

Environmental Disclosure Under CEO Influence: The Silent Role of Female Board Members

Nur Asiah

Universitas Esa Unggul; Jakarta, Indonesia

E-Mail: nur.asiah1699@student.esaunggul.ac.id

Wulan Rahmawati

Universitas Esa Unggul; Jakarta, Indonesia

E-Mail: wulan.rahmawati@esaunggul.ac.id

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ABSTRACT

Indonesia, as one of the major greenhouse gas emitters in Southeast Asia, faces growing pressure to strengthen environmental transparency through carbon emission disclosures in corporate reporting. This study aims to examine the effect of institutional ownership and chief executive officer (CEO) power on carbon emission disclosure (CED) in energy sector companies listed on the Indonesia Stock Exchange during 2020–2023, with female directors as a moderating variable. Using a sample of 13 companies (52 firm-year observations), data were obtained from annual and sustainability reports. The analysis employed a random effect regression model, supported by diagnostic tests for normality, multicollinearity, and heteroskedasticity. The CED index was used to measure disclosure levels, while CEO power was measured using a composite index consisting of duality, tenure, education, share ownership, and age. The results indicate that institutional ownership has a negative effect on carbon emission disclosure, while CEO power has a positive and significant effect. Furthermore, the presence of female directors does not moderate the relationship between institutional ownership and carbon emission disclosure, nor does it moderate the relationship between CEO power and carbon emission disclosure. These findings emphasize the crucial role of CEO leadership in enhancing environmental transparency and suggest that female directors' influence in sustainability governance remains limited within Indonesia's energy sector.

Keywords: Carbon Emission Disclosure, CEO Power, Corporate Governance, Energy Sector, Female Directors, Institutional Ownership, Sustainability.

ABSTRAK

Indonesia, salah satu penghasil emisi gas rumah kaca utama di Asia Tenggara, menghadapi tekanan yang semakin besar untuk meningkatkan transparansi lingkungan melalui pengungkapan emisi karbon dalam pelaporan perusahaan. Studi ini bertujuan untuk mengkaji bagaimana kepemilikan institusional dan kekuasaan CEO memengaruhi pengungkapan emisi karbon di perusahaan sektor energi yang terdaftar di Bursa Efek Indonesia dari tahun 2020 hingga 2023, dengan direktur perempuan sebagai variabel moderasi. Menggunakan sampel 13 perusahaan, menghasilkan 52 observasi perusahaan per tahun, data dikumpulkan dari laporan tahunan dan keberlanjutan. Model regresi efek acak, yang didukung oleh uji diagnostik untuk normalitas, multikolinearitas, dan heteroskedastisitas, digunakan untuk menganalisis hubungan tersebut. Indeks pengungkapan emisi karbon mengukur tingkat pengungkapan, sementara kekuasaan CEO dinilai melalui indeks komposit dualitas, masa jabatan, pendidikan, kepemilikan saham, dan usia. Temuan menunjukkan bahwa kekuasaan CEO berpengaruh positif terhadap pengungkapan emisi karbon, sementara kepemilikan institusional berpengaruh negatif signifikan. Keberadaan direktur wanita tidak memoderasi hubungan antara kepemilikan institusional dan pengungkapan emisi karbon maupun antara kekuatan CEO dan pengungkapan emisi karbon, menunjukkan pengaruh yang terbatas karena tokenisme. Studi ini menyoroti peran penting kepemimpinan CEO dalam

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mendorong transparansi lingkungan dan merekomendasikan pemberdayaan direktur perempuan dalam peran strategis untuk meningkatkan praktik pengungkapan di sektor energi Indonesia.

Kata kunci: *Pengungkapan Emisi Karbon, Kekuasaan CEO, Tata Kelola Perusahaan, Sektor Energi, Direktur Wanita, Kepemilikan Institusional, Keberlanjutan.*

INTRODUCTION

The urgency to address climate change has brought Carbon Emissions Disclosure (CED) into sharper focus, particularly in countries with high emissions like Indonesia. As the largest Greenhouse Gas (GHG) emitter in Southeast Asia in 2023, Indonesia faces increasing pressure to enhance environmental transparency (Crippa et al., 2024). Through Presidential Regulation No. 98 of 2021, the Indonesian government has mandated businesses to measure, verify, and disclose GHG emissions in their sustainability or integrated reports (Gunawan & Meiranto, 2020). On a global scale, the COP-26 UN Framework emphasizes policy coordination in emission reduction. However, Indonesia has only achieved a 29% reduction of its targeted emissions, while global progress remains behind schedule (Widarjo et al., 2024). This study leverages Stakeholder Theory, Legitimacy Theory, and Agency Theory to examine how corporate governance influences CED, providing a comprehensive theoretical lens to understand corporate environmental accountability (Jensen & Meckling, 1976; Freeman, 1984; Deegan, 2019).

Despite the regulatory framework, CED practices in Indonesia remain underdeveloped. Most disclosures are still voluntary and reflect limited corporate awareness of Environmental, Social, and Governance (ESG) practices (Sandi et al., 2021). The average CED rate in Indonesia is only 0.22%, far below countries like the United States (50.33%) and Spain (43.48%) (CDP, 2023). This low disclosure rate underscores the need for research into governance mechanisms that can drive transparency, particularly in high-emission sectors like energy, which contributes 46.35% to Indonesia's GHG emissions (Kementerian Energi dan Sumber Daya Mineral, 2020). Some companies, such as PT Unilever, PT Ajinomoto, and PT Pertamina, have demonstrated commitment through renewable energy projects and emission reduction strategies (Marsyaf, 2021; Santoso, 2023). However, overall progress in the private sector remains uneven and requires further policy and stakeholder support.

Previous studies have identified various determinants of CED, such as profitability, environmental performance, leverage, industry type, and government ownership (Bedi & Singh, 2024a; Sukmawati, 2024). However, a significant research gap exists in exploring how internal governance structures, specifically institutional ownership and CEO power, interact with gender diversity to influence CED in the Indonesian energy sector. According to Budanti et al. (2024), institutional ownership positively affects CED, but findings are inconsistent, with studies like Haura and Willy (2024) and Az Zahra and Titik (2023) reporting no significant impact. Similarly, while CEO power can drive or hinder transparency (Bose et al., 2025), its interaction with female directors as a moderating factor remains underexplored, particularly in Indonesia's unique regulatory and cultural context (Saadah et al., 2024). This gap is critical as female directors are often associated with stronger ESG commitment, yet their moderating role in governance dynamics is not well understood (Zahari et al., 2024).

This research contributes to the literature in two key ways. First, it addresses the research gap by examining the combined influence of institutional ownership, CEO power, and female directors on CED in Indonesia's energy sector, offering insights into how governance dynamics drive sustainability. Second, it provides empirical evidence to guide policymakers, investors, and corporate leaders in designing effective governance structures to support environmental transparency. Insights from this study may inform Indonesia's regulatory strategies to accelerate progress toward national emission reduction targets, particularly in the energy sector, which is pivotal to achieving Net Zero Emissions by 2060.

This study aims to empirically investigate how institutional ownership and CEO power influence Carbon Emission Disclosure (CED), with female directors serving as a moderating factor, focusing on energy companies listed on the Indonesia Stock Exchange (IDX) between 2020 and 2023. Concentrating on a high-emission sector pivotal to Indonesia's Net Zero Emissions 2060 target, the research integrates Legitimacy Theory, which underscores aligning corporate practices with societal expectations, and Agency Theory, which addresses conflicts between management and shareholders (Jensen & Meckling, 1976; Deegan, 2019). CED is measured using the Carbon Emission Disclosure Index (CEDI), while CEO power is assessed via tenure, duality, and ownership dimensions, providing a comprehensive view of governance effects on environmental transparency.

LITERATURE REVIEW & HYPOTHESES DEVELOPMENT

Theoretical Foundations and Their Relevance to Carbon Emission Disclosure

Stakeholder Theory, as proposed by Freeman (1984), emphasizes that companies must address the needs of various stakeholders, including shareholders, creditors, consumers, and the public, to ensure long-term sustainability. According to Freeman (2023), stakeholder expectations are increasingly focused on environmental accountability, making Carbon Emissions Disclosure (CED) a critical mechanism for demonstrating a corporate commitment to sustainability. CED provides stakeholders with essential information to assess a company's environmental performance, enabling responsible investment and consumption decisions. This theory aligns with the study's focus on how governance structures influence CED to meet stakeholder demands in Indonesia's energy sector (Widarjo et al., 2024).

Legitimacy Theory, proposed by Dowling and Pfeffer (1975), asserts that organizations must align actions with societal norms to maintain legitimacy. According to Deegan (2019), transparent environmental disclosures, such as carbon emission disclosure (CED), enhance stakeholder trust and societal approval. In this study, CED enables energy firms to demonstrate compliance with Indonesia's environmental regulations, like Presidential Regulation Number 98/2021, and global commitments such as COP-26 (Gunawan & Meiranto, 2020). Firms with strong governance, including powerful CEOs and institutional investors, are expected to prioritize CED to meet societal expectations (Crifo et al., 2019; Ratmono et al., 2021; Seow, 2025).

Agency Theory, proposed by Jensen and Meckling (1976), explains conflicts between principals (shareholders) and agents (managers) due to differing interests. Jensen and Meckling (2012) emphasize that information asymmetry requires transparency mechanisms, such as carbon emission disclosure (CED), to reduce agency conflicts and enhance accountability. In this study, institutional ownership and female directors serve as monitoring mechanisms to align management actions with shareholders' sustainability objectives. CEO power can either promote or constrain CED depending on managerial priorities (Abdul Majid et al., 2023; Galingging, 2024). Together, these theories provide a framework to analyze how governance, including CEO power and institutional ownership, influences CED, moderated by female directors' role in ethical and sustainable practices (Saadah et al., 2024).

The Effect of Ownership and Leadership Power on Carbon Emissions Disclosure

Institutional ownership refers to the ownership of a company's shares by institutions such as financial institutions, pension funds, and other institutional investors (Murti, et al., 2025). These investors typically have greater resources and long-term sustainability interests, enabling them to monitor corporate behavior more effectively. Study Putu & Budanti (2024) and Döring et al., (2023) show a positive relationship between institutional ownership and CED, as institutions demand greater accountability for environmental risks (Giordino et al. 2025). CED reflects a company's commitment to sustainability (Shi & Wang 2024), and a higher proportion of institutional ownership tends to promote transparency (Zulkarnaen 2025).

CEO power refers to the level of influence the CEO has in strategic decision-making, has greater autonomy, and can control the direction of corporate policies, including policies related to CED (Bedi & Singh, 2024). The theory of legitimacy states that the CEO can use their power to strengthen the company's position in the eyes of the public by increasing transparency, including through disclosure of environmental issues (Bose et al. 2025). Various findings show that a powerful CEO can ultimately improve the quality of information disclosure, including the issue of ESG. According to a study by Khuong et al., (2025) the greater the power of a person CEO, the higher the likelihood of companies disclosing carbon emissions transparently tends to increase.

H1: Institutional ownership has a positive effect on carbon emissions disclosure.

H2: CEO power has a positive impact on carbon emissions disclosure.

The Moderating Role of Female Directors in Carbon Emissions Disclosure

Female directors are generally more responsive to environmental and sustainability issues, often promoting transparency and ethical practices (Su et al., 2020; Alkhwaja et al., 2023; Fina et al., 2024). Their presence can increase the influence of institutional ownership on carbon emission disclosure, as women on boards tend to prioritize social responsibility and long-term stakeholder interests (Saadah et al., 2024). Female directors will further encourage companies to pay attention to CED as they pay higher attention to social and ethical environmental issues and sustainability (Zahari et al., 2024).

Studies show that companies with more women in strategic roles are more likely to respond positively to institutional pressure by adopting sustainable practices and disclosing carbon-related information (Gonenc & Krasnikova, 2022); this effort is made to build a positive image of the company (Zhang et al., 2023). Companies are becoming more motivated to disclose carbon emissions more openly and carry out their commitments to be transparent and sustainable. A study by Putu and Budanti (2024) also found that female directors strengthen the relationship between institutional ownership and carbon disclosure.

CED is a key component of environmental transparency and corporate reputation (Döring et al., 2023). According to Legitimacy Theory, companies must align with societal expectations through responsible practices (Afrizal et al., 2023). CEOs with strong power can drive sustainability initiatives, including CED, by influencing strategy and resource allocation (Bose et al., 2025). The presence of female directors can strengthen this effect, as women in leadership are more attuned to social, ethical, and environmental concerns (Zahari et al., 2024). Their role can balance CEO dominance and enhance environmental accountability (Gavana et al., 2024).

H3: Female directors strengthen the link between institutional ownership and carbon emissions disclosure.

H4: Female directors reinforce the CEO's power as a positive influence on carbon emissions disclosure.

The research framework integrates Stakeholder Theory, Legitimacy Theory, and Agency Theory to examine the influence of institutional ownership and CEO power on CED, with female directors as a moderating variable. According to Budanti et al. (2024), institutional ownership encourages CED by aligning corporate actions with stakeholder expectations, while powerful CEOs shape disclosure strategies based on their influence and values (Khuong et al., 2025). Female directors enhance these relationships by promoting ethical and sustainable practices, particularly in Indonesia's energy sector, which faces intense scrutiny due to its high emissions (Kementerian Energi dan Sumber Daya Mineral, 2020). The framework posits that institutional ownership and CEO power directly affect CED, while female directors moderate these relationships by fostering transparency and accountability (Saadah et al., 2024).

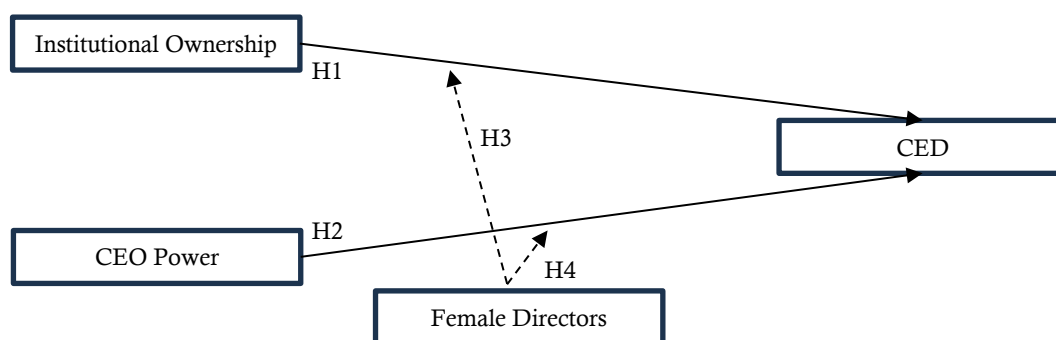


Figure 1. Research Framework

Figure 1 illustrates the hypothesized relationships: institutional ownership and CEO power as independent variables, CED as the dependent variable, and female directors as the moderator. The framework includes control variables like ROA, leverage, and firm age to account for firm-specific factors (Cohen et al., 2023). This model, grounded in the theoretical perspectives of Jensen and Meckling (1976) and Deegan (2019), provides a structured approach to test how governance dynamics drive environmental transparency in the context of Indonesia’s regulatory push for sustainability (Transisienergi.id, 2023). The framework highlights the energy sector’s critical role in achieving Indonesia’s Net Zero Emissions 2060 target, emphasizing the need for robust governance to enhance CED (Widarjo et al., 2024).

RESEARCH METHOD

The study focuses on energy sector companies listed on the Indonesia Stock Exchange (IDX) in 2024, initially identifying 87 firms. To ensure data consistency, selection criteria were applied: 23 companies were excluded due to initial public offerings or delistings during the 2020–2023 period, and 51 were eliminated for not consistently publishing sustainability reports. This resulted in a final sample of 13 companies, yielding 52 firm-year observations over the four-year period. The sample highlights the critical role of the energy sector in Indonesia’s high-emission landscape, aligning with the country’s commitment to Net Zero Emissions by 2060. Data were sourced from annual and sustainability reports available on the IDX and company websites, ensuring reliability and relevance for analyzing carbon emission disclosure (CED) practices.

Carbon Emissions Disclosure (CED), the dependent variable, is measured using the Carbon Emission Disclosure Index (CEDI), which integrates international frameworks like GRI-305 and the GHG Protocol to assess disclosure comprehensiveness. Institutional Ownership, an independent variable, is calculated as the percentage of shares held by institutions such as banks, pension funds, and asset managers. CEO Power is quantified through a composite index based on five dimensions: duality (1 if the CEO also serves as board chair, 0 otherwise), tenure (1 if above industry-year median, 0 otherwise), education level (1 if equal to or above industry median, 0 otherwise), share ownership (1 if above median, 0 otherwise), and age (1 if above median, 0 otherwise), summed and averaged to form a 0–1 index. Female Directors, the moderating variable, is measured as the proportion of female board members to total directors. Control variables include Return on Assets (ROA, net income divided by total assets), Return on Equity (ROE, net income divided by shareholders’ equity), Leverage (total debt divided by total assets), firm age (report year minus establishment year), Book-to-Market Ratio (BMR, book value divided by market value), Tangibility (fixed assets divided by total assets), and Dividend Payout Ratio (DPR, dividends divided by net income).

To test the relationships between Institutional Ownership, CEO Power, and CED, with Female Directors as a moderator, a Random Effect panel data regression model was employed, chosen based on the Hausman test to account for unobserved heterogeneity across firms. The model includes interaction terms (Institutional Ownership × Female

Directors and CEO Power \times Female Directors) to examine moderation effects. Prior to regression, diagnostic tests were conducted, including normality (Shapiro-Wilk test), multicollinearity (Variance Inflation Factor < 10), and heteroskedasticity (Breusch-Pagan test), confirming the model's robustness. The regression model is designed to explain CED variations while controlling for firm-specific factors, providing a comprehensive analysis of governance dynamics in the energy sector.

RESULTS

This section presents the empirical findings from the analysis of Carbon Emissions Disclosure (CED) among 13 energy sector companies listed on the Indonesia Stock Exchange (IDX) from 2020 to 2023, resulting in 52 firm-year observations. The study employs a Random Effect panel data regression model to test the relationships between Institutional Ownership, CEO Power, and CED, with Female Directors as a moderating variable, while controlling for firm-specific factors such as profitability, leverage, and firm age. Descriptive statistics, correlation analysis, and regression results are reported, with diagnostic tests confirming the model's robustness.

Table 1. Descriptive Statistic

Variables	Obs	Mean	Std.Dev.	Min	Max
CED	52	0.526	0.1457	0.096	0.710
KI	52	0.042	0.0431	0.000	0.171
CEOP	52	0.476	0.2314	0.200	0.8
FOB	52	0.153	0.1670	0	0.666
ROA	52	6.002	7.6850	-9.84	27.71
ROE	52	8.406	40.234	-254.34	43.71
Leverage	52	0.547	0.1931	0.122	0.961
Age	52	3.926	14.037	14	63
BMR	52	1.194	0.8025	0.004	3.536
Tangibility	52	0.226	0.1486	0.003	0.518
DPR	52	0.355	0.3271	0	1

To address potential outliers in the dataset, winsorization was applied at the 1% upper and lower percentile limits. Table 1 summarizes the characteristics of the variables. The average CED score is 0.5269, with a standard deviation of 0.1457, indicating a moderate level of transparency in carbon-related disclosures. The minimum CED score of 0.0964 reflects limited disclosure in some firms, while the maximum of 0.7108 suggests relatively comprehensive reporting in others. Institutional Ownership averages 4.22%, with a range from 0% to 17.19%, highlighting variability in institutional investor involvement. CEO Power, measured as a composite index, has an average of 0.4769, ranging from 0.2 to 0.8, indicating diverse levels of CEO influence. Female Directors have an average representation of 15.38%, with a minimum of 0% and a maximum of 66.67%, reflecting gradual progress in gender diversity. Control variables show varied distributions: Return on Assets (ROA) averages 6.00% (range: -9.84% to 27.71%), Return on Equity (ROE) averages 8.41% (range: -254.34% to 43.71%), Leverage averages 54.73% (range: 12.2% to 96.1%), firm age averages 39.27 years (range: 14 to 63 years), Book-to-Market Ratio (BMR) averages 1.1941 (range: 0.004 to 3.536), Tangibility averages 22.68% (range: 0.3% to 51.8%), and Dividend Payout Ratio (DPR) averages 35.51% (range: 0 to 1).

Diagnostic tests were conducted to ensure the model's robustness. The Shapiro-Wilk test confirmed normality of residuals ($p > 0.05$), indicating that the data distribution meets regression assumptions. The Variance Inflation Factor (VIF) for all variables was below 10 (mean VIF = 1.83), confirming no multicollinearity issues. The Breusch-Pagan test for heteroskedasticity yielded a non-significant result ($p = 0.214$), supporting the model's validity. The Hausman test was performed to choose between Random Effect and Fixed Effect models, with results favoring the Random Effect model ($p = 0.672$), as it accounts for unobserved heterogeneity across firms. These diagnostic outcomes ensure that the regression results are reliable for analyzing the relationships between governance variables and CED in the energy sector.

Table 2. Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) CED	1.0000										
(2) KI	0.1682	1.0000									
(3) CEOP	0.4908	-0.0392	1.0000								
(4) FOB	0.1084	0.1937	-0.0719	1.0000							
(5) ROA	0.4273	-0.0162	0.2230	0.0304	1.0000						
(6) ROE	0.1220	-0.2328	0.0557	0.0096	0.5613	1.0000					
(7) LEVERAGE	0.3517	0.0983	0.2733	0.2024	-0.2911	-0.3183	1.0000				
(8) AGE	0.2905	0.6116	-0.2370	0.3424	0.0504	-0.1345	-0.0373	1.0000			
(9) BM	-0.0173	-0.3366	-0.0886	-0.1958	-0.2845	0.0444	0.2032	-0.3597	1.0000		
(10) TANGIBILITY	-0.1477	-0.0207	-0.1362	0.3778	0.0085	0.1660	0.0349	0.0064	0.0222	1.0000	
(11) DPR	0.2718	0.1881	0.1436	0.0996	0.4323	0.2408	-0.3757	0.3034	-0.3957	0.0451	1.0000

Table 3. Regression Result

Variable	Hypothesis	Predictions	Coefficient	T-Stat	p > z
Institutional Ownership	H1	+	-0.1833	-2.09	0.037**
CEO Power	H2	+	0.2442	2.93	0.003**
Female BOD			-0.2126	-0.83	0.405
KI × FOB	H3	+	0.2345	0.67	0.505
CEOP × FOB	H4	+	0.1804	0.44	0.663
ROA			0.0083	3.58	0.000***
ROE			-0.0001	-0.22	0.829
Leverage			0.2133	1.96	0.050**
Age			0.0031	2.06	0.040**
Book to Market			0.0374	1.98	0.048**
Tangibility			-0.0789	-0.68	0.499
Dividend Payout Ratio			0.1066	2.12	0.034**
R-squared overall				0.7385	
Prob>Chi2				0.000	
Estimation				Random Effect Model	
Hetttest				No	
Observation				52	

Note:
This table reports the results of the direct influence test of Institutional Ownership, CEO Power, on Carbon Emission Disclosure moderated by Female Directors for the 2020-2023 Period. Statistical significance is denoted by ***, **, and *, corresponding to the significance levels of 1%, 5%, and 10%, respectively.

Table 2 presents the Pearson correlation coefficients to assess relationships between variables and check for multicollinearity. No multicollinearity issues were detected, as all correlation coefficients are below 0.70. CED is positively correlated with CEO Power (0.4908, $p < 0.05$), ROA (0.4273, $p < 0.05$), Leverage (0.3517, $p < 0.05$), firm age (0.2905, $p < 0.05$), and DPR (0.2718, $p < 0.05$). Institutional Ownership has a negative effect on CED (0.1682, $p > 0.05$). CEO Power and Institutional Ownership are nearly uncorrelated (-0.0392, $p > 0.05$), suggesting these governance variables operate independently. Among control variables, significant correlations include ROE with ROA (0.5613, $p < 0.05$), Leverage with ROA (-0.2911, $p < 0.05$) and ROE (-0.3183, $p < 0.05$), firm age with Institutional Ownership (0.6116, $p < 0.05$) and Female Directors (0.3424, $p < 0.05$), BMR with ROA (-0.2845, $p < 0.05$) and firm age (-0.3597, $p < 0.05$), and DPR with ROA (0.4323, $p < 0.05$) and BMR (-0.3957, $p < 0.05$). These correlations indicate that more profitable, older, and financially active firms tend to disclose more carbon-related information, supporting the feasibility of regression analysis

Table 3 reports the outcomes of the Random Effect regression model, testing the direct and moderating effects on CED across 52 observations. Institutional Ownership has a negative coefficient of -0.1833 but statistically significant ($t = -2.09$, $p = 0.037$). CEO Power shows a positive and significant effect on CED, with a coefficient of 0.2442 ($t = 2.93$, $p = 0.003$). Female Directors have a negative but insignificant direct effect (coefficient = -0.1097, $t = -0.46$, $p = 0.642$). The interaction term between Institutional Ownership and Female Directors does not moderate (coefficient = 0.2345, $t = 0.67$, $p = 0.505$), while the interaction between CEO Power and Female Directors is positive but not significant (coefficient = 0.1804, $t = 0.44$, $p = 0.663$). Among control variables, ROA (coefficient = 0.0083, $t = 3.58$, $p = 0.000$), Leverage (coefficient = 0.2133, $t = 1.96$, $p = 0.050$), firm age (coefficient = 0.0031, $t = 2.06$, $p = 0.040$), BMR (coefficient = 0.0374, $t = 1.98$, $p = 0.048$), and DPR (coefficient = 0.1066, $t = 2.12$, $p = 0.034$) are significant, while ROE (coefficient = -0.0001, $t = -0.22$, $p = 0.829$) and Tangibility (coefficient = -0.0789, $t = -0.68$, $p = 0.499$) show weaker or insignificant effects. The overall R-squared is 0.7385, indicating that the model explains 73.85% of the variation in CED. The model is statistically significant (Prob > Chi2 = 0.000), and no heteroskedasticity was detected (Hetest: No).

Diagnostic tests were conducted to ensure the model's robustness. The Shapiro-Wilk test confirmed normality of residuals ($p > 0.05$), indicating that the data distribution meets regression assumptions. The Variance Inflation Factor (VIF) for all variables was below 10 (mean VIF = 1.83), confirming no multicollinearity issues. The Breusch-Pagan test for heteroskedasticity yielded a non-significant result ($p = 0.214$), supporting the model's validity. The Hausman test was performed to choose between Random Effect and Fixed Effect models, with results favoring the Random Effect model ($p = 0.672$), as it accounts for unobserved heterogeneity across firms. These diagnostic outcomes ensure that the regression results are reliable for analyzing the relationships between governance variables and CED in the energy sector.

DISCUSSION

The findings indicate that CEO Power significantly influences Carbon Emissions Disclosure (CED), with a positive coefficient ($t = 2.93$, $p = 0.003$), supporting H2. According to Bose et al. (2025), powerful CEOs, through attributes like tenure, duality, and share ownership, have greater autonomy to direct resources toward sustainability, enhancing environmental transparency. This aligns with Legitimacy Theory, which suggests that CEOs use disclosure to strengthen corporate reputation and meet societal expectations (Deegan, 2019). The positive effect of CEO Power reflects Indonesia's energy sector context, where influential leaders like Nicke Widyawati of PT Pertamina drive decarbonization initiatives (Pertamina, 2023). In contrast, Institutional Ownership shows a significant negative effect on CED ($t = -2.09$, $p = 0.037$), rejecting H1. Haura and Willy (2024) similarly find that low institutional ownership levels, as observed in this study (average 4.22%), limit investors' ability to enforce transparency, particularly when

prioritizing short-term financial gains (Cella, 2020). This suggests that institutional investors in Indonesia's energy sector may lack sufficient engagement or focus on sustainability to influence CED effectively.

The insignificant direct effect of Female Directors on CED ($p = 0.405$) suggests that their presence alone does not drive disclosure, contrary to normative assumptions about their environmental sensitivity. Saadah et al. (2024) argue that female directors typically promote ESG practices, but their impact may be constrained in contexts with low representation (average 15.38% in this study). The interaction between Institutional Ownership and Female Directors ($p = 0.505$) contradicts H3, which posited a strengthening effect. Gregory-Smith and Main (2024) explain this through tokenism, where female directors hold symbolic roles without substantial decision-making power, limiting their ability to align institutional investors' priorities with sustainability goals. This negative effect may also stem from Indonesia's patriarchal corporate culture, which restricts female directors' influence on strategic decisions like CED (Handayani et al., 2023). The interaction between CEO Power and Female Directors is not significant ($p = 0.663$), rejecting H4. Omenihu et al. (2025) note that female directors' influence requires a critical mass to counterbalance dominant CEOs, which is often absent in firms with centralized decision-making.

Among control variables, ROA, Leverage, firm age, Book-to-Market Ratio (BMR), and Dividend Payout Ratio (DPR) significantly affect CED, while ROE and Tangibility do not. According to Iriyadi and Antonio (2021), higher profitability (ROA) enables firms to invest in sustainability reporting, as evidenced by the significant ROA effect observed in this study ($p = 0.000$). Leverage's positive effect ($p = 0.050$) suggests creditors' pressure for transparency, aligning with Agency Theory (Jensen & Meckling, 1976). Older firms disclose more ($p = 0.040$), likely due to established systems and reputational concerns (Afrizal et al., 2023). The significant effects of BMR and DPR indicate that firms with higher market perceptions and consistent dividend policies prioritize stakeholder accountability (Cohen et al., 2023). The insignificant effect of ROE reflects its volatility, while Tangibility's weak effect suggests that physical assets are less relevant to environmental disclosure unless tied to sustainable practices.

These findings advance Legitimacy Theory by showing that CEO power, rather than institutional ownership, drives environmental transparency in Indonesia's energy sector, emphasizing executive leadership's importance (Bundy et al., 2017). They also extend Agency Theory, indicating that female directors' moderating effect is limited without structural empowerment (Jensen & Meckling, 2012). Practically, firms should appoint visionary CEOs committed to sustainability and empower female directors in strategic roles, such as leading sustainability committees, to improve CED. Policymakers should reinforce regulations like Presidential Regulation No. 98/2021 to encourage institutional investor engagement and support Indonesia's Net Zero Emissions 2060 goal (Transisienergi.id, 2023). Future research should examine cultural and regulatory factors and expand the sample for generalizability.

CONCLUSION

This study finds that CEO Power significantly enhances Carbon Emissions Disclosure (CED) in Indonesia's energy sector, confirming its critical role in driving environmental transparency. In contrast, Institutional Ownership has a significant negative effect on CED, likely due to low ownership levels and a focus on short-term financial goals. The presence of Female Directors does not directly affect CED, and presence of female directors (Female BOD) does not moderate the relationship between Institutional Ownership and CED, nor between CEO Power and CED, possibly due to limited decision-making authority in a patriarchal corporate culture. These findings highlight the dominant influence of executive leadership over other governance mechanisms in shaping sustainability practices.

The results contribute to understanding how governance structures drive environmental accountability, emphasizing the need for visionary CEOs committed to

sustainability and empowered female directors in strategic roles, such as leading sustainability committees, to enhance CED. These insights support Indonesia's Net Zero Emissions 2060 target by informing policies to strengthen corporate transparency. However, the study's small sample size (13 companies, 52 observations) and focus on the post-pandemic period (2020–2023) limit generalizability, as economic recovery may have influenced disclosure practices. Future research should expand the sample to include other high-emission sectors, such as mining or manufacturing, and explore cultural factors, like patriarchal norms, that may constrain female directors' influence on environmental strategies.

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