspective of organizational change. *Baltic Journal of Management*, *11*(3), 238–259. https://doi.org/10.1108/BJM-02-2015-0049

Andrew, J., & Baker, M. (2020). Corporate Social Responsibility Reporting: The Last 40 Years and a Path to Sharing Future Insights. *Abacus*, *56*(1), 35–65. https://doi.org/https://doi.org/10.1111/abac.12181

Ardillah, K., & Rusli, Y. M. (2022). the Effect of Corporate Governance Structures, Environmental Performance, and Media Coverages To Carbon Emissions Disclosure. *Ultimaccounting Jurnal Ilmu Akuntansi*, *14*(2), 246–263. https://doi.org/10.31937/akuntansi.v14i2.2716

Astuti, T. W., & Setiany, E. (2021). The Effect of Board Characteristics on Carbon Emission Disclosure. *International Journal of Management Studies and Social Science Research*, *3*(5), 207–216. www.ijmsssr.org

Bae Choi, B., Lee, D., & Psaros, J. (2013). An analysis of Australian company carbon emission disclosures. *Pacific Accounting Review*, *25*(1), 58–79. https://doi.org/10.1108/01140581311318968

Barney. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99–120. https://doi.org/https://doi.org/10.1177/014920639101700108

CDP. (2023). *CDP Climate Change 2023 Reporting Guidance*. https://guidance.cdp.net/en/guidance?cid=46&ctype=theme&idtype=ThemeID&incchild=1&microsite=0&otype=Guidance&tags=TAG-13071%2CTAG-605%2CTAG-599

Chakraborty, R., & Dey, S. K. (2023). The effects of corporate governance mechanisms on voluntary corporate carbon disclosures: evidence from the emerging economy. *Journal of Economic and Administrative Sciences*. https://doi.org/10.1108/JEAS-09-2022-0209

Chen, Y., & Ma, Y. (2021). Does green investment improve energy firm performance? *Energy Policy*, *153*(121), 112252. https://doi.org/10.1016/j.enpol.2021.112252

Darlis, E., Kurnia, P., & Alamsyah, M. (2020). Carbon Emission Disclosure: A Study on Manufacturing Companies of Indonesia and Australia. *IOP Conference Series: Earth and Environmental Science*, *469*(1). https://doi.org/10.1088/1755-1315/469/1/012014

Dewinta, I. A. R., & Setiawan, P. E. (2016). Pengaruh Ukuran Perusahaan, Umur Perusahaan, Profitabilitas, Leverage, Dan Pertumbuhan Penjualan Terhadap Tax Avoidance. *E-Jurnal Akuntansi Universitas Udayana*, *14*(3), 1584–1613. https://doi.org/10.35829/econbank.v3i2.217

DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, *48*(2), 147–160. https://doi.org/10.2307/2095101

Dissanayake, D., Tilt, C., & Xydias-Lobo, M. (2021). Sustainability reporting by publicly listed companies in Sri Lanka. *Journal of Cleaner Production*, *129*, 169–182. https://doi.org/https://doi.org/10.1016/j.jclepro.2016.04.086

Elshabasy, Y. N. (2018). The impact of corporate characteristics on environmental information disclosure: An empirical study on the listed firms in Egypt. *Journal of Business and Retail Management Research*, *12*(2), 232–241. https://doi.org/10.24052/jbrmr/v12is02/tioccoeidaesotlfie

Erin, O., Adegboye, A., & Bamigboye, O. A. (2022). Corporate governance and sustainability reporting quality: evidence from Nigeria. *Sustainability Accounting, Management and Policy Journal*, *13*(3), 680–707. https://doi.org/10.1108/SAMPJ-06-2020-0185

Fernando, S., & Lawrence, S. (2014). A theoretical framework for CSR practices: Integrating legitimacy theory, stakeholder theory and institutional theory Future developments in Corporate Social Responsibility disclosure and performance practices in developing countries View project A THEORE. *Stewart The Journal of Theoretical Accounting*, *10*(1), 149–178. https://www.sciencedirect.com/science/article/pii/S0361368217300491https://www.journals.elsevier.com/accounting-organizations-and-societyViewproject

Freeman, R. E. (1984). Strategic Management: A Stakeholder Approach. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.263511

Friedlingstein, P., Rui, G., Jiaoyue, W., Longfei, B., Dan, T., Philippe, C., Steven J., D., Robbie M., A., Fengming, X., & Zhu, L. (2023). Global Carbon Budget 2023. *Earth System Science Data*, *13*(4), 1791–1805. https://essd.copernicus.org/articles/13/1791/2021/

Guenther, E., Guenther, T., Schiemann, F., & Weber, G. (2016). Stakeholder Relevance for Reporting: Explanatory Factors of Carbon Disclosure. *Business and Society*, *55*(3), 361–397. https://doi.org/10.1177/0007650315575119

Haleem, F., Farooq, S., Cheng, Y., & Waehrens, B. V. (2022). Sustainable Management Practices and Stakeholder Pressure: A Systematic Literature Review. *Sustainability (Switzerland)*, *14*(4), 1–23. https://doi.org/10.3390/su14041967

Hannan, M. T., & Freeman, J. (1984). Structural Inertia and Organizational Change. *American Sociological Review*, *49*(2), 149–164. https://doi.org/10.2307/2095567

Hapsoro, D., & Ambarwati, A. (2018). Antecedents and Consequences of Carbon Emissions' Disclosure: Case Study of Oil, Gas and Coal Companies in Non-Annex 1 Member Countries. *Journal of Indonesian Economy and Business*, *33*(2), 99. https://doi.org/10.22146/jieb.28756

He, Y., Tang, Q., & Wang, K. (2013). Carbon disclosure, carbon performance, and cost of capital. *China Journal of Accounting Studies*, *1*(3–4), 190–220. https://doi.org/10.1080/21697221.2014.855976

Herold, D. M., Farr-Wharton, B., Lee, K. H., & Groschopf, W. (2019). The interaction between institutional and stakeholder pressures: Advancing a framework for categorising carbon disclosure strategies. *Business Strategy and Development*, *2*(2), 77–90. https://doi.org/10.1002/bsd2.44

Iatridis, G. E. (2013). Environmental disclosure quality: Evidence on environmental performance, corporate governance and value relevance. *Emerging Markets Review*, *14*(1), 55–75. https://doi.org/10.1016/j.ememar.2012.11.003

Indriastuti, M., & Chariri, A. (2021). The role of green investment and corporate social responsibility investment on sustainable performance. *Cogent Business and Management*, *8*(1). https://doi.org/10.1080/23311975.2021.1960120

Jizi, M. I., Salama, A., Dixon, R., & Stratling, R. (2014). Corporate Governance and Corporate Social Responsibility Disclosure: Evidence from the US Banking Sector. *Journal of Business Ethics*, *125*(4), 601–615. https://doi.org/10.1007/s10551-013-1929-2

Kasih, N. (2024, April 25). *Penindakan tersangka pencemaran lingkungan di Bengkalis, Riau*. Indonesia Legal Network. https://www.indonesialegalnetworkco.id/penindakan-tersangka-pencemaran-lingkungan-di-bengkalis-riau/

Kuo, L., & Chen, V. Y.-J. (2013). Is environmental disclosure an effective strategy on establishment of environmental legitimacy for organization? *Management Decision*, *51*(7), 1462–1487. https://doi.org/10.1108/MD-06-2012-0395

Lahyani, F. E. (2022). Corporate board diversity and carbon disclosure: evidence from France. *Accounting Research Journal*, *35*(6), 721–736. https://doi.org/10.1108/ARJ-12-2021-0350

Latip, M., Sharkawi, I., Mohamed, Z., & Kasron, N. (2022). The Impact of External Stakeholders' Pressures on the Intention to Adopt Environmental Management Practices and the Moderating Effects of Firm Size. *Journal of Small Business Strategy*, *32*(3), 45–66. https://doi.org/10.53703/001c.35342

Li, D., Huang, M., Ren, S., Chen, X., & Ning, L. (2018). Environmental Legitimacy, Green Innovation, and Corporate Carbon Disclosure: Evidence from CDP China 100. *Journal of Business Ethics*, *150*(4), 1089–1104. https://doi.org/10.1007/s10551-016-3187-6

Li, X., Wang, N., Jiang, B., & Jia, T. (2023). Institutional pressures and proactive environmental strategy: The mediating effect of top managerial environment attitude and the moderating effect of new media pressure. *Business Strategy and the Environment*, *32*(8), 6106–6123. https://doi.org/10.1002/bse.3475

Liao, L., Luo, L., & Tang, Q. (2015). Gender diversity, board independence, environmental committee and greenhouse gas disclosure. *British Accounting Review*, *47*(4), 409–424. https://doi.org/10.1016/j.bar.2014.01.002

Linda, E. V, & Shanti, S. (2022). Keterkaitan Stakeholders Melalui Beberapa Faktor terhadap Pengungkapan Emisi Karbo. *Organum: Jurnal Saintifik Manajemen Dan Akuntansi*, *5*(2), 125–140.

Luo, X., Zhang, R., & Wang, J. (2022). Product market competition and carbon disclosure: Evidence from China. *Carbon Management*, *13*(1), 379–400. https://doi.org/10.1080/17583004.2022.2100830

Lutter, R. (2000). Developing Countries ' Greenhouse Emissions : Uncertainty and Implications for Participation in the Kyoto Protocol. *The Energy Journal*, *21*(4), 93–120.

Maharani, A., Agustia, D., & Qomariyah, A. (2023). The mediating role of green investment in political connection and carbon information disclosure: Empirical evidence in emerging stock market. *Cogent Business and Management*, *10*(3). https://doi.org/10.1080/23311975.2023.2264004

Mahmood, Z., Kouser, R., Ali, W., Ahmad, Z., & Salman, T. (2018). Does corporate governance affect sustainability disclosure? A mixed methods study. *Sustainability (Switzerland)*, *10*(1), 1–20. https://doi.org/10.3390/su10010207

Meiryani, Huang, S. M., Warganegara, D. L., Ariefianto, M. D., Teresa, V., & Oktavianie, H. (2023). The Effect of Industrial Type, Environmental Performance and Leverage on Carbon Emission Disclosure: Evidence from Indonesian LQ45 Companies. *International Journal of Energy Economics and Policy*, *13*(4), 622–633. https://doi.org/10.32479/ijeep.14466

Ministry of Environment and Forestry. (2022). *Implementation of Nationally Determined Contributions: Enhanced NDC Indonesia [Government report]*.

Monteiro, A. P., Pereira, C., & Barbosa, F. M. (2021). Environmental disclosure on mandatory and voluntary reporting of Portuguese listed firms: the role of environmental certification, lucratively and corporate governance. *Meditari Accountancy Research*, *31*(3), 524–553. https://doi.org/10.1108/MEDAR-09-2020-1001

Newsroom Diskominfosantik. (2022). *Ini Pelanggaran Pencemaran Lingkungan Oleh PT KSA di Cikarang Barat*. https://www.bekasikab.go.id/ini-pelanggaran-pencemaran-lingkungan-oleh-pt-ksa-di-cikarang-barat

Olson, E. G. (2008). Creating an enterprise-level "green" strategy. *Journal of Business Strategy*, *29*(2), 22–30. https://doi.org/10.1108/02756660810858125

Otoritas Jasa Keuangan. (2022). *Peraturan OJK Nomor 51/POJK.03/2017 tentang Penerapan Keuangan Berkelanjutan bagi Lembaga Jasa Keuangan, Emiten, dan Perusahaan Publik.* https://www.ojk.go.id/regulasi

Pfeffer, J., & Salancik, G. . (1978). *The External Control of Organizations: A Resource Dependence Perspective.* Harper & Row.

Radaelli, G., & Sitton-Kent, L. (2016). Middle Managers and the Translation of New Ideas in Organizations: A Review of Micro-practices and Contingencies. *International Journal of Management Reviews*, *18*(3), 311–332. https://doi.org/https://doi.org/10.1111/ijmr.12094

Ramadhani, K., & Astuti, C. D. (2023). Pengaruh Green Strategy Dan Green Investment Terhadap Carbon Emission Disclosure Dengan Media Exposure Sebagai Variabel Pemoderasi. *Jurnal Informasi, Perpajakan, Akuntansi, Dan Keuangan Publik*, *18*(2), 323–338. https://doi.org/10.25105/jipak.v18i2.17244

Ratmono, D., Darsono, D., & Selviana, S. (2021). Effect of carbon performance, company characteristics and environmental performance on carbon emission disclosure: Evidence from Indonesia. *International Journal of Energy Economics and Policy*, *11*(1), 101–109. https://doi.org/10.32479/ijeep.10456

Sari, K. P., & Susanto, B. (2021). Green strategy, corporate social responsibility disclosure, good corporate governance terhadap pengungkapan emisi karbon. *Business and Economics Conference in Utilization of Modern Technology*, 642–657. https://journal.unimma.ac.id

Sembiring, E. R. (2020). Analisis Pengaruh Good Corporate Governance Terhadap Corporate Social Responsibility. *Jurnal Riset Akuntansi & Keuangan*, *6*(2), 145–168. https://doi.org/10.54367/jrak.v6i2.1055

Seroka-Stolka, O., & Fijorek, K. (2020). Enhancing corporate sustainable development: Proactive environmental strategy, stakeholder pressure and the moderating effect of firm size. *Business Strategy and the Environment*, *29*(6), 2338–2354. https://doi.org/https://doi.org/10.1002/bse.2506

Setiawan, I., Gunawan, A., & Djunaidy, D. (2022). Analisis Pengungkapan Emisi Gas Karbon Ditinjau Dari Profitabilitas, Ukuran Perusahaan Dan Proporsi Komisaris Independen. *Jurnal Bisnis, Logistik Dan Supply Chain (BLOGCHAIN)*, *2*(1), 9–16. https://doi.org/10.55122/blogchain.v2i1.401

Singhania, M., & Bhan, I. (2024). Firm ownership structure and voluntary carbon disclosure: a systematic review and meta-analysis. *Sustainability Accounting, Management and Policy Journal*. https://doi.org/10.1108/SAMPJ-08-2023-0613

Solikhah, B., Yulianto, A., & Suryarini, T. (2020). Legitimacy Theory Perspective on the Quality of Carbon Emission Disclosure: Case Study on Manufacturing Companies in Indonesia Stock Exchange. *IOP Conference Series: Earth and Environmental Science*, *448*(1). https://doi.org/10.1088/1755-1315/448/1/012063

Suchman, M. C. (1995). Managing Legitimacy: Strategic and Institutional Approaches. *The Academy of Management Review*,

20(3), 571–610. https://doi.org/10.2307/258788

Syabilla, D., Wijayanti, A., & Fahria, R. (2021). Pengaruh Investasi Hijau dan Keragaman Dewan Direksi Terhadap Pengungkapan Emisi Karbon. *Konferensi Riset Nasional Ekonomi, Manajemen, Dan Akuntansi*, *2*, 1171–1186. https://conference.upnvj.ac.id/index.php/korelasi/article/view/1236/818

Trufvisa, U. S., & Ardiyanto, M. D. (2019). Pengaruh Karakteristik Dewan Komisaris Terhadap Pengungkapan Emisi Karbon. *Diponegoro Journal of Accounting*, *8*(1), 1–11. http://ejournal-s1.undip.ac.id/index.php/accounting

Ummah, Y. R., & Setiawan, D. (2021). Do Board of Commissioners Characteristic and International Environmental Certification Affect Carbon Disclosure? Evidence from Indonesia. *Jurnal Dinamika Akuntansi Dan Bisnis*, *8*(2), 215–228. https://doi.org/10.24815/jdab.v8i2.21332

Wahyuningrum, I. F. S., Ihlashul'amal, M., Utami, S., Djajadikerta, H. G., & Sriningsih, S. (2024). Determinants of carbon emission disclosure and the moderating role of environmental performance. *Cogent Business and Management*, *11*(1). https://doi.org/10.1080/23311975.2023.2300518

Wahyuningrum, I. F. S., Rizkyana, F. W., & Amal, M. I. (2025). Foreign influence on carbon disclosure : Evidence from Indonesian non-financial firms. *Journal of Open Innovation: Technology, Market, and Complexity*, *11*(3), 100603. https://doi.org/10.1016/j.joitmc.2025.100603

Woldometers. (2016). *Top carbon dioxide–emitting countries*. https://www.woldometers.info/co2-emissions/

World Bank. (2023). *Indonesia Country Climate and Development Report: Alignment of climate and growth ambitions through decarbonization*. https://www.worldbank.org/en/news/press-release/2023/05/03/world-bank-group-report-proposes-policies-investments-to-enable-indonesia-to-achieve-its-development-and-climate-goals

Yu, E. P. yi, Luu, B. Van, & Chen, C. H. (2020). Greenwashing in environmental, social and governance disclosures. *Research in International Business and Finance*, *52*(January), 101192. https://doi.org/10.1016/j.ribaf.2020.101192

Yuliana, Y., & Wedari, L. (2023). Desempeño del carbono, estrategia verde, efecto del desempeño financiero en la divulgación de emisiones de carbono evidencia de una industria altamente contaminante en Indonesia. *International Journal of Sustainable Development and Planning*, *18*(5), 1581–1588.

Yustina, A. I., Dewi, C. N., Mahmudah, H., & Andreanantenaina, H. (2024). Corporate Governance Mechanism for Carbon Emission Disclosure: Evidence from State-Owned Enterprises in Indonesia. *Global Business and Finance Review*, *29*(4), 28–42. https://doi.org/10.17549/gbfr.2024.29.4.28