Ilomata International Journal of Tax and Accounting

OPEN ACCESS

RECEIVED 5 February 2026
ACCEPTED 27 April 2026
PUBLISHED 30 April 2026

CITATION
Virtagani FI, (2026). An Analysis of the Effects of Capital Expenditure, Institutional Ownership, and Company Growth on Carbon Emission Disclosure. Ilomata International Journal of Tax and Accounting. 7 (2), 1-9.
doi: 10.61194/ijtc.v7i2.2211

TYPE Original Research
PUBLISHED 30 April 2026
DOI 10.61194/ijtc.v7i2.2228
VOL 7 Issue 2 April 2026

An Analysis of the Effects of Capital Expenditure, Institutional Ownership, and Company Growth on Carbon Emission Disclosure

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Abstract

This study examines the determinants of carbon emission disclosure in energy subsector companies listed on the Indonesia Stock Exchange over the period 2022 to 2024, considering the increasing urgency of corporate transparency in addressing climate change and Indonesia's commitment to reducing greenhouse gas emissions by 43 percent by 2030. The main issue lies in the varying level of corporate compliance in emission reporting, which remains largely voluntary. To address gaps in prior literature, this study provides explicit novelty by focusing specifically on the high-emission energy subsector using recent data and employing a rigorous 18-item Carbon Disclosure Project (CDP) measurement framework. Employing a quantitative approach, panel data derived from 125 firm-year observations were analyzed using multiple linear regression. The findings indicate that only capital expenditure has a positive and statistically significant effect on carbon emission disclosure, while institutional ownership, growth opportunity, and sales growth do not show a significant influence. These results suggest that tangible financial investments are positively associated with environmental transparency, whereas external governance and growth metrics do not exhibit a similar relationship in this context. Ultimately, the findings imply a structural limitation in voluntary disclosure practices, highlighting the potential need for stronger regulatory intervention to ensure that transparency is aligned with broader environmental accountability rather than depending solely on internal resource capacity.

KEYWORDS

carbon emissions disclosure; capital expenditure; institutional ownership; growth opportunity; sales growth.

Introduction

The issue of climate change has emerged as one of the most critical challenges in the contemporary global landscape, influencing not only environmental sustainability but also economic resilience and institutional transformation across nations. Since the Industrial Revolution, the rapid expansion of industrial activities and the extensive reliance on fossil fuels have led to a substantial increase in greenhouse gas emissions, particularly carbon dioxide, which has been widely recognized as a primary driver of global warming and climate instability (Bilbina et al., 2024). The implications of this phenomenon extend beyond ecological degradation, as rising global temperatures, extreme weather events, and environmental disruptions increasingly affect production systems, supply chains, and long term economic development. In this regard, climate change represents a systemic risk that necessitates coordinated responses from governments, markets, and corporate entities (Dharma et al., 2024).

In response to these challenges, governments around the world have begun integrating environmental sustainability into their national development frameworks. Indonesia, as a major emerging economy with significant dependence on natural resources, has demonstrated its commitment to addressing climate change through the incorporation of low carbon development strategies within its long term development plan for the period 2020 to 2055. This policy direction reflects an effort to balance

economic growth with environmental preservation, with projections suggesting that sustainable development strategies may support economic growth of up to six percent while reducing greenhouse gas emissions by forty three percent by 2030 (Harits & Mutasowifin, 2024). Such a policy orientation indicates a paradigm shift in development thinking, where environmental sustainability is increasingly positioned as a fundamental component of economic progress rather than a constraint.

Despite these policy commitments, the effectiveness of emission reduction strategies is highly dependent on the active role of the corporate sector. Firms are among the largest contributors to carbon emissions due to their operational activities, energy consumption, and production processes. At the same time, firms possess the capacity to adopt environmentally responsible practices, invest in cleaner technologies, and improve transparency through the disclosure of carbon related information. Carbon emission disclosure therefore becomes a crucial mechanism that enables stakeholders to evaluate corporate environmental performance and assess climate related risks. The growing importance of such disclosure is also driven by the increasing relevance of environmental social and governance considerations, which have become central to investment decision making and corporate valuation (Kuzey, 2025; Rahmawati et al., 2024).

From a theoretical standpoint, carbon emission disclosure can be explained through stakeholder theory and legitimacy theory. Stakeholder theory suggests that firms disclose environmental information to meet the expectations of various stakeholders, including investors, creditors, regulators, and society at large. Meanwhile, legitimacy theory posits that firms seek to align their operations with societal norms and values in order to maintain legitimacy and ensure continued access to resources. In the Indonesian context, regulatory frameworks such as POJK No. 51/2017 have strengthened institutional pressure for sustainability reporting, encouraging firms to integrate environmental considerations into their corporate strategies. However, despite these regulatory efforts, the level and quality of carbon emission disclosure remain uneven across firms, indicating that compliance is influenced by internal firm characteristics as well as external pressures.

The implementation of carbon emission disclosure also varies across jurisdictions depending on regulatory structures and enforcement mechanisms. In some countries, disclosure is mandatory and strictly regulated, while in others it remains largely voluntary, resulting in differences in transparency and comparability (Al-mari & Mardini, 2025). In emerging economies such as Indonesia, these challenges are further intensified by institutional limitations, differences in corporate governance practices, and varying levels of awareness regarding sustainability issues. Consequently, understanding the determinants of carbon emission disclosure within this context becomes essential for both academic inquiry and policy formulation.

A substantial body of literature has examined firm level determinants of carbon emission disclosure, focusing on variables such as capital expenditure, institutional ownership, growth opportunity, and sales growth. However, existing findings remain fragmented and often inconsistent, suggesting the need for further investigation. Capital expenditure, for example, is generally associated with a firm's ability to invest in environmentally friendly technologies and infrastructure. Firms with higher capital investment are expected to demonstrate greater commitment to sustainability and thus disclose more environmental information. Nevertheless, empirical evidence indicates that capital expenditure does not always lead to increased disclosure, as investments may not be specifically directed toward environmental objectives, thereby limiting their impact on transparency (Dwinanda & Kawedar, 2019).

Institutional ownership is also widely recognized as an important determinant of corporate disclosure practices. Institutional investors are often perceived as sophisticated stakeholders with the capacity to monitor management and demand greater transparency. In theory, higher institutional ownership should enhance carbon emission disclosure through stronger governance mechanisms. However, empirical studies reveal mixed results, as the influence of institutional ownership depends on factors such as investor activism, investment horizon, and governance preferences. Passive institutional investors may prioritize short term financial performance over long term sustainability considerations, thereby weakening their influence on disclosure practices.

Growth opportunity represents another factor that is frequently associated with disclosure behavior. Firms with high growth prospects are expected to disclose more information in order to reduce information asymmetry and attract external financing. In this context, carbon emission disclosure may function as a signal of responsible management and long term sustainability (Rizqullah, 2024). However, empirical findings remain inconclusive, as high growth firms may allocate their resources toward expansion and competitiveness rather than sustainability reporting. This trade off highlights the complexity of corporate decision making in balancing growth objectives with environmental transparency.

Similarly, sales growth is often used as an indicator of firm performance and operational success. While increased sales may provide additional financial resources that enable firms to invest in environmental initiatives and disclosure practices, it may also result in higher production levels and environmental impact. As a result, firms may face conflicting incentives regarding disclosure, either enhancing transparency to demonstrate responsibility or limiting disclosure to avoid negative scrutiny. This dual effect contributes to the ambiguity of the relationship between sales growth and carbon emission disclosure (Nanda et al., 2024).

The inconsistencies observed in prior studies indicate the presence of a significant research gap. While existing literature has explored how firm characteristics influence carbon emission disclosure, there remains a lack of consistent, context-specific explanations within emerging economies like Indonesia, where regulatory environments are rapidly evolving. Furthermore, many previous Indonesian studies rely on broad cross-sectoral analyses or outdated data, which may not accurately capture recent developments in sustainability reporting. To establish its explicit novelty, this study contributes to the existing body of knowledge by distinguishing itself from prior Indonesian research in three key aspects. First, it focuses specifically on the energy subsector, a critical contributor to national emissions. Second, it utilizes recent data from the 2022–2024 period to capture the latest dynamics in Environmental, Social, and Governance (ESG) standards and regulatory advancements. Finally, it employs a rigorous 18-item Carbon Disclosure Project (CDP) measurement to assess disclosure quality, providing a more precise and updated empirical evaluation of corporate disclosure behavior.

Based on these limitations, this study aims to examine the influence of capital expenditure, institutional ownership, growth opportunity, and sales growth on carbon emission disclosure within the Indonesian context. By focusing on a specific institutional environment and incorporating recent data, this study seeks to provide a more comprehensive and context relevant understanding of corporate environmental disclosure practices.

This study contributes to the existing literature through three specific and testable dimensions. First, regarding the sector-specific context, it tests the determinants of carbon emission disclosure exclusively within Indonesia's energy

subsector. This provides targeted insights into the transparency behavior of high-emission firms operating under intense public and regulatory scrutiny. Second, in terms of updated data, it utilizes recent firm-year observations from 2022 to 2024 to capture the impact of evolving ESG (Environmental, Social, and Governance) standards and the latest regulatory developments, directly addressing the limitations of prior studies that rely on outdated periods (Harits & Mutasowifin, 2024). Third, concerning the measurement contribution, this study employs a structured 18-item Carbon Disclosure Project (CDP) framework. This specific measurement offers a highly replicable and testable metric for assessing the quality and extent of corporate carbon transparency, thereby supporting more robust and objectively verifiable empirical conclusions.

The remainder of this paper is organized as follows. The next section presents a review of relevant literature and the development of research hypotheses. The subsequent section outlines the research methodology, including data sources, variable measurement, and model specification. This is followed by the presentation and discussion of empirical findings. The final section concludes the study by summarizing key results, discussing implications, and providing recommendations for future research.

Legitimacy Theory

According to legitimacy theory, businesses work hard to live up to public expectations so they may be recognized by society. Every business action must be in harmony with the general public's morals and ethics according to the social contract theory (Candra & Lindrianasari, 2023). According to (Arsy & Amin, 2025), poor environmental performance potentially increases the risk of losing social legitimacy. As a result, it pushes for more transparency in corporate reporting about the allocation of social and economic gains to the public.

Carbon Emissions Disclosure

Carbon emissions are the release of carbon dioxide and other greenhouse gases, which are exhaust gases from the combustion of gasoline, leaf fuel, wood, and other fuels containing high levels of hydrocarbons. According to (Huang et al., 2023), A company's operating operations are a major source of carbon emissions. These activities cause environmental pollution, such as climate change, air pollution, and other factors. Disclosure of carbon emissions falls under the category of environmental disclosure, demonstrating a company's level of transparency in providing information on greenhouse gas emissions arising from its operational activities. This information is usually included in annual reports or sustainability reports as a form of social accountability and a company's commitment to transparency regarding environmental issues (Arsjah, 2025).

Capital Expenditure

Capital expenditure is the expenditure used to purchase, construct, improve, or maintain fixed assets, whether tangible or intangible, that are expected to be used for more than one year. According to (Normalita & Mahmud, 2017), The purchase of long-term assets, such as buildings or machinery, with a benefit that extends beyond a single accounting period is known as a capital expenditure.

Institutional Ownership

A cooperative is considered to be owned by an institutional investor if that investor has a substantial representation on the board of directors. Many countries, such as the UK, have extensive and significant institutional ownership, which serves as a corporate governance monitoring mechanism (Oyerogba et al., 2025). Institutional ownership is considered a monitoring mechanism among managers and shareholders. Carbon emissions disclosure is further affected by the fact that institutions with majority shares have more power and are thus more motivated to maximize profits (Ghofur, 2025). Institutional ownership encourages carbon emissions disclosure, demands greater accountability for environmental risks, reflects the company's sustainability commitments, and increases transparency with a higher ownership proportion (Asiah & Rahmawati, 2025).

Growth Opportunity

Growth opportunity refers to a company's future growth prospects through the expansion of operational assets. According to (Saraswati & Yuniarta, 2023), companies with promising growth potential generally attract more public attention. Companies with high growth opportunities tend to prioritize business development and avoid using resources to voluntarily disclose carbon emissions. Business entities that demonstrate high growth and the potential for sustainable expansion tend to receive a positive response from the market because they provide investors with hope for future returns or profits (Audrey et al., 2023).

Sales Growth

Sales growth is a measure of expansion that measures the rate of a company's sales growth over a specific period. Companies with high growth tend to prioritize economic goals. They must also be able to manage their own needs well. It includes their responsibility to the community and the surrounding environment (Rahmawati et al., 2024).

Theoretical Framework and Hypothesis

Investments in land or warehouses, for example, that will provide economic advantages for more than one accounting period are known as capital expenditures. Companies with relatively high capital expenditures have the flexibility to manage capital effectively to improve the company's quality, such as by purchasing sophisticated equipment to achieve operational efficiency and better manage greenhouse gas emissions (Suryani & Laela, 2019).

Based on the legitimacy theory developed by (Dowling & Pfeffer, 1975) legitimacy is crucial for an organization, given the boundaries determined by social norms and values. This makes analyzing organizational behavior with environmental concerns crucial. Companies implementing climate change campaigns is intended as a tactic to gain social recognition through clear demonstrations of carbon emission reductions. From a legitimacy theory perspective, companies with substantial capital investments experience greater social pressure to demonstrate their environmental activities (Ratmono et al., 2021). We derive the following hypothesis from this account:

H1: Capital expenditure has a positive effect on carbon emissions disclosure.

Insurance companies, banks, investment firms, mutual funds, and pension funds are examples of entities that own a percentage of a company's shares. This form of ownership reflects large investors who manage third parties, rather than individuals, and serves as an external oversight mechanism to curb opportunistic managerial behavior. Business entities with large levels of institutional ownership tend to experience significant pressure from stakeholders to disclose more transparent information, enhancing institutional oversight of company performance (Oyerogba et al., 2025).

From a legitimacy theory perspective, institutional investors not only play a role as management monitors but also as entities that require legitimacy from their stakeholders. To secure their social legitimacy, institutional investors use their voting power and influence to compel the companies they invest in to disclose carbon emissions transparently. With clear

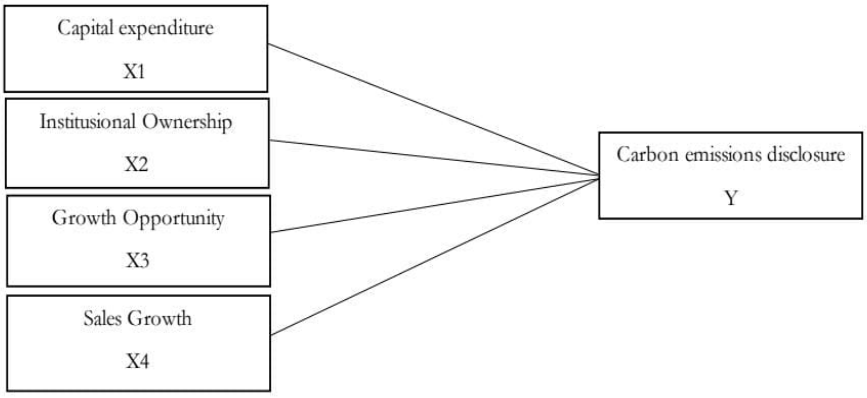

Figure 1. Research Method

emissions reports, institutional investors can demonstrate to the public that they have carried out their investment role responsibly. There is a direct correlation between the amount of institutional ownership and the amount of disclosure pressure on businesses to maintain their credibility with investors. The following hypothesis is developed from this account:

H2: Institutional ownership has a positive effect on carbon emission disclosure.

Growth opportunities are intangible assets that represent an entity's future value through strategic investment. According to (Hermiyetti & Usmar, 2025), high-growth companies view environmental issues not as a burden but as a long-term strategic investment to maintain their reputation, meet stakeholder expectations, and remain adaptive to global carbon emissions regulations.

Legitimacy theory states that companies operate under a social contract with society. Companies with significant growth opportunities typically attract greater public and regulatory attention. When a company grows, its energy consumption and carbon impact also rise. Consequently, businesses justify their expansion efforts by disclosing their carbon footprints. The extent of a company's carbon emissions disclosure is directly proportional to the size of its growth potential. The following theory is developed from this account:

H3: Growth opportunities have a positive effect on carbon emissions disclosure.

Sales growth is a measure used to assess a company's capacity to sustainably increase revenue from one period to the next. Companies with stable growth provide flexibility to manage resources efficiently, while high sales growth risks neglecting environmental issues because companies tend to focus all funding on core operational needs (Suhardi, 2025).

According to (Rahmawati et al., 2024), Theoretically, businesses should inspire trust in their customers and the public by demonstrating how their operations support societal values and contribute to the greater good. Businesses that are experiencing rapid expansion could benefit from being transparent about the amount of carbon they produce. We derive the following hypothesis from this account:

H4: Sales growth has a positive effect on carbon emission disclosure.

The research framework illustrating the relationship among variables is presented in Figure 1.

Methods

This study employs a quantitative approach using secondary data obtained from annual reports and official company websites of energy subsector firms listed on the Indonesia Stock Exchange (IDX) over the period 2022 to 2024. The selection of this period is intended to capture recent developments in sustainability reporting practices and regulatory dynamics related to environmental disclosure in Indonesia. The sample was determined using a purposive sampling technique based on the following inclusion criteria: (1) energy subsector companies consistently listed on the IDX during the 2022–2024 period; (2) companies that published complete annual reports and/or sustainability reports for the respective years; and (3) companies that provided all the necessary financial and non-financial data required to measure the variables in this study. Based on these criteria, a total of 125 firms met the requirements, yielding an initial pool of 129 firm-year observations over the three-year period. After excluding 4 extreme outlier data points during the preliminary data screening to satisfy the classical assumption requirements (particularly data normality), the sample was refined.

The empirical analysis focuses on examining the relationship between four independent variables, namely capital expenditure, institutional ownership, growth opportunity, and sales growth, and Carbon Emission Disclosure as the dependent variable. While these variables have been widely examined in prior literature, this study positions its contribution within a specific institutional and temporal context. By focusing on energy subsector firms in Indonesia and utilizing more recent data, this study aims to provide updated empirical evidence that reflects current corporate behavior under evolving environmental governance and ESG related expectations.

Furthermore, the choice of variables is grounded in their theoretical relevance to corporate disclosure behavior, particularly within the frameworks of legitimacy theory and corporate governance. The integration of these variables within a single empirical model allows for a more comprehensive assessment of how financial capacity, ownership structure, and growth dynamics jointly influence carbon emission disclosure. Therefore, although the variables are not entirely novel their combined analysis within this specific context contributes to a more nuanced understanding of environmental transparency in emerging markets, emerging markets, as presented in Table 1.

The data analysis in this research was also conducted using eViews 12 via a series of methodical processes. A descriptive analysis was conducted to provide a summary of the data distribution as the first stage. Before moving on to the inferential analysis step, the traditional assumption tests were run. These tests included checks for autocorrelation, normalcy, multicollinearity, and heteroscedasticity. Also, the f-test was used to test the hypothesis, and the t-test was used to examine the partial impact of each variable.

Table 1. Operational Variables

No.	Variable	Description	Variabel Measurement
1	Carbon Emissions Disclosure (CED)	Disclosing details about the Company's environmental technologies, practices, and performance. This is measured using 18 disclosure items developed by the Carbon Disclosure Project (CDP) (Dharma et al., 2024).	$CED = \frac{\sum Di}{M} x100\%$ CED : Carbon Emission Disclosure ∑Di : Number of items disclosed M : Total number of items used
2	Capital Expenditure	Capital expenditure is measured by looking at the annual report for the fixed asset acquisition section. (Rooschella & Sulfitri, 2023).	$Capex = ln$ (acquisition or purchase of fixed assets)
3	Institutional Ownership	Institutional ownership is a form of cooperation relating to shares owned by an institution or institutions.	Institutional ownership = Number of shares owned by institutions / number of shares outstanding
4	Growth Opportunity	Growth opportunity is the Company's capacity to generate an increase in the Company's size through an increase in assets. (Saraswati & Yuniarta, 2023).	$GROWTH = \frac{Asset_t - Asset_{t-1}}{Asset_{t-1}} x\ 100\%$ $Asset_t$ = Total assets this year $Asset_{t-1}$ = Total assets previous year
5	Sales Growth	The Company's sales growth is measured by comparing the current period's sales with the previous period to obtain the percentage increase or decrease. (Rahmawati et al., 2024)	$SG = \frac{(S_t - S_{t-1})}{S_{t-1}} x\ 100\%$ SG = Sales Growth S_t = Current sales S_{t-1} = Previous sales

Result and Discussion

A logical overview of the characteristics of respondents or variables can be obtained through descriptive statistics, which is an analytical method that uses measures of central tendency (mean, median, mode) and dispersion (standard deviation, variance, minimum, maximum) to represent research data. Data representing the dependent variable (Y) in this study—carbon emissions disclosure—were obtained by descriptive statistical analysis. X1, capital expenditure, X2, institutional ownership, X3, and X4, sales growth, are the independent variables in this research. They were described using descriptive statistics, as presented in Table 2.

The descriptive statistical analysis revealed an average carbon emission disclosure of 0.402667, or 40.26%. This indicates that companies in the sample have begun to be aware of environmental reporting, but not yet optimally. The relatively large standard deviation of 0.364 compared to the average indicates inequality. Some companies were highly transparent in their environmental reporting, with a maximum value of 1.00000. It means that they disclose 18 CED items. The minimum value of 0.055556 indicates that these companies are still low in disclosing carbon emissions, with a total disclosure of only one item out of 18. This indicates that carbon emission policies in Indonesia are still voluntary, resulting in highly variable levels of compliance.

In addition, the capital expenditure had an average value of 28.34698. It means that the general level of fixed asset investment is undertaken by the companies. From 23.58429 to 32.09248, the range was quite wide. This limited range suggests that capital expenditures are often of a constant size for different firms. Low data deviation is shown by a standard deviation of 1.953862, which is less than the mean. It means that capital expenditure data are relatively stable or exhibit low variability between observations. Capital expenditure stability reflects that a company's long-term investments are not disrupted by short-term market fluctuations, providing a foundation for more sustainable operations.

Additionally, a standard deviation of 0.2523771 was recorded in the descriptive analysis of the institutional ownership variable. It indicates a wide variation or spread in the data between companies. The average value was 0.6038775, or 60.38% of the company's shares in the sample were owned by institutions. The maximum value of 0.950000 indicates that a company has almost all of its shares controlled by institutions.

Regarding the growth opportunity variable, the data reveals a maximum value of 1.216559, indicating that certain firms in the sample experienced substantial asset expansion during the observation period. Conversely, a minimum value of -0.998822 reflects that some companies experienced significant business contraction or a decrease in total assets. The standard deviation for this variable was 0.411477, which is significantly greater than its mean of 0.048262. This wide spread indicates a high level of volatility and substantial variation in growth opportunities among the sampled energy companies. Furthermore, the sales growth variable shows an average rate of 0.093536, indicating that the sampled companies experienced an average annual sales growth of 9.35%.

The traditional assumptions were then tested. Heteroscedasticity, autocorrelation, multicollinearity, and normalcy were the traditional assumption tests. This study's traditional assumption tests yielded the following results:

Finding out whether regression model residuals follow a normal distribution is what the normality test is all about. The results of the normalcy test utilizing the Jarque-Bera technique are shown in Figure 2. If the probability is greater than 0.05, then the data are said to have a normal distribution. The significance level in this research was 0.317938, which is more than 0.05. This indicates that the residual statistics follow a normal distribution.

When independent variables in a regression model exhibit either a highly correlated or strongly linear relationship, it is known as multicollinearity. To rule out the possibility of any connection between the independent variables, a multicollinearity test was run. According to (Basuki & Prawoto, 2015), There is no evidence of multicollinearity between independent variables if their correlation value is less than 0.85. Table 3 shows that the independent variables have the following correlation values: 0.16426, 0.065558, -0.035573, 0.259396, and -0.091487. Table 3 displays the results of the multicollinearity test, which indicated that no correlation between the independent variables was more than

Table 2. Descriptive Analysis Test Results

	X1	X2	X3	X4	Y
Mean	28.34698	0.603875	0.048262	0.093536	0.402667
Median	28.41107	0.661227	0.021715	0.075939	0.277778
Maximum	32.09248	0.950000	1.216559	0.552314	1.000000
Minimum	23.58429	0.000000	0.998822	-0.331148	0.055556
Std. Dev.	1.953862	0.252371	0.411477	0.158870	0.364825
Skewness	-0.037145	-1.025008	-0.037258	0.232724	0.461788
Kurtosis	2.411561	3.175957	3.770729	3.410475	1.581464
Jarque-Bera	1.832182	22.04961	3.122788	2.005896	14.92312
Probability	0.400080	0.000016	0.209843	0.366797	0.000575
Sum	3543.373	75.48434	6.032746	11.69203	50.33333
Sum Sq. Dev.	473.3795	7.897711	20.99486	3.129708	16.50405
Observations	125	125	125	125	125

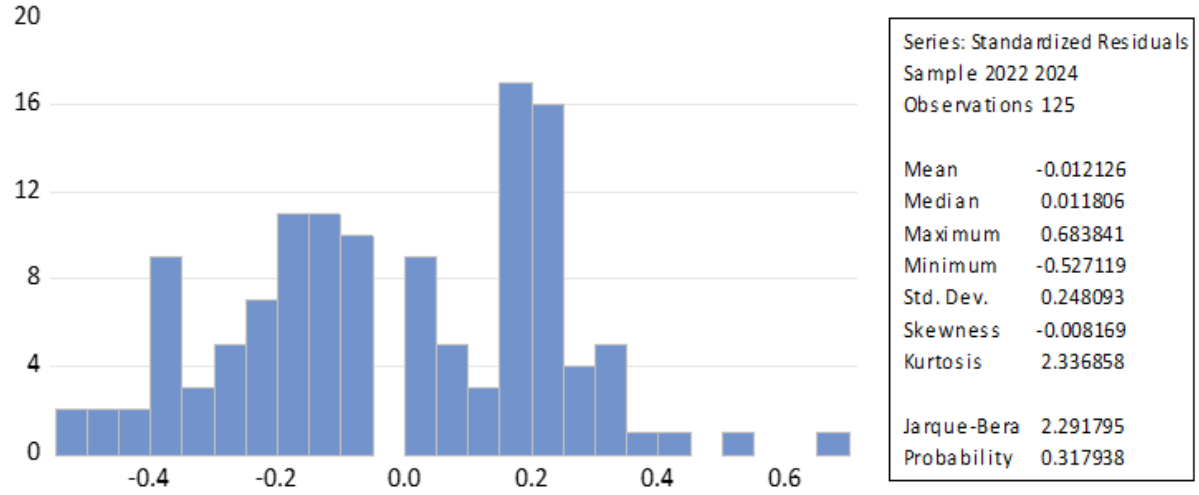

Figure 2. Normality Test

Table 3. Multicollinearity Test

Variabel	X1	X2	X3	X4
X1	1.000000	0.164269	0.065558	-0.091487
X2	0.164269	1.000000	-0.035573	0.003351
X3	0.065558	-0.035573	1.000000	0.259396
X4	-0.091487	0.003351	0.259396	1.000000

Table 4. Autocorrelation Test

R-squared	0.219679	Mean dependent var	-7.69E-18
Adjusted R-squared	0.179663	S.D. dependent var	0.275837
S.E. of regression	0.249832	Akaike info criterion	0.118742
Sum squared resid	7.302696	Schwarz criterion	0.277952
Log likelihood	-0.362023	Hannan-Quinn criterion	0.183417
F-statistic	5.489719	Durbin-Watson stat	2.071344
Prob (F-statistic)	0.000049		

0.85. It may be inferred that multicollinearity does not occur in the panel data regression model used in this research.

The autocorrelation test is conducted to determine whether the residuals in the regression model are correlated across observations. In this study, the Durbin Watson test is used to detect the presence of autocorrelation. The decision rule follows the standard criterion in which no autocorrelation is indicated when the Durbin Watson statistic lies between the upper bound and four minus the upper bound, that is when dU is less than DW and DW is less than four minus dU. This study is based on 125 firm year observations with four independent variables. The lower bound value is 1.6426 and the upper bound value is 1.7745. The Durbin Watson statistic obtained from the regression results is 2.071344, as presented in Table 4. Accordingly, the value of four minus dU is 2.2255. Based on these values, the inequality can be expressed as 1.7745 less than 2.071344 and 2.071344 less than 2.2255. Since the Durbin Watson statistic lies between the upper bound and four minus the upper bound, it can be concluded that there is no autocorrelation in the residuals.

The Glejser test, the Park test, and the White test are some of the statistical tools available for determining whether or not heteroscedasticity is present (Basuki & Prawoto, 2015). The R-squared probability value surpasses 0.05, reaching 0.1356 according to Table 5. Accordingly, heteroscedasticity is not present in the study data.

Based on the regression results presented in Table 6, capital expenditure (X1) demonstrates a positive coefficient of 0.140346, alongside a t-statistic of 12.22656 and a p-value of 0.0000. Because the t-statistic is significantly greater than the t-table value of 1.979439, and the p-value is well below the 0.05 significance threshold, the first hypothesis (H1) is accepted. This statistical evidence indicates that capital expenditure has a positive and significant effect on carbon emission disclosure, suggesting that higher investments in fixed assets drive companies to increase their transparency

Table 5. Heteroscedasticity Test

F-statistic	1.481494	Prob.F(14,110)	0.1298
Obs*R-squared	19.83017	Prob-Chi-Square (14)	0.1356
Scaled explained SS	18.31809	Prob-Chi-Square (14)	0.1927

Table 6. t-test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3.461484	0.322945	-10.71849	0.0000
X1	0.140346	0.011479	12.22656	0.0000
X2	-0.158910	0.088177	-1.802161	0.0740
X3	-0.101163	0.055468	-1.823815	0.0707
X4	0.143201	0.143823	0.995672	0.3214

Table 7. F-Test

R-squared	0.566985	Mean dependent var	0.402667
Adjusted R-squared	0.552551	S.D. dependent var	0.364825
S.E. of regression	0.244037	Akaike info criterion	0.056187
Sum squared resid	7.146505	Schwarz criterion	0.169319
Log likelihood	1.488324	Hannan-Quinn criter.	0.102147
F-statistic	39.28162	Durbin-Watson stat	1.470022
Prob (F-statistic)	0.000000		

regarding carbon emissions.

To determine the simultaneous effect of the independent variables on carbon emission disclosure, an F-test was conducted. As shown in Table 7, the analysis yielded an F-statistic of 39.28162, which is substantially higher than the F-table value of 2.679535. This is further supported by a significance probability value of 0.000000, which is well below the 0.05 threshold. These results indicate that the independent variables specifically capital expenditure, institutional ownership, growth opportunity, and sales growth simultaneously exert a significant impact on carbon emission disclosure (Hidayati et al., 2025).

Regarding the second hypothesis (H2), the statistical results do not support the assumption that institutional ownership (X2) positively affects carbon emission disclosure. As shown in Table 6, the computed t-statistic for institutional ownership is -1.802161, which in absolute terms is lower than the t-table value of 1.979439. Furthermore, the p-value of 0.0740 exceeds the 0.05 significance threshold. Consequently, H2 is rejected, indicating that institutional ownership does not have a significant influence on carbon emission disclosure. Similarly, the data shows that the growth opportunity variable (X3) does not significantly affect carbon emission disclosure, leading to the rejection of the third hypothesis (H3). The computed t-statistic of -1.823815 falls short of the t-table limit, and its p-value of 0.0707 remains above the 0.05 threshold. Therefore, it can be concluded that growth potential does not independently explain the variations in corporate carbon emission transparency.

Among the other factors, sales growth had the least level of significance. Compared to the t-table value of 1.979439, the computed t-value of -0.995672 was less. The very high probability value of 0.3214 proved this. It follows that disclosure of carbon emissions is unaffected by increases in sales. Significant changes in the dependent variable did not occur in tandem with changes in the Company's sales growth, either in the same direction or in the opposite way.

Capital expenditure is positively associated with carbon emission disclosure. This finding is consistent with the notion that in a voluntary disclosure environment, firms may use tangible environmental investments as a substantive legitimacy mechanism to credibly signal alignment with societal expectations. This relationship appears to be more consistent than that of institutional ownership, whose influence relies on varying levels of investor monitoring that may not always translate into active pressure for environmental transparency. Furthermore, the data suggests that a firm's financial capacity to invest in fixed assets is aligned with broader corporate efforts to mitigate climate change impacts. Viewed through the lens of legitimacy theory, this disclosure behavior is consistent with an effort to maintain the social contract by harmonizing operational activities with public values. These results are in agreement with studies by Rooschella & Sulfitri (2023) and Ratmono et al. (2021) who also observed a positive association between capital spending and emission transparency. Conversely, Desvita & Rahma (2025) documented an insignificant relationship, arguing that in certain contexts, companies might prioritize direct financial returns over environmental initiatives when allocating capital.

Institutional ownership does not have a significant influence on carbon emission disclosure, and this finding can be more robustly explained through the perspective of corporate governance in emerging market contexts. Although institutional investors are theoretically positioned as monitoring mechanisms that can enhance corporate transparency, their effectiveness depends on their underlying incentives and governance orientation. In many emerging markets, institutional investors tend to prioritize financial performance and short term returns, which may limit their attention to non financial issues such as environmental disclosure. This condition reflects a divergence between profit maximization objectives and ecological accountability, where environmental transparency is not always perceived as directly contributing to shareholder value. As a result, the presence of institutional investors does not necessarily translate into stronger pressure on firms to disclose carbon emissions.

This explains why firms are not consistently encouraged to improve environmental reporting solely due to institutional ownership, particularly in a voluntary disclosure environment where external enforcement is limited. This finding is consistent with prior research conducted by Fahira & Yuliandhari (2025), which also reports that institutional ownership does not significantly affect carbon emission disclosure. However, it contrasts with the findings of Oyerogba et al. (2025), who argue that institutional ownership enhances transparency. These differing results indicate that the role of institutional investors in promoting environmental disclosure is context dependent, particularly in relation to variations in governance structures, investor behavior, and market maturity.

Companies with high growth opportunities should be more transparent to attract investors. However, companies entering a rapid growth phase generally focus more on using funds on productive investment projects that generate direct profits, rather than directing them to developing a voluntary

environmental reporting system. Therefore, this study did not find an effect between growth opportunities and carbon emissions disclosure. This analysis supports the argument put out by Saraswati & Yuniarta (2023) that growth prospects have no impact on the disclosure of carbon emissions.

The results of this research demonstrate that disclosure of carbon emissions is unaffected by increases in sales. This indicates that H4 is not supported. (Hilmi et al., 2020) stated that increased profits do not accompany broader carbon emissions disclosure. This study also contradicts Rahmawati et al. (2024). In their research, business entities are obliged to build stakeholder trust by proving that their functional activities and financial performance are aligned with social values, thus creating added value for growth and for their social environment.

Conclusion

This study empirically investigated the determinants of carbon emission disclosure among energy subsector companies in Indonesia from 2022 to 2024. The empirical findings demonstrate that capital expenditure has a positive and significant effect on carbon emission disclosure, whereas institutional ownership, growth opportunity, and sales growth exert no significant influence. These results highlight that tangible physical asset investments serve as the primary driver for substantive legitimacy in environmental transparency. By focusing on the high-emission energy sector and utilizing recent data alongside a rigorous 18-item CDP framework, this study contributes to the existing literature by clarifying that corporate environmental accountability in this specific context relies more heavily on internal financial capacity for fixed assets rather than external governance or growth metrics.

At the same time, the study's findings on what factors influence disclosure of carbon emissions are quite helpful. A number of caveats should be mentioned, however. These include the fact that the research only looked at the energy subsector, that the observation period was somewhat short (2022–2024), and that disclosure was optional, which led to a lot of data fluctuation. Therefore, it would be beneficial for future studies to include moderating factors like the efficacy of audit committees or green audits, and to broaden the sample to include other industrial sectors. A better grasp of sustainability reporting dynamics and suggestions for more comprehensive ESG (Environmental, Social, and Governance) guidelines for the Indonesia Stock Exchange might result from this.

Author contributions

Fitria Inka Virtagani is the sole author of this study and is responsible for all aspects of the research. This includes conceptualizing the research idea, designing the study, collecting and analyzing the data, interpreting the results, and writing and revising the manuscript. The author confirms full responsibility for the integrity and accuracy of the work.

Acknowledgements

The author would like to express sincere gratitude to the Faculty of Economics and Business, Universitas Negeri Semarang, for providing academic support and resources that contributed to the completion of this study. Appreciation is also extended to all parties who have indirectly supported this research through guidance, discussion, and constructive feedback

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