

Green Strategy and Green Investment on Carbon Emission Disclosure: Environmental Performance as Mediation Variable

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ABSTRACT: Global climate change triggered by increased greenhouse gas emissions is encouraging companies to increase environmental transparency through carbon emission disclosure. This study aims to analyze the effect of green strategy and green investment on carbon emission disclosure, with environmental performance as a mediating variable in publicly traded companies listed on the Indonesia Stock Exchange (IDX) for the 2022–2024 period. The research sample was determined using a purposive sampling method, with the criteria being that the company received PROPER for three consecutive years, resulting in a total sample of 120 observations during the 2022–2024 period. Data analysis was performed using panel data regression with the Random Effects Model (REM) and the Sobel test to examine the mediation effect. The results show that green strategy, green investment, and environmental performance have a positive effect on carbon emission disclosure. In addition, green strategy has a positive effect on environmental performance. However, green investment has no effect on environmental performance. The results of the mediation test indicate that environmental performance is able to mediate the effect of green strategy on carbon emission disclosure, but is unable to mediate the effect of green investment on carbon emission disclosure. These findings indicate that the implementation of an integrated green strategy in a company's operational activities can improve environmental performance and encourage broader carbon emission disclosure. On the other hand, green investments made by companies are not necessarily able to improve environmental performance and therefore cannot strengthen their influence on carbon emission disclosure through environmental performance.

KEYWORDS: Carbon emission disclosure, green strategy, green investment, environmental performance.

I. INTRODUCTION

Global climate change is one of the most serious environmental challenges facing the world today (Ge & Zhang, 2025). The increase in the average temperature of the earth triggered by the accumulation of greenhouse gases, especially carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), has had a wide impact on the environment, human life, and the stability of the global economy (IPCC, 2023; Zhao et al. 2022). Human activities, particularly industrial activities and the use of fossil fuel-based energy, are the main contributors to increasing greenhouse gas emissions (Bhatti et al. 2024). This global warming phenomenon is causing significant climate change on a global scale. The economic impact is also evident in the potential decline in global economic output if emissions are not controlled (Zhang, 2023). Globally, carbon emissions have continued to show an upward trend following the Covid-19 pandemic (Sikarwar et al. 2021). The International Energy Agency (IEA) reported that in 2023, global carbon dioxide emissions reached over 37,4 billion tonnes, a 1,1% increase compared to the previous year and the highest level since records began (IEA, 2025).

Indonesia, as a country with rapid economic growth, is also not immune to these environmental issues. As reported on the Sindonews (2023) website, an estimated IDR 4,002 trillion is needed to achieve clean air quality throughout Indonesia. Furthermore, data from the Joint Research Centre (JRC), a research-based policy support organization of the European Commission, shows that Indonesia is one of the ten countries with the largest global greenhouse gas emissions. This data is presented in Figure 1.

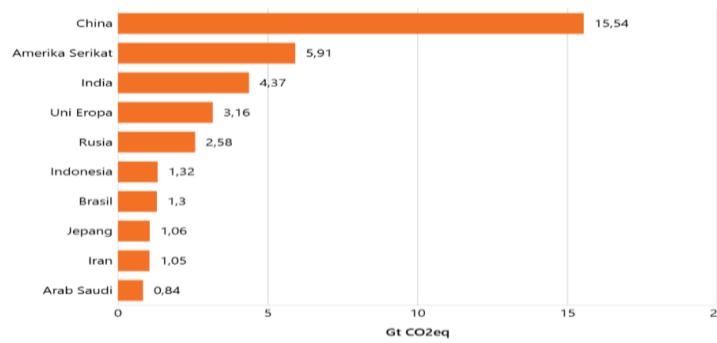


Figure 1. Countries with the Largest Global Greenhouse Gas Emissions (2024)
Source: Databoks (2025a)

Figure 1 shows that Indonesia ranks sixth among the world's largest carbon emitters, producing 1.32 billion tons of CO₂eq in 2024 or 2.5% of global greenhouse gas emissions. Increased emissions contribute to global warming, which intensifies extreme rainfall, flooding, and landslides in Asia, including Indonesia, due to higher atmospheric water vapor (APNews, 2025). According to data cited in Databoks (2025b), increased transportation mobility, energy consumption, and industrial and tourism activities, for example in Bali, have resulted in worsening air quality and carbon emissions, which have a direct impact and are felt by the community. This suggests that companies dependent on natural resources often ignore the negative impacts of their operational activities on the environment (Widianto & Sari, 2021).

According to data from the Ministry of Environment and Forestry of Indonesia (KLHK), in 2023 Indonesia produced greenhouse gas emissions of 1.36 billion tons of carbon dioxide equivalent (CO₂e) consisting of several sectors, this data is presented in Figure 2.

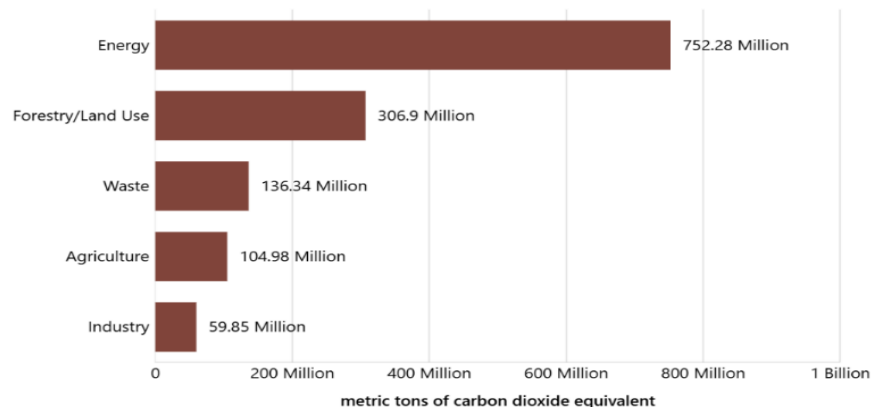


Figure 2. Sectors Contributing the Largest Emissions in 2023
Source: Databoks (2025c)

Figure 2. shows that the energy sector is the largest contributor to Indonesia's carbon emissions, producing 752.28 million tons of CO₂e or 55% of total national emissions, mainly from fossil fuel use dominated by coal. Other contributing sectors include forestry and land use, waste, agriculture, and industry (Databoks, 2025c). Companies, as the main actors in economic activities, contribute significantly to carbon emissions, and are therefore required to be responsible not only for their financial performance but also for their environmental impacts, particularly for publicly traded companies under the scrutiny of the public, investors, and regulators (Laszlo, 2023). Various agreements and regulations have been implemented to reduce carbon emissions, ranging from the Kyoto Protocol ratified by Indonesia through UU No. 17 Tahun 2004 to national policies such as Perpres No. 61 and 71 of 2011. The government has set a target of reducing emissions by 29% by 2030 and is encouraging businesses to disclose carbon emissions and implement sustainable business practices (Budanti et al. 2025).

Carbon emission disclosure is a form of commitment to GHG reduction carried out by companies as business actors (Elsayih et al. 2021). Although the government has called for reporting GHG emissions, in practice, carbon emission disclosure in Indonesia is still rarely carried out by business entities (Lasmianti et al. 2025; Rashid & Barokah, 2024). Carbon emission disclosure is crucial for companies to achieve sustainable business. However, in Indonesia, carbon emission reporting remains low due to high calculation and reporting costs, and is still voluntary (Ummah & Setiawan, 2021). Consequently, "not all Indonesian

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companies are disclosing carbon emissions" despite increasing regulatory pressure/market expectations (Houten & Wedari, 2023).

Disclosure practices by companies show a high degree of variation, creating transparency issues, as the carbon emissions information disclosed may not reflect the company's true environmental performance (Bazhair et al. 2022). Siddique et al. (2021), found that carbon emission disclosure can negatively impact a company's financial performance. Research by Xu et al. (2025) states that due to the explicit costs of emissions disclosure, carbon disclosure can result in short-term financial performance pressures, despite the potential long-term benefits of improving market position and investor confidence. This has resulted in many companies opting not to disclose carbon emissions due to concerns about the negative impact on the company's financial performance (Siddique et al. 2021). Carbon emission disclosure has increased in line with Indonesia's commitment to the Paris Agreement, ratified through UU No. 16 of 2017, with the aim of reducing global temperature rise to below 2°C and moving towards a zero-emission target (Ratmono et al. 2023; Woen & Setijaningsih, 2025).

This study uses carbon emission disclosure as the dependent variable, in line with the government's commitment to reduce emissions by 29–41% by 2030. Therefore, industries are expected to reduce and disclose carbon emissions to support sustainable development (Guo & Pan, 2022). The extent of carbon emission disclosure in this study was measured using an index developed by Choi et al. (2013), based on the carbon information request sheet issued by the Carbon Disclosure Project (CDP). The carbon emission information request sheet issued by CDP can be used in various countries because it has a globally consistent voluntary disclosure standard (Lina & Devyanti, 2024; Uyar et al. 2021).

In carbon emission disclosure research, companies adopt sustainable business practices through green strategy and green investment in response to regulatory and stakeholder pressures. Green strategy involves integrating environmental aspects into business activities, while green investment refers to funding environmentally supportive initiatives such as renewable energy and green technology (Jaenudin et al. 2025). Both approaches are expected to reduce environmental impacts and improve carbon emission disclosure (Kusumajaya & Budiasih, 2025).

Research by Yuliana & Wedari (2023), Jaenudin et al. (2025), Islamiah & Sofia (2025), Maharani & Dewi (2024), Andrian & Kevin (2021), Wilasittha & Aini (2025), Setiawan et al. (2024), indicates that green strategy has a positive effect on carbon emission disclosure. This means that the better the implementation of green strategy within a company, the higher the level of carbon emission disclosure. Companies that consistently integrate environmental aspects into their business strategies tend to have a stronger awareness and commitment to sustainability issues, thus being encouraged to disclose carbon emission information more transparently as a form of accountability and an effort to gain legitimacy from stakeholders. This differs from the results of research by Baroroh & Harto (2025), which stated that green strategy had no effect on carbon emission disclosure.

According to Ali & Widianingsih (2025), Ge & Zhang (2025), Kusumajaya & Budiasih (2025), Zhang et al. (2022), Zheng & Jin (2023) and Baroroh & Harto (2025), green investment has a positive effect on carbon emission disclosure. This means that the greater a company's investment in environmentally friendly activities and technologies, the higher the level of carbon emission disclosure. Companies that make green investments demonstrate a real commitment to environmental management, thus being encouraged to convey information related to carbon emissions more transparently as a form of accountability to stakeholders and an effort to gain social legitimacy. This contrasts with the research results of Jaenudin et al. (2025) and Tyas (2025), that green investment has no effect on carbon emission disclosure.

Due to research inconsistencies in the application of green strategy and green investment to reduce carbon emissions, it is necessary to add environmental performance as a mediating variable, assumed to bridge the influence of green strategy and green investment on carbon emission disclosure. Environmental performance reflects a company's ability to manage and control the environmental impacts of its operational activities. Companies with good environmental performance tend to be better prepared to face regulatory pressures, reduce environmental risks, and gain legitimacy and trust from stakeholders (Giang et al. 2025). Superior environmental performance also provides a basis for companies to disclose environmental information more transparently. According to Jaenudin et al. (2025), Amanda et al. (2025), Widiyanto & Sari (2021), Utami et al. (2026), environmental performance has a positive effect on carbon emission disclosure. These findings indicate that green strategy and investment, accompanied by good environmental performance, can encourage companies to conduct optimal carbon emission disclosure.

Differences in carbon emission disclosure levels among publicly traded companies in Indonesia, along with inconsistent previous research findings, indicate a phenomenon and empirical gap. Therefore, this study examines the effect of green strategy and green investment on carbon emission disclosure through environmental performance among companies listed on the Indonesian Stock Exchange (IDX) for the 2022–2024 period.

II. LITERATURE REVIEW AND HYPOTHESIS

A. Stakeholder Theory

According to the stakeholder theory developed by Freeman (1984), companies are not only accountable to shareholders but also to all stakeholders, such as the government, investors, the public, and the environment. In the context of sustainability, companies are required to disclose environmental information through carbon emission reporting as a form of transparency and accountability to stakeholders (Amalia & Aji, 2025; Indriastuti & Chariri, 2021; Budanti et al. 2024). Stakeholder pressure regarding climate change issues drives companies to implement green strategies and green investments as forms of sustainable environmental management (Chen & Feng, 2020). The implementation of these green strategies and investments can improve environmental performance, which in turn encourages companies to conduct broader carbon emission disclosures to meet stakeholder expectations and maintain corporate legitimacy (Yauri & Widianingsih, 2023).

B. Legitimacy Theory

According to legitimacy theory, a company's survival depends on public acceptance of its operational activities in accordance with prevailing social values and norms (Gray et al. 1996; Brown & Deegan, 1998). In the face of growing attention to climate change issues, companies strive to maintain social legitimacy through environmental responsibility, one of which is by improving environmental performance as a measure of the company's ability to manage the environmental impacts of its operations (Dworczak, 2018). Good environmental performance encourages companies to disclose carbon emissions to demonstrate transparency, strengthen a positive image, and gain recognition from the public, regulators, and investors (Albitar et al. 2023; Jaenudin et al. 2025). Legitimacy theory supports this study in explaining that green strategies and green investments can improve environmental performance, which in turn encourages companies to disclose carbon emissions as an effort to maintain social legitimacy (Liu et al. 2023; Utami et al. 2026).

C. Green Strategy on Carbon Emission Disclosure

Green strategy reflects a company's long-term commitment to environmental sustainability (Yuliana & Wedari, 2023).. This strategy encourages companies not only to manage their environmental impacts but also to communicate this commitment to the public. Consequently, companies that adopt a green strategy tend to more extensive carbon emissions disclosure (Jaenudin et al. 2025). Based on stakeholder theory, carbon emission disclosure is viewed as a form of corporate accountability to stakeholders (Islamiah & Sofia, 2025). Green strategy serves as the foundation for corporate policies in responding to demands for environmental transparency. With a strong green strategy in place, companies are encouraged to disclose carbon emission information as a manifestation of their responsibility to stakeholders (Setiawan et al. 2024). Research conducted by Yuliana & Wedari (2023), Jaenudin et al. (2025), Islamiah & Sofia (2025), Maharani & Dewi (2024), Andrian & Kevin (2021), Wilasittha & Aini (2025), Setiawan et al. (2024), demonstrate a positive relationship between green strategy and carbon emission disclosure. Here is the formulation of the first hypothesis:

H1: Green strategy positively affect carbon emission disclosure.

D. Green Investment on Carbon Emission Disclosure

Green investment demonstrates a company's commitment to allocating resources for environmental management (Ali & Widianingsih, 2025). Such investments reflect a company's efforts to reduce emissions and other environmental impacts. Consequently, companies that engage in green investment tend to be more transparent in disclosing carbon emissions data (Zheng & Jin, 2023). Based on stakeholder theory, it is explained that allocating investments to environmental aspects is a form of corporate accountability toward stakeholder interests (Kusumajaya & Budiasih, 2025). Green investment provides a strong foundation for companies to communicate their environmental performance and efforts through carbon emission disclosure as a form of transparency. The higher the level of green investment, the more likely a company is to engage in broader carbon emission disclosure (Ge & Zhang, 2025). Research conducted by Ali & Widianingsih (2025), Ge & Zhang (2025), Kusumajaya & Budiasih (2025), Zhang et al. (2022), Zheng & Jin (2023), Baroroh & Harto (2025) demonstrates a positive relationship between green investment and carbon emission disclosure. Here is the formulation of the second hypothesis:

H2: Green investment positively affect carbon emission disclosure.

E. Environmental Performance on Carbon Emission Disclosure

Environmental performance reflects a company's ability to manage and control the environmental impacts of its operational activities (Indriastuti & Chariri, 2021). Companies with good environmental performance have an incentive to disclose their achievements to the public. Therefore, environmental performance influences carbon emission disclosure (Yauri & Widianingsih, 2023). Legitimacy theory explains that companies with good environmental performance will strive to maintain social legitimacy

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through environmental disclosure (Gray et al. 1996). Carbon emission disclosure is used as a communication tool to demonstrate that company activities are in line with societal norms and expectations. The better a company's environmental performance, the higher the level of carbon emission disclosure (Jaenudin et al. 2025). Research conducted by Yauri & Widianingsih (2023), Woen & Setijaningsih (2025), Firmansyah et al. (2023), Jaenudin et al. (2025), Amanda et al. (2025), Widiyanto & Sari (2021), Utami et al. (2026), Afdilah & Triyono (2025), show a positive relationship between environmental performance and carbon emission disclosure. This is how the third hypothesis is put forth:

H3: Environmental performance positively affect carbon emission disclosure.

F. Green Strategy on Environmental Performance

Green strategy is a corporate strategy that integrates environmental aspects into operational policies and activities, such as energy efficiency, emission reduction, and the use of environmentally friendly technologies (Jaenudin et al. 2025). The implementation of this strategy is aimed at minimizing the environmental impact of company activities. The stronger the implementation of a green strategy, the greater the company's opportunity to improve environmental performance (Olayeni et al. 2021). Based on stakeholder theory, companies are required to respond to the expectations of stakeholders who are increasingly concerned about environmental issues (Freeman, 1984). Stakeholder pressure encourages companies to adopt sustainability-oriented strategies as a form of environmental responsibility (Dovash et al. 2025). Green strategy is seen as a strategic tool for companies to meet stakeholder demands, which is ultimately reflected in improved environmental performance as an indicator of successful environmental management (Soana, 2024). Research conducted by Olayeni et al. (2021), Dovash et al. (2025), and Soana (2024), shows a positive relationship between green strategy and environmental performance. Here is the formulation of the fourth hypothesis:

H4: Green strategy positively affect environmental performance.

G. Green Investment on Environmental Performance

Green investment is the allocation of company resources to activities or assets aimed at reducing environmental impacts, such as investments in clean technology and energy efficiency (Kusumajaya & Budiasih, 2025). These investments provide tangible support for companies in improving the quality of environmental management. The greater the green investment a company makes, the better its environmental performance can be achieved (Chen & Feng, 2020). Stakeholder theory explains that stakeholders demand not only symbolic commitments but also concrete actions in environmental management (Freeman, 1984). Green investment represents a company's concrete commitment to meeting stakeholder interests related to sustainability. Through green investment, companies can enhance environmental capabilities, which directly impacts environmental performance (Kang et al. 2025). Research conducted by Chen & Feng (2020) and Kang et al. (2025) shows a positive relationship between green investment and environmental performance. This is the sixth theory that has been proposed:

H5: Green investment positively affect environmental performance.

H. Environmental Performance Mediates Green Strategy on Carbon Emission Disclosure

A company's green strategy aims to integrate environmental aspects into its policies and operational processes (Olayeni et al. 2021). Implementing this strategy encourages improved environmental performance through more effective environmental management (Soana, 2024). Good environmental performance then serves as the basis for companies to conduct broader carbon emission disclosures (Utami et al. 2026), thus serving as a bridge between green strategy and carbon emission disclosure (Ratmono et al. 2023). Based on legitimacy theory, companies need to demonstrate that their activities and policies align with societal values and expectations (Gray et al. 1996). Green strategy serves as a company's internal policy direction, but external legitimacy is stronger when the strategy results in tangible environmental performance (Dovash et al. 2025). Environmental performance serves as a form of substantive legitimacy that encourages companies to disclose carbon emissions as a means of communication to the public, thus the mediating role of environmental performance can explain the relationship between green strategy and carbon emission disclosure (Ratmono et al. 2023). Research conducted by Ratmono et al. (2023) shows that environmental performance mediates the influence of green strategy on carbon emission disclosure. The hypothesis is formulated:

H6: Environmental performance mediates green strategy on carbon emission disclosure.

I. Environmental Performance Mediates Green Investment on Carbon Emission Disclosure

Green investment is a form of company commitment to allocating resources to support environmentally friendly activities (Kusumajaya & Budiasih, 2025). This investment directly contributes to improved environmental performance through

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technological improvements and processes that are more efficient and lower emissions (Chen & Feng, 2020). Improved environmental performance subsequently encourages companies to disclose carbon emissions as a form of transparency regarding their environmental performance, thus environmental performance acts as a mediating variable (Amalia & Aji, 2025). Based on legitimacy theory, corporate legitimacy is achieved when actual performance aligns with social and environmental demands (Gray et al. 1996). Green investment reflects a company's efforts to improve environmental performance. However, legitimacy stems not only from the size of the investment but also from the results of that investment, as reflected in environmental performance (Kang et al. 2025). Good environmental performance provides a legitimate basis for companies to disclose carbon emissions to the public, thus environmental performance explains the mechanism by which green investment influences carbon emission disclosure (Amalia & Aji, 2025). Research conducted by Amalia & Aji (2025) shows that environmental performance is able to mediate the influence of green investment on carbon emission disclosure. The hypothesis is formulated:

H7: Environmental performance mediates green investment on carbon emission disclosure.

The research model is shown in Figure 3.

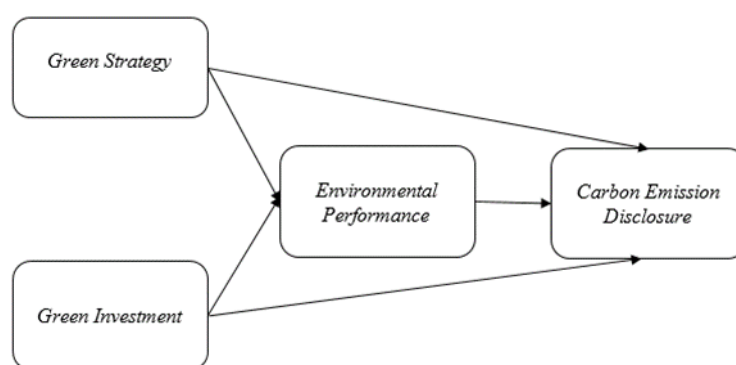


Figure 3. Research Model

III. RESEARCH METHOD

This study employs a quantitative approach. This study focuses on go public companies on the Indonesia Stock Exchange for the 2022-2024 period. Go public companies were selected because they are a sector required to reduce the impact of carbon emissions, as stipulated in Peraturan Presiden Number 61 of 2011 concerning the National Action Plan for Reducing Greenhouse Gas Emissions (RAN-GRK). The 2022–2024 period was chosen because it reflects increased corporate awareness of climate change and carbon emission reduction in the post-COVID-19 pandemic period, when economic activity is picking up again. This period aligns with the implementation of the PROPER assessment, making it relevant for analyzing corporate carbon emission disclosures in the context of regulatory pressures, stakeholder demands, and corporate environmental performance.

The population in this study was 930 go public companies. The sampling method used was purposive sampling with the criteria of companies participating in PROPER for three consecutive years, resulting in a sample of 40 companies that met the criteria. There were 120 companies for the three-year observation period, 2022-2024. This study used Carbon Emission Disclosure (CED) as the dependent variable. CED was measured using an index developed by Choi et al. (2013), which consists of five categories with a total of 18 carbon disclosure items based on the carbon information request sheet issued by the CDP (Carbon Disclosure Project). CDP is one of the channels for voluntary corporate environmental disclosure. This index is calculated by comparing the number of items disclosed by a company with a total of 18 available items. Carbon emission data was obtained from the company's annual report or sustainability report.

The independent variables are green strategy and green investment. Green strategy refers to the level of implementation of a company's strategy oriented towards environmental protection and sustainability. Green strategy is measured using Olson (2008) research with 10 disclosure items. Green investment is investment obtained from the public and private sectors to fund investments in environmental goods and services to measure a company's commitment to environmental spending. Green investment is measured based on Chen & Ma (2021) research by dividing total environmental costs by the company's total assets. The mediating variable is environmental performance, assessed using the Corporate Performance Rating Program in Environmental Management (PROPER). Data analysis was conducted using Panel Data Mediation Regression Analysis with Stata 17.0, to test the formulated hypotheses, and to test the mediation hypothesis using the Sobel test.

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IV. RESULT AND DISCUSSION

This study collected 120 data points over a three-year observation period, using purposive sampling. Descriptive statistics show that the average carbon emission disclosure (CED) of companies was 63,05%. This result indicates that some companies still have not disclosed carbon emissions optimally because disclosure is still voluntary and varies between companies. The average green strategy was 74,83%. This result indicates that most companies have begun implementing business strategies that support environmental sustainability. The average green investment was 1,51%. This result indicates that the allocation of corporate investment to environmental activities is still relatively low and uneven across companies. The average environmental performance was 3,65. These results indicate that most companies have quite good environmental performance and are in the blue to green category based on the PROPER assessment

The results of the regression model selection through the Chow Test, Hausman Test, and Lagrange Multiplier Test can be concluded that the best estimation model is the Random Effect Model (REM). Hypothesis testing uses panel data mediation regression analysis, which has previously been validated under classical assumptions. The results of the normality test using the Shapiro-Wilk Test show that all Prob> 0,05, which indicates a normal data distribution. The results of the multicollinearity test show a VIF value of 1,08 <10. Therefore, it can be concluded that the research model used in this study is free from multicollinearity. This regression model also does not show symptoms of heteroscedasticity because the Prob> chi2 of 0,131> 0.05. The next test is hypothesis testing of Equation 1, which is presented in Table 1.

Table 1. Results of Random Effect Model 1

Variable	Coefficient	Std. err	z-statistic	Prob	Prediction
Green Strategy	0,246	0,123	1,99	0,049**	H1(+)
Green Investment	0,900	0,410	2,19	0,032**	H2(+)
Environmental Performance	7,417	3,561	2,08	0,037**	H3(+)
Cons_	14,911	27,954	0,53	0,594	
Wald chi2(3)	5,27				
Prob > chi2	0,1679				
R-squared (Overall)	0,0479				

** Sig. pada level 0,05 (p<0,05)

Source: Processed data (2026)

Equation 1 examines the role of green strategy, green investment and environmental performance on CED. The test results show a significance value of 0,049 for green strategy, thus supporting H1. The test results show a significance value of 0,032 for green investment, thus supporting H2. The test results show a significance value of 0,037 for environmental performance, thus supporting H3. Meanwhile, the results of the model feasibility test produce an overall R-squared value of 0,0479 indicating that the green strategy, green investment, and environmental performance variables are able to explain Carbon Emission Disclosure by 4,79%, while the remaining 95,21% is explained by other variables outside the study. The Prob > chi2 of 0,1679 indicates that simultaneously the variables green strategy, green investment, and environmental performance do not have a significant effect on carbon emission disclosure because the probability value is greater than 0,05. The equation 2 panel data regression models is as follows in Table 2.

Table 2. Results of Random Effect Model 2

Variable	Coefficient	Std. err	z-statistic	Prob	Prediction
Green Strategy	0,155	0,025	6,01	0,000**	H4(+)
Green Investment	0,027	0,014	1,87	0,061	H5
Cons_	3,813	0,825	4,62	0,000	
Wald chi2(3)	3,57				
Prob > chi2	0,1753				
R-squared (Overall)	0,1012				

** Sig. pada level 0,05 (p<0,05)

Source: Processed data (2026)

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This equation 2 examines the role of green strategy and green investment on environmental performance. The test results show a significance value of 0.000 for green strategy, thus supporting H4. The test results show a significance value of 0.061 for green investment, thus not supporting H5. Meanwhile, the results of the model feasibility test produce an overall R-squared value of 0.1012 indicates that the green strategy and green investment variables are able to explain environmental performance by 10.12%, while the remaining 89.88% is explained by other variables outside the study. The Prob value > chi2 of 0.1753 indicates that simultaneously the green strategy and green investment variables do not have a significant effect on environmental performance because the probability value is greater than 0.05. These results indicate that this research model is not yet able to explain variations in environmental performance strongly.

The mediation test in this study was conducted using the Sobel Test Calculator based on the procedure developed by Sobel (1982), to determine the ability of environmental performance to mediate the influence of green strategy and green investment on carbon emission disclosure. The test results are presented in Table 3.

Table 3. Sobel Test Results

	The Influence of Mediation	Sobel Test Statistic	P-value	Prediction
1	Green Strategy → Environmental Performance → Carbon Emission Disclosure	1,96	0,049**	Accepted
2	Green Investment → Environmental Performance → Carbon Emission Disclosure	1,39	0,164	Rejected

** Sig. pada level 0,05 (p<0,05)

Source: Processed data (2026)

The Sobel test results show a p-value of 0,049 for the effect of green strategy on carbon emission disclosure through environmental performance, thus supporting H6. Meanwhile, the effect of green investment on carbon emission disclosure through environmental performance obtained a p-value of 0,164, thus not supporting H7.

The results of the first hypothesis test indicate that a green strategy has a positive effect on carbon emission disclosure, thus the formulated hypothesis is accepted. Based on stakeholder theory, a green strategy is a form of company commitment to integrating environmental aspects into operational activities to meet stakeholders' information needs regarding the company's environmental impact (Islamiah & Sofia, 2025). The implementation of a green strategy encourages companies to set emission reduction targets, implement environmental standards, and prepare sustainability reports containing carbon emission information (Andrian & Kevin, 2021). Thus, companies that implement a green strategy tend to make broader carbon emission disclosures as a form of transparency and accountability to stakeholders (Setiawan et al. 2024). Furthermore, the implementation of a green strategy requires measurement, monitoring, and evaluation of environmental performance so that carbon emission information becomes more structured and well-documented (Jaenudin et al. 2025). This condition makes it easier for companies to compile and disclose carbon emission information to stakeholders. The results of this study are in line with research by Yuliana & Wedari (2023), Jaenudin et al. (2025), Islamiah & Sofia (2025), Maharani & Dewi (2024), Andrian & Kevin (2021), Wilasittha & Aini (2025), and Setiawan et al. (2024), who found that green strategy has a positive effect on carbon emission disclosure, but this is not in line with Baroroh & Harto (2025) who stated that green strategy has no effect on carbon emission disclosure.

The results of testing the second hypothesis show that green investment has a positive influence on CED, which supports the formulated hypothesis. Green investment is an investment made by a company by allocating company funds to activities oriented towards environmental protection and sustainability, including efforts to reduce carbon emissions, energy efficiency, and waste management (Kusumajaya & Budiasih, 2025). Based on stakeholder theory, green investment is a form of corporate responsibility in meeting stakeholder interests related to environmental sustainability. Through this investment, the company demonstrates its seriousness in managing the environmental impacts arising from operational activities (Kusumajaya & Budiasih, 2025). Companies that undertake green investment will conduct broader carbon emission disclosures as a form of transparency and accountability to stakeholders (Ge & Zhang, 2025). Green investment is reflected in the allocation of environmental funds issued by companies as a form of commitment to environmental management (Ali & Widianingsih, 2025). These expenditures are used to support various activities that contribute to emission reduction, such as energy efficiency programs, reduced fuel consumption in operational processes, and waste management aimed at reducing company emissions. The implementation of these activities encourages companies to measure and evaluate the achievement of emission reductions (Kusumajaya & Budiasih, 2025). Information on carbon emissions that have been implemented then serves as the basis for companies to

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conduct more complete and transparent carbon emission disclosures to stakeholders. The results of this study align with those conducted by Ali & Widianingsih (2025), Ge & Zhang (2025), Kusumajaya & Budiasih (2025), Zhang et al. (2022), Zheng & Jin (2023) and Baroroh & Harto (2025), which found that green investment has a positive effect on carbon emission disclosure. These results are inconsistent with those conducted by Jaenudin et al. (2025), Tyas (2025), and Utami et al. (2026), which stated that green investment has no effect on carbon emission disclosure.

The results of testing the third hypothesis show that environmental performance has a positive influence on CED, which supports the formulated hypothesis. Based on legitimacy theory, companies need to gain and maintain legitimacy from society by demonstrating that their operational activities align with community values, norms, and expectations regarding environmental protection (Amanda et al. 2025). Companies with good environmental performance will disclose more extensive environmental information, including carbon emission disclosure, as a means of demonstrating the success of their environmental management (Utami et al. 2026). High environmental performance demonstrates a company's ability to meet government-set environmental management standards, as reflected in its PROPER rating. Companies achieving high PROPER ratings, such as Blue, Green, and Gold, not only demonstrate success in managing energy efficiency, emission reduction, pollution control, and waste management, but also demonstrate that they have implemented an effective environmental management system (Firmansyah et al. 2023). This achievement is achieved through a continuous process of monitoring, measuring, and evaluating environmental performance, providing companies with more comprehensive data on energy use, emission levels, and various environmental management efforts (Widianto & Sari, 2021). This data facilitates companies in compiling and disclosing carbon emissions information in greater detail and transparency. The recognition gained through the PROPER rating must be maintained to maintain public trust in the company (Utami et al. 2026). The higher a company's environmental performance, the greater its incentive to disclose carbon emissions to maintain the legitimacy it has gained from the public and regulator (Amanda et al. 2025). The results of this research are in line with research conducted by Yauri & Widianingsih (2023), Woen & Setijaningsih (2025), Firmansyah et al. (2023), Jaenudin et al. (2025), Amanda et al. (2025), Widianto & Sari (2021), Utami et al. (2026), and Afdilah & Triyono (2025), who found that environmental performance has a positive effect on carbon emission disclosure. The results of this study are not in line with those conducted by Ulupui et al. (2020) which states that environmental performance has no effect on carbon emission disclosure.

The results of the fourth hypothesis test show that green strategy has a positive effect on environmental performance; this result supports the formulated hypothesis. Based on stakeholder theory, companies need to demonstrate to stakeholders that their operational activities take environmental aspects into account. Implementing a green strategy serves as a foundation for companies to direct their policies and operational activities to align with their environmental management objectives (Olayeni et al. 2021). Through a well-planned strategy, companies have clear guidelines for setting environmental targets, allocating resources, and evaluating environmental performance (Dovash et al. 2025). Therefore, implementing a sound green strategy will support improved corporate environmental performance (Soana, 2024). A green strategy is realized through setting carbon emission reduction targets, implementing environmental standards in the supply chain, establishing a sustainability committee, and providing an environmental monitoring system as part of the company's operational activities (Olayeni et al. 2021). Implementing this strategy encourages companies to implement various environmental management programs in a more targeted and sustainable manner, such as energy efficiency, emission reduction, pollution control, and waste management (Soana, 2024). The implementation of these programs makes it easier for companies to identify the sources of environmental problems, evaluate the effectiveness of actions taken, and make continuous improvements to the company's environmental management (Wilasittha & Aini, 2025). This condition improves the quality of the company's environmental management and supports the achievement of various indicators assessed in the PROPER (Proper) rating, such as pollution control, resource efficiency, and sustainable environmental management (Utami et al. 2026). Success in meeting these indicators will improve the company's PROPER rating, resulting in higher environmental performance. Therefore, the better the green strategy implemented by a company, the better its environmental performance (Olayeni et al. 2021). The results of this study align with those conducted by Olayeni et al. (2021), Dovash et al. (2025), and Soana (2024), which found that green strategy positively impacts environmental performance. This study's results differ from those of Rachmawati (2021), who stated that green strategy has no impact on environmental performance.

The results of the fifth hypothesis test show that green investment does not affect environmental performance; these results do not support the formulated hypothesis. Based on stakeholder theory, companies need to demonstrate environmental responsibility to stakeholders through various efforts that support better environmental management. Green investment reflects a company's commitment to providing the necessary funding to support the implementation of its environmental programs. Companies are expected to improve the quality of environmental management, which ultimately improves their

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environmental performance (Chen & Feng, 2020). Green investment is reflected in the allocation of environmental funds spent by companies to support various environmental management activities, such as energy efficiency, emission reduction, pollution control, and waste management (Ali & Widianingsih, 2025). These activities are part of the aspects assessed in PROPER, so theoretically green investment is expected to improve a company's environmental performance. However, research results show that green investment does not affect environmental performance. According to Chen & Feng (2020), green investment is not always able to improve environmental performance, because its effectiveness is highly dependent on the efficiency of the investment's use, not just the amount of funds spent. Chen & Feng (2020) emphasized that many companies have low green investment, caused by over-investment or suboptimal fund allocation, so that environmental investments are not effectively converted into improved environmental performance. In other words, companies incur environmental costs, but without the right implementation strategy, these investments do not have a real impact on environmental performance.

Green investment is heavily influenced by internal company factors, such as internal policies, environmental management systems, decision-making structures, and the company's ability to integrate these investments into business operations (Chen & Feng, 2020). Furthermore, Indonesia itself does not yet have regulations regarding the minimum amount of green investment that must be allocated by companies. Descriptive statistics show that the average green investment is only 1.51% of a company's total assets, indicating that the allocation of environmental funds by companies only covers a small portion of the company's total assets. For example, a company like PT Semen Indonesia (Persero) Tbk has large total assets, but the proportion of environmental costs to assets is relatively low. Conversely, a company with small total assets, such as PT Alamtri Resources Indonesia Tbk, actually recorded a high proportion of environmental costs. This indicates that asset capacity is not a primary determinant of the size of green investment, in line with research by Chen & Feng (2020), which states that this difference is caused by the allocation of environmental costs that depend on internal policies and business strategies. The PROPER assessment not only considers the amount of environmental costs incurred by a company, but also the company's success in implementing environmental programs and achieving the set environmental performance (Rahmah & Priantinah, 2025). Companies that allocate larger environmental funds do not necessarily obtain a higher PROPER rating if the investment has not been able to produce tangible improvements in the environmental management aspects that form the basis of the PROPER assessment (Zulfa & Purnamasari, 2025). The results of this study align with those of Dewi & Aryati (2025), Zulfa & Purnamasari (2025), Rahmah & Priantinah (2025), who stated that green investment had no effect on environmental performance. This study's results contradict those of Kang et al. (2025) and Diantini et al. (2023), who stated that green investment had a positive effect on environmental performance.

The results of sixth hypothesis test show that environmental performance is able to mediate the influence of green strategy on carbon emission disclosure. Based on legitimacy theory, companies need to gain and maintain legitimacy from society by demonstrating that their operational activities align with prevailing environmental values and expectations. The implementation of a green strategy demonstrates a company's commitment to integrating environmental aspects into its policies and operational activities (Yuliana & Wedari, 2023). This strategy directs companies to implement various environmental management programs that impact environmental performance (Olayeni et al. 2021). Improved environmental performance indicates that a company has successfully met environmental management standards, as reflected in the PROPER assessment, such as pollution control, resource efficiency, and waste management (Dovash et al. 2025). This recognition of a company's environmental performance encourages companies to disclose carbon emissions information as a form of transparency to the public and to maintain legitimacy (Amanda et al. 2025). A company's green strategy drives improved environmental performance, reflected in a better PROPER rating. A high PROPER rating demonstrates a company's success in managing its environmental impact, resulting in environmental management achievements that can be disclosed through carbon emission disclosure. Therefore, environmental performance can mediate the effect of green strategy on carbon emission disclosure (Ratmono et al. 2023). This study's findings align with those of Ratmono et al. (2023), which found that environmental performance can mediate the effect of green strategy on carbon emission disclosure.

The results of testing the seventh hypothesis show that environmental performance is not able to mediate the influence of green investment on carbon emission disclosure. Based on legitimacy theory, companies strive to gain and maintain legitimacy from society by demonstrating that their operational activities align with prevailing environmental values and expectations. Theoretically, green investment represents a company's commitment to supporting environmental management, which is expected to improve environmental performance and strengthen corporate legitimacy (Kusumajaya & Budiasih, 2025). Improved environmental performance is then expected to encourage companies to disclose carbon emissions as a form of transparency to the public (Rahmah & Priantinah, 2025). However, research shows that green investment has no impact on environmental performance (Dewi & Aryati, 2025). This suggests that companies' environmental investments have not yet

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reflected tangible changes in environmental management, as assessed by PROPER, such as energy efficiency, emission control, and waste management. Furthermore, the average green investment of only 1.51% of total assets indicates that companies' environmental fund allocations cover only a small portion of total assets, thus failing to impact environmental performance (Zulfa & Purnamasari, 2025). Green investment does not significantly improve environmental performance, as environmental performance is largely determined by tangible changes in a company's operational systems, such as energy efficiency, emission control, the implementation of low-carbon technology, and compliance with environmental standards (Rahmah & Priantinah, 2025). Consequently, when green investment fails to improve environmental performance, the environmental performance variable also fails to mediate the relationship between green investment and carbon emission disclosure. This is inconsistent with legitimacy theory, as companies should improve environmental performance and disclosure in an effort to gain legitimacy from the public and stakeholders (Zhang et al. 2022). This finding contradicts the research by Amalia & Aji (2025), which states that environmental performance mediates the effect of green investment on carbon emission disclosure.

CONCLUSIONS

Global climate change is a major concern today due to rising greenhouse gas (GHG) emissions, which negatively impact the environment and the economy. These increases in emissions largely stem from industrial activity and the use of fossil fuels, prompting companies to be more transparent in disclosing their carbon emissions. This study examines the effect of green strategy and green investment on CED, with environmental performance as a mediating variable. Green strategy has a positive impact on CED. The implementation of green strategy increases carbon emission disclosure. Green investment has a positive impact on CED. The higher the green investment made by a company, the higher the company's carbon emission disclosure. Environmental performance has a positive impact on carbon emission disclosure. The better the company's environmental performance, the higher the company's carbon emission disclosure. Green strategy has a positive impact on environmental performance, while green investment has no effect on environmental performance, meaning that green investment does not influence the increase or decrease in the company's environmental performance due to the relatively low average value of environmental investment made by companies. For the mediation results, environmental performance is able to mediate the effect of green strategy on carbon emission disclosure, while environmental performance is unable to mediate the effect of green investment on carbon emission disclosure.

LIMITATION AND SUGGESTION

There are several limitations in this study. First, the R-squared value in this study is still low, namely 4.79% in the first model and 10.12% in the second model. Furthermore, the results of the simultaneous test (F test) indicate that the model is not able to explain the influence of the independent variables on the dependent variable strongly. Therefore, further research is recommended to add other variables, such as institutional ownership as an independent variable or moderating factor. Second, this study has the potential for conceptual overlap between green strategy and green investment because both represent corporate sustainability practices. Therefore, further research is recommended to develop a model that can more clearly distinguish the role of green strategy as an environmental policy and green investment as an implementation of environmental investment, as well as adding control variables such as company size (firm size), profitability, leverage, or corporate governance characteristics to make the research results more accurate and reliable.

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