Journal of Accounting, Entrepreneurship, and Financial Technology (JAEF) p-ISSN: 2686 - 4479
Volume 07, Number 02, April 2026 e-ISSN: 2686 - 5505

Determinants of Carbon Emission Disclosure in State-Owned and Private Enterprises

Kenley Maccauley Riyono, Nicklaus Stanley, Luky Patricia Widianingsih*
Universitas Ciputra Surabaya

Abstract: This study aims to provide empirical evidence on the determinants of CED, with total carbon emissions as a moderating variable in state-owned and private enterprises. The method used is moderate regression analysis. The results of this study indicate that there is no single determinant that has a significant effect on CED in state-owned enterprises. However, total carbon emissions interact with board size in relation to CED. In private enterprises, CEO narcissism, capital expenditure, and media exposure has a significantly positive effect on CED, with total carbon emissions interacting only with capital expenditure. Foreign CEOs have a significant negative effect on CED, interacting with total carbon emissions. Board size, female CEO presence, and productivity do not have a significant impact on CED. The findings provide guidance for management on factors to enhance CED while supporting greater transparency and accountability in enterprises. This helps address carbon emissions in Indonesia to support a green and blue economy.

Keywords: carbon emission disclosure, board size, ceo narcissism, media exposure, foreign ceo

Received: *5 March 2026,* ***Revised:*** *13 March 2026,* ***Accepted:*** *14 April 2026*

INTRODUCTION

Global warming is a critical global issue with far-reaching effects on the environment, human health, and economies. The IPCC (2024) states that the main cause of global warming is human activities, especially the emission of greenhouse gases. According to Edgar (2024), Indonesia ranked sixth among the world's largest greenhouse gas emitters in 2023 and has consistently remained in the global top ten since 2000. Emissions rose relentlessly until 2023, more than double since 2000. This means that Indonesia also plays a role in

*Corresponding Author.
email: luky.patricia@ciputra.ac.id

global environmental change. Among all sectors in Indonesia, the energy sector dominates Indonesia's greenhouse gas emissions, producing 45.5% of the total in 2022 (IEA, 2025). This sector's operational activities directly and significantly affect the surrounding environment. Without mitigation efforts, these gases will persist in the atmosphere for decades, intensifying climate hazards and undermining global resilience.

Indonesia has committed to reducing greenhouse gas emissions by 2030, as mandated by Law No. 19 of 2003 and Law No. 40 of 2007 on the Ratification of the Kyoto Protocol to the UN Framework Convention on Climate Change. Article 74(1) of Law No. 40 of 2007 requires companies engaged in natural resource sectors to fulfill social and environmental responsibilities. This commitment is reinforced by Article 4 of Presidential Decree No. 61 of 2011, which obligates business actors to take part in efforts to reduce greenhouse gas emissions. The difference is that the first law focuses on Indonesian state-owned enterprises, while the latter is for all enterprises that operate in Indonesia. However, despite these commitments and regulations, a significant gap remains between national targets and business practices.

The lack of carbon emission disclosure (CED) in Indonesia drives unchecked business activities that accelerate greenhouse gas accumulation and environmental degradation. This is because CED in Indonesia is still treated as confidential, and in practice, remains rare (Florencia & Handoko, 2021; Hidayat et al., 2022a; Simamora et al., 2022), whether in state-owned or private enterprises. Disclosing carbon emissions is a key demonstration of a company's commitment to addressing global warming and is primarily reported through sustainability reports rather than annual reports. Yet, IFAC (2025) highlights a declining trend in sustainability reporting among Indonesia's top companies. In 2019, 82% of reports were published as standalone sustainability reports. However, this figure plunged to just 4% in 2022 and dropped further to 2% in 2023. The quality of sustainability reporting remains below average and lacks assurance, worse than the average of other countries in the Asia-Pacific (IFAC, 2025). Among top companies, only 38% have internal assurance, and 36% have external assurance (PwC, 2023). From 2020 to 2022, only 20% of companies disclosed Scope 1 emissions, 17% Scope 2, and only 5% Scope 3 (Kurnia et al., 2025), exposing a major transparency gap. Indonesia is a developing economy characterized by fragile institutions and weak corporate governance (Zaman et al., 2022). These raise concerns about the depth and credibility of CEDs in Indonesia.

CED is a voluntary aspect of corporate reporting, where some companies choose transparency while others remain silent. This variation is shaped by key determinants,

including corporate governance practices, financial performance, and media exposure. Prior studies using the same sample year found that board size has a significant positive impact on CED, as a larger board tends to encourage companies to better address environmental issues (Simamora et al., 2022; Widianingsih, 2025a). On the other hand, research by Astuti and Setiany (2021) and Budiharta and Kacaribu (2020) reveals a contrasting result that board size has no significant effect on CED. No prior research has specifically examined the direct impact of CEO narcissism on CED. However, Falah and Mita (2022), Kalbuana et al. (2023), and Saadah et al. (2022) shows that CEO narcissism has a significant positive effect on sustainability disclosure. Yet, since sustainability disclosure is a broad construct, its specific link to decarbonization efforts remains unclear. An international study by Park et al. (2023) found that female CEOs can enhance CED. Conversely, Meiryani et al. (2023) revealed that female CEOs have a negative effect on CED in Indonesian companies. Research on foreign CEOs and CED is still limited in Indonesia. Harjito and Sutopo (2024) study in Indonesia found that foreign CEOs have a significant positive impact on disclosure. Kandil et al. (2025) and Mardini and Lahyani (2022) international study supports this but also highlights that disclosure depends on the level of carbon emissions, underscoring the need for deeper investigation.

Media exposure can exert pressure on directors to disclose carbon emissions (Hidayat et al., 2022b; Wahyuningrum et al., 2024). However, recent studies by Citra & Sastradipraja (2025) found that media exposure has a significant negative effect on CED, as greater media attention to the issue is associated with a lower tendency for companies to report their carbon emissions transparently. This finding is consistent with research by Wibowo et al. (2023). Given that previous research has reported mixed findings, with some relationships remaining unclear or limited.

From the perspective of stakeholder theory, CED represents a crucial form of engagement between a company and its stakeholders. It is essential for advancing business sustainability, as it enhances transparency (Ding et al., 2023; Ma et al., 2023), builds stakeholder trust (Ma et al., 2023; Pitrakkos & Maroun, 2020), and drives better climate strategies (Ding et al., 2023; Kılıç & Kuzey, 2019; Prasetyo & Sri Harta Mimba, 2021). In turn, these efforts strengthen economic performance (Downar et al., 2021; Kurnia et al., 2020) and ultimately increase the firm's value (Bui et al., 2020; Kurnia et al., 2020). Thus, CED stands as a critical pillar for corporate sustainability and value enhancement. It is also noteworthy that Indonesia ranks among the top countries in addressing stakeholder sustainability concerns, with 70% of companies disclosing ways to respond to stakeholder

issues, close to the highest rates observed, such as in Hong Kong (72%) and Thailand (70%) (PwC, 2023).

The rising importance of CED has sparked interest among researchers. Although some studies have looked at how corporate governance, financial performance, and media exposure relate to CED, the findings have been mixed and still need to be clarified further. This study is essential to advance understanding in this area. Moreover, in 2025, Indonesia is facing regulations on CED to meet the requirements of the carbon tax roadmap, green taxonomy, and sustainability reporting. Understanding the determinants of such disclosure is crucial to support effective policy development and regulatory oversight.

Notably, no prior study has separated between state-owned enterprises and private companies in a specific sector, even though these two types of firms may have different priorities. State-owned enterprises often focus on meeting regulations while still aiming for profit, while private companies tend to prioritize staying competitive and delivering value to shareholders. As a result, state-owned and private enterprises may be driven by different determinants when it comes to CED. Yet, both have a shared responsibility under stakeholder theory, which emphasizes that companies should act transparently and responsibly to build trust and create long-term value for all their stakeholders. State-owned enterprises tend to have slightly better overall sustainability disclosures compared to private enterprises due to legitimacy concerns and regulatory pressures, but actual achievement of sustainability targets remains limited for both (Kuswantoro et al., 2023). Moreover, most previous studies on CED have concentrated on the manufacturing, non-financial, mining, and basic chemical industries. In contrast, empirical evidence on the energy sector is scarce, despite its critical importance as the largest contributor to carbon emissions in Indonesia.

This study offers three key novelties. First, it highlights the differences in determinants of CED between state-owned and private enterprises within the energy sector, an area that has received little attention in prior research. Second, it introduces an integrated model of determinants by combining CEO narcissism, female CEO, foreign CEO status, capital expenditure, and productivity, which are factors that have rarely been examined together in the context of CED, thereby broadening the scope of discussion on what drives transparency. Third, it employs total carbon emissions as a moderating variable to reveal whether firms with higher emissions respond differently to these determinants, offering fresh insights into disclosure behavior among high-emission companies. These novelties are crucial in addressing the urgency of improving carbon transparency in Indonesia's largest-emitting sector, at a time when regulatory pressures, stakeholder expectations, and

climate risks are rapidly intensifying.

This study aims to provide empirical evidence on the effects of board of directors' size, CEO narcissism, female CEO, foreign CEO, capital expenditure, productivity, and media exposure, moderated by total carbon emissions. The literature implication in this study enriches CED research and distinguishes between state-owned and private enterprises. The findings also provide practical guidance for company management on key factors to consider in enhancing CED, especially in energy sector firms that are major contributors to carbon emissions. The social implications are that this research supports greater transparency and accountability in enterprises.

The stakeholder theory is a comprehensive theoretical framework that encourages organizations to engage with both internal and external stakeholders by understanding their needs and expectations, thus fostering a more inclusive and responsive decision-making process, enabling organizations to be more strategic in their actions, enhance overall value creation, and uphold their long-term sustainability (Mahajan et al., 2023). Additionally, the stakeholder theory focuses on the practical knowledge of 'how' to engage stakeholders and create value for them, rather than relying on universal rules that apply to all businesses, such as the belief that creating barriers to entry would lead to long-term competitive advantage (Freeman et al., 2020).

The stakeholder theory holds that organizations operate within a network of relationships where various stakeholders demand transparency and ethical behaviour. In environmentally sensitive sectors like energy, firms face higher pressure to disclose their environmental impacts. Thus, CED becomes a mechanism through which companies demonstrate accountability, reduce information asymmetry, and enhance firm value (Adhikari & Zhou, 2021; Kurnia et al., 2021; Lee & Cho, 2021a). This theory justifies that CED is not only a regulatory response but a strategic tool to maintain legitimacy in the eyes of diverse stakeholders. As such, the stakeholder theory emerges as a relevant lens in this study.

Stakeholders' theory states that a robust governance structure helps companies to meet stakeholders' expectations, including those concerned about environmental issues. Prior research shows that companies with larger boards tend to disclose more information about their carbon emissions. This is because a larger board strengthens governance and supervisory functions, enabling more thorough and transparent environmental disclosure (Simamora et al., 2022; Widianingsih, 2025a). A larger board of directors is also generally linked to diverse perspectives and more resources, which can enhance transparency and

responsiveness to stakeholder concerns (Alfi et al., 2024; Lina & Devyanti, 2024). Hence, the following is hereby hypothesized:
H1a: Board of directors' size has a positive effect on CED in state-owned enterprises.
H1b: Board of directors' size has a positive effect on CED in private enterprises.

CEO narcissism reflects traits such as a strong need for admiration, a desire to be in the spotlight, and a tendency to project a positive image. As in stakeholder theory, narcissistic CEOs may view CED as an opportunity to enhance their personal image and gain legitimacy from stakeholders. Highly narcissistic CEOs are likely to disclose both socially related and governance-related activities, including sustainable reporting (Kushandojo & Widianingsih, 2024; Lassoued & Khanchel, 2023). Narcissistic CEOs seek to appear responsible and visionary, driving them to disclose carbon emissions to align with stakeholder demands for environmental accountability (Daniel & Ernawan, 2019; Marquez-Illescas et al., 2019). Hence, the following is hereby hypothesized:
H2a: CEO narcissism has a positive effect on CED in state-owned enterprises.
H2b: CEO narcissism has a positive effect on CED in private enterprises.

Aligning with stakeholder theory, female CEOs are also likely to enhance CED to fulfill stakeholder expectations for environmental accountability. Prior studies have found that the presence of female CEOs significantly influences environmental disclosure (Caby et al., 2024; Charumathi & Rahman, 2019; Magdalena et al., 2025; Nicolò et al., 2023). Female leadership is linked to a stronger propensity for ethical governance and a heightened commitment to transparency (Kushandojo & Widianingsih, 2024; Magdalena et al., 2025). This is consistent with stakeholder theory, which emphasizes the importance of meeting stakeholder demands for information and ethical conduct. Thus, the following is hereby hypothesized:
H3: Female CEOs have a positive effect on CED in private enterprises.

Foreign CEOs generally promote CED by leveraging their global experience to address stakeholder pressures, aligning with stakeholder theory's emphasis on external demands as disclosure drivers. Prior research also shows that Indonesian firms with a foreign CEO significantly improve corporate social responsibility (CSR) and carbon disclosure quality (Diajeng Fitri Wulan, 2022; Harjito & Sutopo, 2024). Foreign CEOs are more likely to prioritize carbon disclosure due to exposure to stringent environmental regulations and

stakeholder expectations (Harjito & Sutopo, 2024; Zhang & Dong, 2023). Their global perspective increases awareness of climate risks, resulting in proactive environmental reporting. Thus, the following is hereby hypothesized:
H4: Foreign CEOs have a positive effect on CED in private enterprises.

Companies may respond to stakeholder pressures by investing in sustainable technologies and transparently reporting environmental impacts to maintain legitimacy and trust, as in stakeholder theory. Previous studies confirm that higher capital expenditures correlate with increased CED. Companies investing in green technologies tend to disclose more emissions-related information to demonstrate environmental responsibility and align with stakeholder demands (Desvita & Rahma, 2025; Hanisyah Iratiwi & Sulfitri, 2023; Kurnia et al., 2025; Ratmono et al., 2021; Suryani & Wijayati, 2019). This synergy underscores the role of strategic investment in achieving sustainability goals. Hence, the following is hereby hypothesized:
H5a: Capital expenditure has a positive effect on CED in state-owned enterprises.
H5b: Capital expenditure has a positive effect on CED in private enterprises.

Highly productive companies need to adhere to social and environmental standards to protect their reputation and meet stakeholder expectations to create competitive advantage, as suggested by stakeholder theory. High company productivity is reflected in strong relationships with stakeholders, as indicated by high consumer demand, which in turn enhances company performance (Kurnia et al., 2020). Companies with high growth attract greater investor attention, as this growth is expected to motivate them to enhance their social and environmental disclosures to gain public attention and build a positive image (Gledis et al., 2020; Savitri et al., 2021). Hence, the following is hereby hypothesized:
H6a: Productivity has a positive effect on CED in state-owned enterprises.
H6b: Productivity has a positive effect on CED in private enterprises.

From the perspective of stakeholder theory, a company's efforts to make disclosures serve as a means of communication with its stakeholders. Multiple studies show that media exposure generally encourages the extent and transparency of CED. Media coverage creates public pressure, compelling firms to be more open about their environmental impact to maintain legitimacy and meet societal expectations (Bintang & Ardiana, 2025; Hidayat et al., 2022a; Wahyuningrum et al., 2024; Widianingsih, 2025a). Thus, the following is hereby

hypothesized:
H7a: Media exposure has a positive effect on CED in state-owned enterprises.
H7b: Media exposure has a positive effect on CED in private enterprises.

While factors like corporate governance, financial performance, and media exposure can encourage CED, high total carbon emissions (CE) may weaken these relationships. Companies with higher emissions face greater reputational risk and may fear stakeholder backlash (Aulia et al., 2024; Chortareas et al., 2024; Sun et al., 2022), or damage to their legitimacy if they disclose their full carbon footprint (Chortareas et al., 2024; Guastella et al., 2022). Even when governance structures or CEO leadership traits promote CED, firms with large emissions might choose to limit or selectively disclose information to manage perceptions and protect their image (Guastella et al., 2022; Kandil et al., 2025; Lee & Cho, 2021b; Mardini & Elleuch Lahyani, 2022). This aligns with stakeholder theory, as firms may engage in strategic disclosure to balance stakeholder expectations with the desire to avoid negative attention. Thus, the following is hereby hypothesized:
H8a: Total CE has an interaction in board of directors' size and CED relationship in state-owned enterprises.
H8b: Total CE has an interaction in board of directors' size and CED relationship in private enterprises.
H9a: Total CE has an interaction in CEO narcissism and CED relationship in state-owned enterprises.
H9b: Total CE has an interaction in CEO narcissism and CED relationship in private enterprises.
H10: Total CE has an interaction in female CEO and CED relationship in private enterprises.
H11: Total CE has an interaction in Foreign CEO and CED relationship in private enterprises.
H12a: Total CE has an interaction in capital expenditure and CED relationship in state-owned enterprises.
H12b: Total CE has an interaction in capital expenditure and CED relationship in private enterprises.
H13a: Total CE has an interaction in productivity and CED relationship in state-owned enterprises in state-owned enterprises.
H13b: Total CE has an interaction in productivity and CED relationship in private

enterprises.

H14a: Total CE has an interaction in media exposure and CED relationship in state-owned enterprises.

H14b: Total CE has an interaction in media exposure and CED relationship in private enterprises.

METHOD

Sample, Data, and Measurement of Variables

This quantitative research focuses on firms listed on the energy sector of the Indonesian Stock Exchange (IDX) from 2016 to 2023. The energy sector is selected because it accounts for relatively high greenhouse gas emissions compared to other sectors, thereby playing a significant role in environmental degradation through the direct impacts of its operational activities. Secondary data used in this study were obtained from firms' annual and sustainability reports, which are publicly available on their official websites. Using the purposive sampling technique, the final sample consists of 34 energy firms with 121 observations from a total of 272 observations (34 x 8), which is then reduced by 56 observations for not having annual or sustainability reports and 95 observations for not disclosing carbon emissions-related information. The measurements of the variables used in this study are presented in Table 1 below.

Table 1 Measurement of Variables

Variables	Proxy	Measurement
	Dependent Variable	
Carbon Emission Disclosure (CED)	Checklist of 18 items distributed among 5 categories (Choi et al., 2013): 1. Risks and opportunities of climate change (2 items) 2. Greenhouse gas emissions (7 items) 3. Energy consumption (3 items)	$\frac{Total\ Number\ of\ Disclosed\ Items}{18}$

	4. Cost and reduction of greenhouse gas emissions (4 items) 5. Accountability of carbon emissions (2 items)	
Independent Variables		
Pressure (PSE)	Media exposure (Widianingsih, 2025b)	A score of 0 is given if firms disclose information related to carbon emissions through internal media but are not published by third or external parties, a score of 1 is given if firms disclose on both media
Board Size (BSZ)	Size of the board of directors	Total number of directors on the board
CEO Narcissism (NCEO)	Dummy variable	A score of 1 is given if there is no photo of the CEO, a score of 2 is given if there is a photo of the CEO with other executives, a score of 3 is given if the photo of the CEO takes up less than half of a page, a score of 4 is given if the photo of the CEO takes up more than half of a page
CEO Gender (GCEO)	Dummy variable	A score of 1 is given if the CEO is a female, and vice versa
Foreign CEO (FCEO)	Dummy variable	A score of 1 is given if the CEO is a foreigner, and vice versa
Productivity (PRD)	Ratio of revenue to total assets (Mardini & Lahyani, 2021)	$\frac{Revenue}{Total\ Assets}$
Capital Expenditure (CAPEX)	Amount of capital expenditure	Natural logarithm of capital expenditure
Moderating Variable		
Carbon Emissions (CE)	Total carbon emissions	Natural logarithm of carbon emissions

Method of Analysis

This study consists of two distinct model specifications, in which Model 1 focuses on state-owned enterprises (SOEs) and Model 2 focuses on private enterprises. A moderated regression analysis through a three-equation framework is employed (Sharma et al., 1981). The equation for Model 1, which does not include CEO gender and Foreign CEO since they are statistically omitted, is shown below:

$$CED = \alpha + \beta_1 PSE + \beta_2 BSZ + \beta_3 NCEO + \beta_4 PRD + \beta_5 CAPEX + \varepsilon \quad (1)$$

$$CED = \alpha + \beta_1 PSE + \beta_2 BSZ + \beta_3 NCEO + \beta_4 PRD + \beta_5 CAPEX + \beta_6 CE + \varepsilon \quad (2)$$

$$CED = \alpha + \beta_1 PSE + \beta_2 BSZ + \beta_3 NCEO + \beta_4 PRD + \beta_5 CAPEX + \beta_6 CE + \beta_7 PSE * CE + \beta_8 BSZ * CE + \beta_9 NCEO * CE + \beta_{10} PRD * CE + \beta_{11} CAPEX * CE + \varepsilon \quad (3)$$

The second equation for Model 2 is shown below:

$$CED = \alpha + \beta_1 PSE + \beta_2 BSZ + \beta_3 NCEO + \beta_4 GCEO + \beta_5 FCEO + \beta_6 PRD + \beta_7 CAPEX + \varepsilon \quad (1)$$

$$CED = \alpha + \beta_1 PSE + \beta_2 BSZ + \beta_3 NCEO + \beta_4 GCEO + \beta_5 FCEO + \beta_6 PRD + \beta_7 CAPEX + \beta_8 CE + \varepsilon \quad (2)$$

$$CED = \alpha + \beta_1 PSE + \beta_2 BSZ + \beta_3 NCEO + \beta_4 GCEO + \beta_5 FCEO + \beta_6 PRD + \beta_7 CAPEX + \beta_8 CE + \beta_9 PSE * CE + \beta_{10} BSZ * CE + \beta_{11} NCEO * CE + \beta_{12} GCEO * CE + \beta_{13} FCEO * CE + \beta_{14} PRD * CE + \beta_{15} CAPEX * CE + \varepsilon \quad (3)$$

Where PSE is pressure, BSZ is board size, NCEO is CEO narcissism, GCEO is CEO gender, FCEO is foreign CEO, PRD is productivity, CAPEX is capital expenditure, CE is carbon emissions, α is constant, β is a coefficient, and ε is the error term.

Based on the moderated regression analysis approach by Sharma et al. (1981), there are four types of moderator variables. First, a moderator variable is considered an independent variable or predictor if it is statistically significant in Equation 2 but not in the interaction term in Equation 3. Conversely, a moderator variable is a pure moderator if it is not statistically significant in Equation 2 but significant in the interaction term in Equation 3. However, if both are statistically significant, then the moderator variable is considered a quasi-moderator. Finally, if neither is statistically significant, then it is not considered a moderator variable.

Classical assumption tests for regression analysis include normality, multicollinearity, and heteroscedasticity tests. Normality is tested using the Skewness-Kurtosis Test, in which the residual errors are normally distributed if the p-value is above 0.05. Multicollinearity is tested using the Variance Inflation Factor (VIF), where there are no symptoms of

multicollinearity if the mean VIF value is below 10. Heteroscedasticity is tested using the Breusch-Pagan/Cook-Weisberg Test, in which there are no symptoms of heteroscedasticity if the p-value is above 0.05. Lastly, hypothesis testing involves interpreting the F-test, adjusted R-squared, and t-test values.

RESULTS

Descriptive Statistics

Table 2 shows the descriptive statistics results for state-owned enterprises in the energy sector. With a mean value of 0.4551581, most state-owned enterprises have a fair disclosure of carbon emissions in their report, with the highest disclosure recorded by PT Perusahaan Gas Negara Tbk (PGAS) in both 2022 and 2023. PSE, with relatively small means, indicates that not all information regarding CED of state-owned enterprises is published by external parties. With a small standard deviation, the board size of state-owned enterprises consists of around four directors. Furthermore, CEO narcissism, with a mean value of 3.384615, demonstrates that most CEOs publish their photos with a size of less than half a page. State-owned enterprises also have relatively high productivity since the mean value reaches up to 0.7607692. CAPEX, stated in trillion IDR, reveals that state-owned enterprises have a relatively huge amount of capital expenditure every year. The average carbon emissions generated by state-owned enterprises are 317,020 g/CO_{2e} with the highest carbon emission generated by PT Bukit Asam Tbk in 2023.

Table 2 Descriptive Statistics Results for Model 1

Variable	Mean	Std. Dev.	Min	Max
CED	0.4551581	0.2166324	0.111	0.8333333
PSE	0.2692308	0.4523443	0	1
BSZ	4.653846	1.056118	3	6
NCEO	3.384615	0.5710988	2	4
PRD	0.7607692	0.2584867	0.38	1.39
CAPEX	0.981	0.691	0.132	3.379
CE	317,020	258,980.4	50,315.89	1,028,230

Table 3 shows the descriptive statistics results for private enterprises in the energy sector. With a mean value of 0.4135345, most state-owned enterprises also have a fair disclosure of carbon emissions in their report, but still lower than those of state-owned

enterprises. The highest disclosure recorded by PT Alamtri Resources Indonesia Tbk (ADRO) in both 2022 and 2023. PSE, with a relatively small means, indicates that not all information regarding CED of private enterprises is published by external parties. However, since this mean value is greater than that of state-owned enterprises, it indicates that private enterprises publish their information more often. With a small standard deviation, the board size of private enterprises consists of around five directors, one member higher than state-owned enterprises. Furthermore, CEO narcissism, with a mean value of 3.042105, demonstrates that most CEOs in private enterprises publish their photos of a size of less than half a page. Private enterprises also have relatively high productivity since the mean value reaches up to 0.7593684. CAPEX, stated in trillion IDR, reveals that private enterprises also have a relatively huge amount of capital expenditure every year. The average carbon emissions generated by private enterprises are much greater than those of state-owned enterprises, reaching up to 373,217,055 g/CO_{2e} with the highest carbon emission generated by PT AKR Corporindo Tbk in 2018.

Table 3 Descriptive Statistics Results for Model 2

Variable	Mean	Std. Dev.	Min	Max
CED	0.4135345	0.2071687	0.0555556	0.778
PSE	0.4	0.4924969	0	1
BSZ	5.094737	1.885407	2	12
NCEO	3.042105	0.6982621	2	5
GCEO	0.0631579	0.2445372	0	1
FCEO	0.1263158	0.3339673	0	1
PRD	0.7593684	0.500476	0.16	2.59
CAPEX	0.953	1.673	0.00105	10.052
CE	373,217,055	2,545,742,472	2,323	18,054,543,617

Classical Assumption Tests

Table 4 shows the classical assumption test results for Model 1, which consists of a group of state-owned enterprises. The p-value from the Skewness-Kurtosis Test is above 0.05 for all three equations, indicating that the residual errors are normally distributed (Demir, 2022; Hatem et al., 2022). The mean VIF value is below 10 for all 3 equations, indicating that there are no symptoms of multicollinearity (Lavery et al., 2019; Shrestha, 2020). Lastly, the p-values from the Breusch-Pagan/Cook-Weisberg Test show insignificant

values, which suggest that there are no symptoms of heteroscedasticity within the model (Guo et al., 2020).

Table 4 Classical Assumption Test Results for Model 1

Classical Assumption Test	Equation 1	Equation 2	Equation 3
Normality	0.8435	0.8464	0.9100
Multicollinearity	1.21	1.45	4.27
Heteroscedasticity	0.1615	0.1604	0.0853

Table 5 shows the classical assumption test results for Model 2, which consists of a group of private enterprises. Since the three equations of Model 2 meet the required assumptions, there are no issues with normality, multicollinearity, and heteroscedasticity in this model.

Table 5 Classical Assumption Test Results for Model 2

Classical Assumption Test	Equation 1	Equation 2	Equation 3
Normality	0.0667	0.1038	0.4711
Multicollinearity	1.25	1.29	2.88
Heteroscedasticity	0.4817	0.4298	0.1591

Hypothesis Testing

Table 6 shows the regression results for the state-owned enterprises group. Since the F-test shows a significant value, it implies that Model 1 is feasible for use. The results, as shown in Equation 3, reveal that pressure, board size, CEO narcissism, productivity, and capital expenditure have no significant effect on CED; thus, H1a, H2a, H5a, H6a, and H7a are rejected. Moreover, results show that total carbon emissions interact with board size. This means that as total carbon emissions increase, the positive effect of board size on CED becomes stronger; thus, H10a is accepted. In addition, since total carbon emissions are not significant in Equation 2, but significant in the interaction term in Equation 3, it is regarded as a pure moderator. Since total carbon emissions do not interact with other independent variables, therefore, H9a, H12a, H13a, and H14a are rejected. An adjusted R-squared value of 0.5706 indicates that the variables in this study can explain CED of state-owned enterprises by 57.06%.

Table 6 Regression Analysis Results for Model 1

Variable	Equation 1 CED	Equation 2 CED	Equation 3 CED
PSE	0.1434006	0.1422582	0.1316631
	(0.070)	(0.099)	(0.106)
BSZ	0.1004837	0.1027044	0.0186199
	(0.006) *	(0.013) *	(0.690)
NCEO	-0.0258049	-0.0256945	-0.0210681
	(0.656)	(0.668)	(0.730)
PRD	-0.1069322	-0.1057843	0.3469159
	(0.412)	(0.493)	(0.243)
CAPEX	0.0461554	0.0462744	0.0588858
	(0.105)	(0.127)	(0.242)
CE		-0.000684	-0.1259226
		(0.988)	(0.056)
PSE*CE			0.0608901
			(0.531)
BSZ*CE			0.2198792
			(0.029) *
NCEO*CE			-0.0226952
			(0.742)
PRD*CE			0.6880737
			(0.070)
CAPEX*CE			-0.085605
			(0.202)
Constant	-1.141137	-1.13611	0.1084323
	(0.125)	(0.173)	(0.934)
Prob > F	0.0014*	0.0038*	0.0084*
Adjusted R-squared	0.5042	0.4781	0.5706

*Note: p-values in parentheses, *significant at the 5% level*

Table 7 shows the regression results for the private enterprises group. Since the F-test shows significant value, it implies that Model 2 is feasible for use. The results, as shown in Equation 3, reveal that pressure, CEO narcissism, and capital expenditure have a significant and positive effect on CED; thus, H2b, H5b, and H7b are accepted. Foreign CEOs have a significant and negative effect on CED; thus, H4 is rejected. Since board size, CEO gender,

and productivity have no significant effects, H1b, H3b, and H6b are rejected. Furthermore, results also reveal that total carbon emissions interact with foreign CEOs and capital expenditure; thus, H11b and H12b are accepted. This means that the negative and positive effect of foreign CEOs and capital expenditure on CED is stronger when there are higher total carbon emissions. In addition, since total carbon emissions are not significant in Equation 2, but significant in the interaction term in Equation 3, it is regarded as a pure moderator. On the other hand, as total carbon emissions do not interact with pressure, board size, CEO narcissism, CEO gender, and productivity, H8b, H9b, H13b, and H14b are rejected. An adjusted R-squared value of 0.4511 indicates that the variables in this study can explain the CED of private enterprises by 45.11%.

Table 7 Regression Analysis Results for Model 2

Variable	Equation 1 CED	Equation 2 CED	Equation 3 CED
PSE	0.1559006	0.1547053	0.1541275
	(0.000) *	(0.000) *	(0.000) *
BSZ	0.0228279	0.0211069	0.0180304
	(0.031) *	(0.058)	(0.086)
NCEO	0.0751899	0.0730744	0.0623193
	(0.007) *	(0.010) *	(0.042) *
GCEO	-0.0974657	-0.0928968	-0.2335001
	(0.179)	(0.205)	(0.127)
FCEO	-0.0525475	-0.0581574	-0.1477183
	(0.372)	(0.333)	(0.040) *
PRD	0.0322711	0.0309736	0.0409662
	(0.437)	(0.458)	(0.331)
CAPEX	0.0273026	0.0267442	0.0275958
	(0.006) *	(0.007) *	(0.009) *
CE		0.0042219	0.0018719
		(0.607)	(0.874)
PSE*CE			0.0033539
			(0.827)
BSZ*CE			0.0113636
			(0.088)
NCEO*CE			-0.0324682
			(0.051)

GCEO*CE			-0.135938
			(0.120)
FCEO*CE			-0.1203893
			(0.006) *
PRD*CE			-0.03616
			(0.298)
CAPEX*CE			0.0135671
			(0.014) *
Constant	-0.7227206	-0.7460804	-0.7148221
	(0.011) *	(0.010) *	(0.015) *
Prob > F	0.0000*	0.0000*	0.0000*
Adjusted R-squared	0.3706	0.3653	0.4511

*Notes: p-values in parentheses, *significant at the 5% level*

DISCUSSION

CED Determinant in State-Owned Enterprises

Based on the statistical descriptive results, state-owned enterprises have higher CED than private enterprises on average, with 45.5% of 18 indicators disclosed. The average yearly CED has also steadily increased over the years, rising from 16.6% in 2016 to 65.2% in 2023. However, this study finds that neither corporate governance, financial performance, nor media exposure influence CEDs. Also, the total of carbon emissions also does not interact with these relationships. This indicates that regardless of board of directors' size, CEO narcissism, female CEO, foreign CEO, productivity, CAPEX, or media exposure, the level of CED remains consistently high. In state-owned enterprises, disclosure practices are primarily driven by institutional and regulatory pressures. These disclosures are made to comply with government mandates and maintain legitimacy under heightened scrutiny from regulators and the public (Purwanti et al., 2022; Yuan et al., 2022; Yustina et al., 2024). As a result, CED appears to be more symbolic or mandatory in nature, rather than a voluntary initiative shaped by governance or leadership characteristics. In this context, stakeholder expectations are met through adherence to external regulations, not internal governance dynamics. This finding is aligned with Dewi et al. (2019), Fransisca et al. (2024) and Wardiman et al. (2023) that regulatory pressures significantly affect CED. Such a pattern is consistent with the obligations set out in Law No. 19 of 2003 and Law No. 40 of 2007, which is still focused on requiring state-owned enterprises to focus on sustainability compliance. These regulatory requirements also explain why state-owned enterprises have

demonstrated more consistent sustainability reporting since 2016 compared to private enterprises in the energy sector.

Although state-owned enterprises may consistently produce high levels of CED, this can also pose risks to stakeholders or greenwashing. From the perspective of legitimacy theory, such disclosure may serve as symbolic compliance to satisfy external scrutiny, a practice known as ceremonial conformity. In this case, the actual commitment to environmental improvement may be weak, as disclosures are issued primarily to create a positive public image, regardless of the quality of internal governance (Irawati et al., 2023; Tanjung, 2020). This means there may be no real change in the company's operations or behaviors. The disclosure exists largely "on paper" to meet regulatory or stakeholder expectations, without reflecting a genuine integration of sustainability into the company's strategies or core practices.

CED Determinant in State-Owned Enterprises

In private enterprises, the average CED is relatively high, reaching 45.1% across 18 indicators. The growth of this disclosure has also shown a consistent upward trend, rising from 22.2% in 2016 to 48.6% in 2023. The results show that CEO narcissism, capital expenditure (CAPEX), and media exposure all have a significant positive effect on CED. Total carbon emissions also strengthen the relationship between CAPEX and CED through an interaction effect. Furthermore, the findings reveal that most private enterprises are led by highly narcissistic CEOs. In line with stakeholder theory, this narcissism leads to greater CED, as narcissistic leaders seek stakeholder approval and reputation enhancement to gain legitimacy. Narcissistic CEOs are more motivated to avoid being perceived as irresponsible in their environmental, social, and governance practices, as they aim to protect their image and earn positive recognition from stakeholders (Falah & Mita, 2022; Lassoued & Khanchel, 2023; Putikadea & Kusumaningsih, 2025). This drives them to be more proactive in disclosing carbon emissions and climate-related information, as they strive to be seen as responsive and responsible leaders. Even in enterprises with high carbon emissions levels, these CEOs maintain their narcissistic tendencies. Ultimately, CED becomes a form of self-promotion, allowing these CEOs to demonstrate that under their leadership, the company is proactive and aligned with global sustainability trends. This finding aligns with research by Daniel and Ernawan (2019), Kushandojo and Widianingsih (2024), and Lassoued and Khanchel (2023) that CEO narcissism is correlated with sustainability-related information disclosure, including carbon emissions.

According to stakeholder theory, capital expenditure can lead to greater CED when companies are responsive to stakeholder pressures. This is because higher investment in assets may result in higher carbon emissions, so it must be disclosed to maintain the balance between operational growth and environmental accountability. This aligns with prior studies by Kurnia et al. (2020) that companies that invest more in assets and operations will face greater stakeholder scrutiny or regulatory requirements. Some investments may relate to environmental improvements, cleaner production processes, or energy efficiency; this must be disclosed to show that they are using their resources to address environmental risks and gain legitimacy from stakeholders.

Media exposure acts as a channel that amplifies stakeholders' awareness of corporate environmental performance, as in stakeholder theory. Almost most private enterprises gain media attention, with 40% on average having media exposure. This media highlights enterprises' carbon emissions issues, which result in greater external scrutiny and reputational pressure. To maintain legitimacy and trust, firms are more motivated to disclose their carbon emissions transparently as a form of accountability and dialogue with stakeholders (Abdullah et al., 2020; Mita Sari & Sulfitri, 2023; Widianingsih, 2025a). This also aligns with prior research by Ulfa and Ermaya (2019) and Ulupui et al. (2020)that media attention increases the pressure on companies to report carbon emissions as part of their efforts to appear socially responsible and responsive to stakeholder concerns. With that, CED is not only a compliance mechanism but also a strategic response to sustain or enhance firm reputation under stakeholder scrutiny.

Foreign CEOs have a significant negative effect on CED, and this effect is amplified by high total carbon emissions. From 2016 to 2023, only 12 out of 95 private energy firms were led by foreign CEOs, yet the findings contradict stakeholder theory, which expects companies to respond to stakeholder pressure. This contradiction can be explained by the liability of foreign theory, which refers to the additional costs foreign CEOs face due to unfamiliarity with local institutions, norms, and stakeholder expectations (Lu et al., 2022). This unfamiliarity hinders their ability to respond effectively to environmental pressures, leading to weaker stakeholder engagement and higher perceived risks of disclosure. The negative impact is stronger in high-emission firms, where stakeholder scrutiny is greater. In this case, foreign CEOs may adopt a more cautious approach, widening the gap between stakeholder expectations and actual CED. This foreign CEO disadvantage depends on their home country. If a CEO comes from a country with stringent requirements, they will promote higher levels of environmental and social disclosures (Bose et al., 2024; Santoso &

Setiawan, 2024; Toumi et al., 2022). So, it can be said that the current foreign CEO in Indonesia's energy sector private enterprises comes from a country with less stringent environmental policies.

Meanwhile, board size, female CEO presence, and productivity show no significant effect on CED. The average board size in 2016 was larger than in 2023, yet CED was higher in 2023 than in 2016. Unlike state-owned enterprises, private energy firms in Indonesia are not subject to the same level of public accountability or mandatory reporting requirements (Kim, 2021; Le et al., 2023). As a result, CED in these firms is largely voluntary, and board size has little influence if such disclosure is not viewed as a strategic priority or a competitive advantage. Without public or government scrutiny, boards of directors may not feel the urgency to push for greater transparency on carbon emissions (Saptono & Purwanto, 2022; Yustina et al., 2024). With that, a larger board in private firms does not necessarily mean stronger environmental governance, unless the board includes members with expertise or interest in sustainability (Li et al., 2024; Ulufiyah & Harymawan, 2025). Especially if they believe carbon disclosure could expose them to criticism or regulatory risk, a higher board of directors may even result in withholding information more strategically (Aulia et al., 2024; Chortareas et al., 2024). This result is aligned with prior studies by Astuti and Setiany (2021) and Budiharta and Kacaribu (2020).

Indonesia's energy sector remains male-dominated, with 89 of the observations between 2016 and 2026 led by male CEOs, and only 6 led by female CEOs. In this environment, female CEOs have limited opportunity to translate their ethical orientation into disclosure practices. The deep-rooted organizational priorities and norms in financial aspects also override the potential influence of CEO gender on disclosure (Santoso & Setiawan, 2024). Even with a female CEO, if the firm's strategic focus is not on voluntary transparency, carbon disclosure levels are unlikely to change even with high carbon emissions. However, studies by Fuadi et al. (2024) and Harjito & Sutopo (2024) found that older and more highly educated female CEOs are more likely to enhance CED, highlighting the importance of diverse executive backgrounds to make female CEOs effective.

Productivity is also an interesting factor, as companies with below-average productivity still demonstrate high levels of CED, nearly equivalent to those with above-average productivity. In 2023, the gap between the two groups was only 9.9%, or just two disclosure indicators. This suggests that CED may be driven not by operational productivity, but by the need to gain legitimacy in the eyes of stakeholders. Regardless of a company's productivity level, disclosure can serve as a tool to fulfill stakeholder expectations and

demonstrate environmental accountability (Di Tullio et al., 2020; Janang et al., 2020; Reber et al., 2022).

Research Position

Despite increasing global emphasis on CED, there remains a significant gap in understanding the determinants of CED within Indonesia's energy sector, its largest contributor to national emissions. This study positions itself to fill these gaps by examining and comparing the determinants of CED in state-owned versus private enterprises in the energy sector. It incorporates a novel integrated framework that combines CEO attributes (narcissism, gender, and foreign status) with firm-level characteristics (capital expenditure and productivity), offering a multidimensional perspective on what drives disclosure of carbon emissions among firms. Furthermore, this research differs from prior research by employing carbon emissions as a moderating variable to assess whether firms with higher carbon emissions demonstrate different disclosure behaviours in response to these determinants. Based on the foregoing, this research not only advances theoretical understanding from a stakeholder perspective but also provides practical insights at a time when regulatory scrutiny and climate-related risks are intensifying.

Theory Verification

Based on the findings of this study, stakeholder theory cannot be fully verified empirically. This is because the strongest determinant of CED still comes from regulatory pressure to comply, as observed in state-owned enterprises. In contrast, in private enterprises, only certain factors appear to act as key determinants, namely CEO narcissism, capital expenditure, and media exposure. This suggests that while stakeholder pressure plays a role, it is often overshadowed by formal regulatory frameworks.

Conclusion, Limitations, and Suggestions

This study indicates that there is no determinant on CED in state-owned enterprises, and total carbon emissions have an interaction with board of director size and the CED relation. On the other hand, the determinant in private enterprises is CEO narcissism, capital expenditure, and media exposure that have a significant positive effect on CED. The total carbon emissions only have interaction in capital expenditure and CED relationship. Meanwhile, foreign CEOs have a significant negative effect on CED, interacting with total

carbon emissions. Board size, female CEO presence, and productivity show no significant effect on CED. This suggests that regulatory pressures are more dominant than the dynamic of corporate governance, financial performance, and media exposure, especially in highly regulated enterprises such as state-owned enterprises. In private enterprises, CEO narcissism and capital expenditure are able to push enterprises to disclose more about carbon emissions to gain legitimacy from stakeholders. More media coverage also puts pressure toward enterprises to respond to their carbon emissions problem by CED. Foreign CEOs have disadvantages for stakeholders' engagement due to the unfamiliar environment in Indonesia. This finding strengthens the progress of prior studies that remain inconclusive regarding the determinant of CED moderated with total carbon emissions, while also drawing attention to the underexplored focus on state-owned and private enterprises.

The literature implication in this study enriches CED research and distinguishes between state-owned and private enterprises. The findings also provide practical guidance for company management on key factors to consider in enhancing CED, especially in energy sector firms that are major contributors to carbon emissions. This can also address the carbon emissions problem in Indonesia to achieve a green and blue economy. The social implications are that this research supports greater transparency and accountability in enterprises.

This study is limited because there are no foreign or female CEOs in state-owned enterprises. Additionally, it was intended to use carbon intensity, measured by total carbon emissions divided by energy volume, as the moderator, but most enterprises have not reported this in their sustainability reports. Further studies are suggested to use a more dynamic CEO gender measure to capture its characteristics and focus on the agriculture sector. The agriculture sector studies remain untapped, even though Indonesia's highest emissions reduction targets by 2030 are currently in forestry.

REFERENCES

Abdullah, M. W., Musriani, R., Syariati, A., & Hanafie, H. (2020). Carbon Emission Disclosure in Indonesian Firms: The Test of Media-Exposure Moderating Effects. *International Journal of Energy Economics and Policy*, *10*(6), 732–741. https://doi.org/10.32479/IJEEP.10142

Adhikari, A., & Zhou, H. (2021). Voluntary Disclosure and Information Asymmetry: Do Investors in US Capital Markets Care about Carbon Emission? *Sustainability*

Accounting, Management and Policy Journal, *13*(1), 195–220. https://doi.org/10.1108/SAMPJ-02-2020-0046

Alfi, C. F., Mohamad, M., & Hussainey, K. (2024). Unveiling the Hidden Symphony: Board Dynamics and Carbon Emission Disclosure – A Meta-Analysis Study in the Realm of Developed Markets. *Journal of Accounting Literature, 47*(2), 404–432. https://doi.org/10.1108/jal-07-2023-0126

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.

Aulia, A. M., Safitri, U. N. C., & Hwihanus, H. (2024). The Impact of Carbon Emission Disclosure on Firm Value. *Journal of Environmental Economics and Sustainability*, *1*(3), 1–6. https://doi.org/10.47134/jees.v1i3.354

Bintang, I. D. A., & Ardiana, P. A. (2025). Media Reporting on Environmental Issues and Its Association with Carbon Emission Disclosure. *E-Jurnal Akuntansi*, *35*(1). https://doi.org/10.24843/EJA.2025.v35.i01.p03

Bose, S., Lim, E. K. Y., Minnick, K., & Shams, S. (2024). Do Foreign Institutional Investors Influence Corporate Climate Change Disclosure Quality? International Evidence. *Corporate Governance: An International Review*, *32*(2), 322–347. https://doi.org/10.1111/corg.12535

Budiharta, P., & Kacaribu, H. (2020). The Influence of Board of Directors, Managerial Ownership, and Audit Committee on Carbon Emission Disclosure: A Study of Non-Financial Companies Listed on BEI. *Review of Integrative Business and Economics Research*, *9*(3), 75–87.

Bui, B., Moses, O., & Houqe, M. N. (2020). Carbon Disclosure, Emission Intensity and Cost of Equity Capital: Multi-Country Evidence. *Accounting and Finance*, *60*(1), 47–71. https://doi.org/10.1111/acfi.12492

Caby, J., Coron, C., & Ziane, Y. (2024). How Does Gender Diversity in Top Management Teams Affect Carbon Disclosure and its Quality: Evidence from The Technological Industry. *Technological Forecasting and Social Change*, *199,* 123077. https://doi.org/10.1016/j.techfore.2023.123077

Charumathi, B., & Rahman, H. (2019). Do Women on Boards Influence Climate Change Disclosures To CDP? - Evidence from Large Indian Companies. *Australasian Accounting, Business and Finance Journal*, *13*(2), 5–31. https://doi.org/10.14453/aabfj.v13i2.2

Choi, B. 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

Chortareas, G., Kou, F., & Ventouri, A. (2024). Corporate Pollution and Reputational Exposure. *Financial Markets, Institutions and Instruments*, *33*(2), 149–178. https://doi.org/10.1111/fmii.12190

Citra, Y., & Sastradipraja, U. (2025). The Influence of Green Investment and Media Exposure on Carbon Emission Disclosure (Case Study on Oil, Gas and Coal Energy Subsector Companies Listed on the Indonesia Stock Exchange in 2021-2023). *Journal of Accounting and Finance Management*, *5*(6), 1796–1810. https://doi.org/10.38035/jafm.v5i6.1443

Daniel, D. R., & Ernawan, K. (2019). The Influence of CEO Narcissism on Corporate Social Responsibility Disclosure. *Jurnal Akuntansi*, *23*(2), 253–268. https://doi.org/10.24912/ja.v23i2.587

Demir, S. (2022). Comparison of Normality Tests in Terms of Sample Sizes Under Different Skewness and Kurtosis Coefficients. *International Journal of Assessment Tools in Education*, *9*(2), 397–409. https://doi.org/10.21449/ijate.1101295

Desvita, L., & Rahma, Y. (2025). The Effect of Capital Expenditure, Environmental Perfomance, Environmental Management System, Institutional Ownership and Independent Board of Commissioners on Carbon Emission Disclosure. *Jurnal Akuntansi Bisnis*, *18*(1), 126–145. https://doi.org/10.30813/jab.v18i1.7415

Dewi, L. G. K., Yenni Latrini, M., & Rsi Respati, N. N. (2019). Determinan Carbon Emission Disclosure Perusahaan Manufaktur. *E-Jurnal Akuntansi, 28*(1), 613–640. https://doi.org/10.24843/eja.2019.v28.i01.p24

Di Tullio, P., Valentinetti, D., Nielsen, C., & Rea, M. A. (2020). In Search of Legitimacy: A Semiotic Analysis of Business Model Disclosure Practices. *Meditari Accountancy Research*, *28*(5), 863–887. https://doi.org/10.1108/MEDAR-02-2019-0449

Ding, D., Liu, B., & Chang, M. (2023). Carbon Emissions and TCFD Aligned Climate-Related Information Disclosures. *Journal of Business Ethics*, *182*(4), 967–1001. https://doi.org/10.1007/s10551-022-05292-x

Downar, B., Ernstberger, J., Reichelstein, S., Schwenen, S., & Zaklan, A. (2021). The Impact of Carbon Disclosure Mandates on Emissions and Financial Operating Performance. *Review of Accounting Studies*, *26*(3), 1137–1175. https://doi.org/10.1007/s11142-021-09611-x

EDGAR. (2024). The Emissions Database for Global Atmospheric Research. EDGAR. Retrieved 8 April, 2026, from: https://edgar.jrc.ec.europa.eu/report_2024

Falah, L. J., & Mita, A. F. (2022). ESG Disclosure and the Role of CEO Narcissism on Firm Value: The Case Of ASEAN-5. *Global Business and Economics Review*, *27*(2), 133–148. https://doi.org/10.1504/gber.2022.125036

Florencia, V., & Handoko, J. (2021). Uji Pengaruh Profitabilitas, Leverage, Media Exposure terhadap Pengungkapan Emisi Karbon dengan Pemoderasi. *Jurnal Riset Akuntansi dan Keuangan*, *9*(3), 583–598.

Fransisca, S., Robiani, B., Meutia, I., & Yusnaini, Y. (2024). Development of Carbon Emission Disclosure Indicators in Indonesia and Analysis of Determining Factors. *Qubahan Academic Journal*, *4*(3), 242–262. https://doi.org/10.48161/qaj.v4n3a617

Freeman, R. E., Phillips, R., & Sisodia, R. (2020). Tensions in Stakeholder Theory. *Business and Society*, *59*(2), 213–231. https://doi.org/10.1177/0007650318773750

Fuadi, F., Rubihani, D., Puspitasari, S., Sinatria, N., & Pasangka, P. H. (2024). The Role of CEO Characteristics in Enhancing Carbon Emission Disclosure: Evidence from Indonesia. *Hasanuddin Economics and Business Review*, *8*(2), 96–110. https://doi.org/10.26487/hebr.v8i2.5606

Gledis, D., Yovana, & Kadir, A. (2020). Pengaruh Ukuran Perusahaan, Pertumbuhan Perusahaan, Profitabilitas, dan Leverage terhadap Pengungkapan Corporate Sosial Responbility (CSR). *Jurnal Manajemen dan Akuntansi*, *21*(1), 15–24.

Guastella, G., Mazzarano, M., Pareglio, S., & Xepapadeas, A. (2022). Climate Reputation Risk and Abnormal Returns in the Stock Markets: A Focus on Large Emitters. *International Review of Financial Analysis*, *84*, 102365. https://doi.org/10.1016/j.irfa.2022.102365

Guo, X., Jiang, X., Zhang, S., & Zhu, L. (2020). Pairwise Distance-Based Heteroscedasticity Test for Regressions. *Science China Mathematics*, *63*(12), 2553–2572. https://doi.org/10.1007/s11425-018-9462-2

Iratiwi, H. & Sulfitri, V. (2023). Pengaruh Kinerja Karbon, Tekanan Stakeholder dan Sertifikasi Iso 14001 terhadap Pengungkapan Emisi Karbon. *Postgraduate Management Journal*, *3*(1), 9–20. https://doi.org/10.36352/pmj.v3i1.429

Harjito, Y., & Sutopo, B. (2024). Measuring Carbon Disclosure from Ceo Characteristics. *Jurnal Akuntansi dan Auditing*, *21*(2), 200–217. https://doi.org/10.14710/jaa.21.2.200-217

Hatem, G., Zeidan, J., Goossens, M., & Moreira, C. (2022). Normality Testing Methods

and the Importance of Skewness and Kurtosis in Statistical Analysis. *BAU Journal - Science and Technology*, *3*(2), 7. https://doi.org/10.54729/ktpe9512

Hidayat, I., Ismail, T., Taqi, M., & Yulianto, A. S. (2022a). Investigating in Disclosure of Carbon Emissions: Influencing the Elements Using Panel Data. *Jurnal Reviu Akuntansi dan Keuangan*, *12*(3), 721–732. https://doi.org/10.22219/jrak.v12i3.23072

Hidayat, I., Ismail, T., Taqi, M., & Yulianto, A. S. (2022b). Investigating in Disclosure of Carbon Emissions: Influencing the Elements Using Panel Data. *Jurnal Reviu Akuntansi dan Keuangan*, *12*(3), 721–732. https://doi.org/10.22219/jrak.v12i3.23072

IEA. (2025). Global Energy Review 2025. IEA. Retrieved 8 April, 2026, from: https://Www.Iea.Org/Reports/Global-Energy-Review-2025/Co2-Emissions.

IFAC. (2025). The State of Play: Sustainability Disclosure and Assurance. IFAC. Retrieved 8 April, 2026, from: https://www.ifac.org/knowledge-gateway/audit-assurance/publications/state-play-sustainability-disclosure-and-assurance.

IPCC. (2024). Chapter 2: Emissions Trends and Drivers. Retrieved 8 April, 2026, from: https://Www.Ipcc.Ch/Report/Ar6/Wg3/Chapter/Chapter-2/.

Irawati, Prananingtyas, P., & Wulan, R. C. (2023). Regulation Urgency of the Misleading "Greenwashing" Marketing Concept in Indonesia. *IOP Conference Series: Earth and Environmental Science*, *1270*(1), 012007. https://doi.org/10.1088/1755-1315/1270/1/012007

Janang, J. S., Joseph, C., & Said, R. (2020). Corporate Governance and Corporate Social Responsibility Society Disclosure: The Application of Legitimacy Theory. *International Journal of Business and Society*, *21*(2), 660–678.

Kalbuana, N., Taqi, M., Uzliawati, L., Ramdhani, D., & Muchlish, M. (2023). Factors Affecting the Disclosure of Sustainability Reports of Transportation Companies in Indonesia. *Business and Accounting Research (IJEBAR) Peer Reviewed-International Journal*, *7*(2), 564–575.

Kandil, N., Basuony, M. A. K., Bouaddi, M., Elmoursy, H., & Elbayuomi, A. F. (2025). Examining CEO Characteristics and Carbon Emissions: A Quantile Approach to UK-Listed Firms. *Sustainability*, *17*(13), 5732. https://doi.org/10.3390/su17135732

Kim, K. (2021). Indonesia's Restrained State Capitalism: Development and Policy Challenges. *Journal of Contemporary Asia*, *51*(3), 419–446. https://doi.org/10.1080/00472336.2019.1675084

Kılıç, M., & Kuzey, C. (2019). The Effect of Corporate Governance on Carbon Emission

Disclosures: Evidence from Turkey. *International Journal of Climate Change Strategies and Management*, *11*(1), 35–53. https://doi.org/10.1108/IJCCSM-07-2017-0144

Kurnia, P., Agustia, D., Soewarno, N., & Ardianto, A. (2025). The Mediating Role of Carbon Emission Disclosure in the Relationship between Structure of Corporate Governance and Firm Performance. *Journal of Applied Accounting Research, 26*(5), 1106–1134. https://doi.org/10.1108/JAAR-01-2023-0015

Kurnia, P., Darlis, E., & Putra, A. A. (2020). Carbon Emission Disclosure, Good Corporate Governance, Financial Performance, and Firm Value. *Journal of Asian Finance, Economics and Business*, *7*(12), 223–231. https://doi.org/10.13106/JAFEB.2020.VOL7.NO12.223

Kurnia, P., Nur, D. P. E., & Putra, A. A. (2021). Carbon Emission Disclosure and Firm Value: A Study of Manufacturing Firms in Indonesia and Australia. *International Journal of Energy Economics and Policy*, *11*(2), 83–87. https://doi.org/10.32479/ijeep.10730

Kushandojo, A. H., & Widianingsih, L. P. (2024). Peran Narsisme Ceo dan Komposisi Gender Dewan Direksi dalam Meningkatkan Kualitas Pelaporan Keberlanjutan: Perusahaan-Perusahaan Di ASEAN. *Financial: Jurnal Akuntansi*, *10*(2), 186–202. https://doi.org/10.37403/financial.v10i2.613

Kuswantoro, H., Sholihin, M., & Djajadikerta, H. G. (2023). Exploring the Implementation of Sustainable Development Goals: A Comparison between Private and State-Owned Enterprises in Indonesia. *Environment, Development and Sustainability*, *25*(10), 10799–10819. https://doi.org/10.1007/s10668-022-02505-1

Lassoued, N., & Khanchel, I. (2023). Voluntary CSR Disclosure and CEO Narcissism: The Moderating Role of CEO Duality and Board Gender Diversity. *Review of Managerial Science*, *17*(3), 1076–1123. https://doi.org/10.1007/s11846-022-00555-3

Lavery, M. R., Acharya, P., Sivo, S. A., & Xu, L. (2019). Number of Predictors and Multicollinearity: What are Their Effects on Error and Bias in Regression? *Communications in Statistics: Simulation and Computation*, *48*(1), 27–38. https://doi.org/10.1080/03610918.2017.1371750

Le, T. H., Park, D., & Castillejos-Petalcorin, C. (2023). Performance Comparison of State-Owned Enterprises Versus Private Firms in Selected Emerging Asian Countries. *Journal of Asian Business and Economic Studies*, *30*(1), 26–48. https://doi.org/10.1108/JABES-08-2021-0116

Lee, J. H., & Cho, J. H. (2021a). Firm-Value Effects of Carbon Emissions and Carbon

Disclosures—Evidence from Korea. *International Journal of Environmental Research and Public Health*, *18*(22), 1–16. https://doi.org/10.3390/ijerph182212166

Lee, J. H., & Cho, J. H. (2021b). Firm-Value Effects of Carbon Emissions and Carbon Disclosures—Evidence from Korea. *International Journal of Environmental Research and Public Health*, *18*(22), 12166. https://doi.org/10.3390/ijerph182212166

Li, X., Guo, F., & Wang, J. (2024). A Path Towards Enterprise Environmental Performance Improvement: How Does CEO Green Experience Matter? *Business Strategy and the Environment*, *33*(2), 820–838 . https://doi.org/10.1002/bse.3524

Lina, L., & Devyanti, C. (2024). The Influence of Corporate Governance Mechanisms on Carbon Emission Disclosure: Does Green Performance Matter? *JRAK*, *16*(2), 13–28. https://doi.org/10.23969/jrak.v16i2.17833

Lu, J. W., Ma, H., & Xie, X. (2022). Foreignness Research in International Business: Major Streams and Future Directions. *Journal of International Business Studies*, *53*(3). https://doi.org/10.1057/s41267-021-00465-8

Ma, B., Lin, S., Bashir, M. F., Sun, H., & Zafar, M. (2023). Revisiting the Role of Firm-Level Carbon Disclosure in Sustainable Development Goals: Research Agenda and Policy Implications. *Gondwana Research*, *117*, 230–242. https://doi.org/10.1016/j.gr.2023.02.002

Magdalena, R., Isnalita, I., & Soewarno, N. (2025). Women Leadership and Corporate Water Information Disclosure: Moderating Effect of Internet Visibility. *JRAK*, *17*(2), 48–62. https://doi.org/10.23969/jrak.v17i2.19798

Mahajan, R., Lim, W. M., Sareen, M., Kumar, S., & Panwar, R. (2023). Stakeholder Theory. *Journal of Business Research*, *166*, 1–16. https://doi.org/10.1016/j.jbusres.2023.114104

Mardini, G. H., & Elleuch Lahyani, F. (2022). Impact of Foreign Directors on Carbon Emissions Performance and Disclosure: Empirical Evidence from France. *Sustainability Accounting, Management and Policy Journal*, *13*(1), 221–246. https://doi.org/10.1108/SAMPJ-09-2020-0323

Marquez-Illescas, G., Zebedee, A. A., & Zhou, L. (2019). Hear Me Write: Does CEO Narcissism Affect Disclosure? *Journal of Business Ethics*, *159*(2), 401–417. https://doi.org/10.1007/s10551-018-3796-3

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

Sari, N., & Sulfitri, V. (2023). The Effect of Media Exposure, Environmental Performance, and ISO 14001 Certification on Carbon Emission Disclosure. *Journal Of Economics, Finance and Management Studies*, *6*(8), 3662–3671. https://doi.org/10.47191/jefms/v6-i8-13

Nicolò, G., Aversano, N., Sannino, G., & Tartaglia Polcini, P. (2023). Online Sustainability Disclosure Practices in the University Context. The Role of the Board of Directors. *Corporate Governance (Bingley)*, *23*(4), 800–826. https://doi.org/10.1108/CG-05-2022-0224

Park, J., Lee, J., & Shin, J. (2023). Corporate Governance, Compensation Mechanisms, and Voluntary Disclosure of Carbon Emissions: Evidence from Korea. *Journal of Contemporary Accounting and Economics*, *19*(3), 100361. https://doi.org/10.1016/j.jcae.2023.100361

Pitrakkos, P., & Maroun, W. (2020). Evaluating the Quality of Carbon Disclosures. *Sustainability Accounting, Management and Policy Journal*, *11*(3), 553–589. https://doi.org/10.1108/SAMPJ-03-2018-0081

Prasetyo, I. P. A., & Sri Harta Mimba, N. P. (2021). The Effect of Good Corporate Governance, Company Size, and Profitability on Carbon Emission Disclosure. *International Journal of Scientific and Research Publications (IJSRP)*, *11*(6), 553–589. https://doi.org/10.29322/ijsrp.11.06.2021.p114101

Purwanti, A., Harnovinsah, H., & Nugroho, L. (2022). Media of Carbon Emissions Disclosure and Return on Asset Operations in State-owned Enterprises Public Company. *International Journal of Energy Economics and Policy*, *12*(3), 781–786. https://doi.org/10.32479/ijeep.13012

Putikadea, I., & Kusumaningsih, A. (2025). Climate-Related Disclosure and Financial Performance: Which One is Affected by CEO Narcissism? *Journal of Economic, Management, Accounting and Technology*, *8*(1), 133–144. https://doi.org/10.32500/jematech.v8i1.8848

PwC. (2023). Sustainability Counts II. PwC. Retrieved 8 April, 2026, from: https://www.pwc.com/id/en/services/environmental-social-governance/sustainability-counts-ii.html

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

Reber, B., Gold, A., & Gold, S. (2022). ESG Disclosure and Idiosyncratic Risk in Initial Public Offerings. *Journal of Business Ethics*, *179*(3), 867–886. https://doi.org/10.1007/s10551-021-04847-8

Saadah, K., Probohudono, A. N., & Setiawan, D. (2022). Comparison of Environmental Disclosure on Social Media and Sustainability Report (CEO Narcissism Perspective). *Proceedings of the International Colloquium on Business and Economics (ICBE 2022), 229,* 179–194. https://doi.org/10.2991/978-94-6463-066-4_16

Santoso, A., & Setiawan, D. (2024). CEO Characteristics and Water Disclosure: Multi-Country Evidence. *Sustainable Futures*, *8*, 100322. https://doi.org/10.1016/j.sftr.2024.100322

Saptono, P. B., & Purwanto, D. (2022). Factors Causing the Ineffectiveness of Good Corporate Governance in Preventing Corruption in State-Owned Enterprises. *Integritas : Jurnal Antikorupsi*, *8*(1), 77–94. https://doi.org/10.32697/integritas.v8i1.870

Savitri, I., Pratiwi, D. N., & Sumadi, S. (2021). Faktor-Faktor yang Mempengaruhi Pengungkapan Corporate Social Responsibility. *Journal of Accounting and Digital Finance*, *1*(1), 15–24. https://doi.org/10.53088/jadfi.v1i1.18

Sharma, S., Durand, R. M., & Gur-Arie, O. (1981). Identification and Analysis of Moderator Variables. *Journal of Marketing Research*, *18*(3), 291–300.

Shrestha, N. (2020). Detecting Multicollinearity in Regression Analysis. *American Journal of Applied Mathematics and Statistics*, *8*(2), 39–42. https://doi.org/10.12691/ajams-8-2-1

Simamora, R. N. H., Safrida, & Elviani, S. (2022). Carbon Emission Disclosure in Indonesia: Viewed from the Aspect of Board of Directors, Managerial Ownership, and Audit Committee. *Journal of Contemporary Accounting, 4*(1), 1–9. https://doi.org/10.20885/jca.vol4.iss1.art1

Sun, Z. Y., Wang, S. N., & Li, D. (2022). The Impacts of Carbon Emissions and Voluntary Carbon Disclosure on Firm Value. *Environmental Science and Pollution Research*, *29*(40), 60189–60197. https://doi.org/10.1007/s11356-022-20006-6

Suryani, R., & Wijayati, F. L. (2019). Large Determinant of Greenhouse Gas Emissions Disclosure in Indonesia. *Riset Akuntansi dan Keuangan Indonesia, 4*(2), 101–117. https://doi.org/10.23917/reaksi.v4i2.8545

Tanjung, M. (2020). A Cross-Firm Analysis of Corporate Governance Compliance and

Performance in Indonesia. *Managerial Auditing Journal*, *35*(5), 621–643. https://doi.org/10.1108/MAJ-06-2019-2328

Toumi, N. B. F., Khemiri, R., & Makni, Y. F. (2022). Board Directors' Home Regions and CSR Disclosure: Evidence from France. *Journal of Applied Accounting Research*, *23*(2), 509–539. https://doi.org/10.1108/JAAR-02-2021-0032

Ulfa, F. N. A., & Ermaya, H. N. L. (2019). Effect of Exposure Media, Environmental Performance and Industrial Type on Carbon Emission Disclosure. *Jurnal Ilmiah Akuntansi Universitas Pamulang*, *7*(2), 149–158. https://doi.org/10.32493/jiaup.v7i2.2320

Ulufiyah, R., & Harymawan, I. (2025). Economic Expertise in Leadership : How CEO Economic Certifications Drive Corporate EES Performance. *Owner*, *9*(2), 1020–1032. https://doi.org/10.33395/owner.v9i2.2663

Ulupui, I. G. K. A., Maruhawa, D., Purwohedi, U., & Kiswanto. (2020). Carbon Emission Disclosure, Media Exposure, Environmental Performance, Characteristics of Companies: Evidence from Non Fincancial. *IBIMA Business Review*, *2020,* 1–21. https://doi.org/10.5171/2020.628159

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), 2300518. https://doi.org/10.1080/23311975.2023.2300518

Wardiman, R. F., Muid, D., & Hamdani, H. (2023). The Influence of Social Pressure, Market Pressure, Shareholder Pressure and the Reputation of Public Accounting Firms on Carbon Emission Disclosure. *Jurnal Manajemen Bisnis*, *10*(1), 84–97. https://doi.org/10.33096/jmb.v10i1.482

Wibowo, R., Suhendro, S., & Amelia, Y. (2023). Analysis of Factors Affecting Carbon Emission Disclosure in Indonesia. *Jambu Air : Journal of Accounting Management Business and International Research*, *1*(1), 1–16. https://doi.org/10.57235/jambuair.v1i1.6

Widianingsih, L. P. (2025a). Determinants of Carbon Emission Disclosure of Energy Sector Companies in Indonesia. *Jurnal Ekonomi dan Bisnis*, *28*(1), 21–38.

Widianingsih, L. P. (2025b). Determinants of Carbon Emission Disclosure of Energy Sector Companies in Indonesia. *Jurnal Ekonomi dan Bisnis*, *28*(1), 21–38.

Wulan, D. F. (2022). Foreign Directors, Foreign Ownership, and Carbon Emission Disclosure: Evidence from Indonesia Environmentally Sensitive Companies. *Review of*

Management, Accounting, and Business Studies, *3*(2), 90–100.

Yuan, L., Chen, Y., He, W., Kong, Y., Wu, X., Degefu, D. M., & Ramsey, T. S. (2022). The Influence of Carbon Emission Disclosure on Enterprise Value Under Ownership Heterogeneity: Evidence from the Heavily Polluting Corporations. *Environmental Science and Pollution Research*, *29*(46), 69753–69770. https://doi.org/10.1007/s11356-022-20705-0

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

Zaman, R., Jain, T., Samara, G., & Jamali, D. (2022). Corporate Governance Meets Corporate Social Responsibility: Mapping the Interface. *Business & Society*, *61*(3), 690–752. https://doi.org/10.1177/0007650320973415

Zhang, Y., & Dong, L. (2023). Foreign Experience of CEO and Corporate Social Responsibility: Evidence from China. *Frontiers in Environmental Science*, *11,* 1–20. https://doi.org/10.3389/fenvs.2023.1103394