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Firm Characteristics and Carbon Emission Transparency: Evidence from Indonesian Energi Companies in 2024

Ni Wayan Apriyani[1], A.A. Pt. Agung Mirah Purnama Sari2[2], Anak Agung Istri Pradnyarani Dewi[3]

[1,2,3] Department of Accounting, Faculty of Economy and Business, Universitas Warmadewa, Bali, Indonesia.
Email: wayanapriyani09@gmail.com[1], purnamasari@warmadewa.ac.id[2], aipradnyarani@warmadewa.ac.id[3]

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ABSTRACT
The objective of this study is to examine how energy sector companies listed on the Indonesia Stock Exchange (IDX) in 2024 disclose their carbon emissions in relation to profitability, leverage, and firm size. The study's urgency stems from the fact that businesses in the energy sector contribute significantly to greenhouse gas emissions, making carbon emission reporting transparency an essential component of establishing a company's reputation and guaranteeing its sustainability. In addition, Indonesia's emission reduction targets and implementation, as reported by Climate Action Tracker 2024, are still insufficient to keep global warming below 1.5°C. The sampling method employed is saturated sampling (census) based on specific criteria, resulting in 75 observations. This study uses cross-sectional data for the year 2024. The analytical model applied is ordinary least squares (OLS). OLS is chosen as it is a BLUE estimator and is considered the most appropriate method for testing causal relationships among observed variables. Firm size has a positive impact on carbon emission reporting, but profitability and leverage have no effect, according to empirical findings. The study's conclusions contradict legitimacy theory because carbon emission reporting policies are still optional, which encourages businesses to prioritize improving their financial performance. However, large firms tend to increase the transparency of carbon emission reporting as an effort to maintain reputation and obtain social legitimacy. The results are also not in line with stakeholder theory, as firms with high leverage tend to prioritize financial stability over carbon emission reporting, which requires additional costs.

Keywords: Carbon Emission Reporting, Profitability, Leverage, Firm Size, Energy Sector Companies.
JEL Code: M41, M14, Q56, G32, L25

I. Introduction

Climate change driven by global warming, especially greenhouse gas emissions, continues to worsen and has become a major issue in Indonesia and worldwide (Greenpeace, 2020). Indonesia ranks eighth among countries with the highest carbon emissions globally. This position highlights the significant environmental challenges faced by the country, particularly in sectors heavily dependent on fossil fuels (KLHK, 2023). The energy sector contributes approximately 752 million tons of CO_2e greenhouse gas emissions, dominated by coal, petroleum, and natural gas (Databoks, 2024). This dominance of fossil-based energy illustrates the

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structural dependence that complicates emission reduction efforts (Kementerian ESDM, 2024). Indonesia ranks 143rd out of 180 countries in the corporate climate mitigation category, with a score of 32.1 out of 100 (EPI, 2024). (Climate Action Tracker, 2024) reports that Indonesia's emission reduction targets and policy implementation remain insufficient to limit global warming to below 1.5°C. Carbon emission issues constitute a critical problem that must be addressed seriously by various stakeholders, including the business sector, particularly in terms of reporting and corporate accountability for activities that generate carbon emissions. In response to these environmental challenges, attention has increasingly shifted toward corporate accountability, particularly through sustainability reporting practices. Reporting of carbon emissions is a component of sustainability reporting methods and falls under non-financial accounting problems. It indicates a company's dedication to social and environmental responsibility resulting from its operational operations (Afrizal et al., 2023). Increasing public awareness and concern regarding global climate change have intensified demands on companies to disclose risks and strategies for mitigating its impacts (Maryati, 2025).

PSAK No. 1, paragraph 9, implicitly outlines the objectives of financial statements and the provision of relevant and reliable financial information to users. However, the existence of this standard does not automatically enhance carbon emission reporting, as such reporting remains voluntary, thereby creating gaps in environmental information transparency among companies (Maryati, 2025). As a result, stakeholders are not the only parties to use financial reports; other parties who require information about the company's social and environmental obligations include workers, suppliers, consumers, the community, and the general public. In fact, the adoption of carbon accounting, a form of environmental accountability for the company's operations, is supported by the publication of carbon emissions data in sustainability reports (Maryati, 2025). Although publication of carbon emissions should be included in a company's sustainability report, it is still optional, so not all businesses whose operations have a direct impact on the environment or natural resources disclose this information. To understand the reasons for the low level of carbon emissions reporting, numerous previous studies have examined factors that may influence it. Previous research results show diverse results, such as (Sandi et al., 2021) and (Putri & Muhammad Nuryatno Amin, 2022) stating that higher corporate profitability increases carbon emission reporting. (Oestreich & Tsiakas, 2024) discovered a very unfavorable cross-sectoral association between carbon emission intensity and revenue, whereby businesses with large levels of carbon emissions were less profitable, and vice versa. (Putri & Muhammad Nuryatno Amin, 2022) discovered that businesses are less inclined to reveal carbon emissions when they have more influence. On the other side, (Meiryani et al., 2023) discovered that the publication of carbon emissions is negatively impacted by revenue and leverage.

Pangestu & Hati (2024) and (Heriana & Irawan, 2024) discovered that larger businesses typically experience more significant public pressure and have the means to disclose their carbon emissions. Additionally, (Kartikasary et al., 2023) discovered that larger companies have sufficient capital and resources to actively contribute to the reduction of carbon emissions and the environment. Larger companies also utilize carbon emission transparency to enhance their reputation and image among stakeholders and shareholders. (Padila et al., 2025) discovered different results, claiming that the reporting of carbon emissions is negatively affected by firm size. This study aims to investigate whether revenue, financial leverage, and company size affect the publication of carbon emissions data in energy-sector businesses listed on the Indonesia Stock Exchange in 2024, given the inconsistent results of previous studies. The choice of 2024 is predicated on the growing adoption of ESG (Environmental, Social, and Governance) principles and the tightening of Indonesian government rules governing the management of carbon emissions. Since the energy industry contributes significantly to greenhouse gas emissions, this study is quite urgent; therefore, transparency regarding carbon emissions becomes a crucial element in building corporate reputation and supporting business sustainability. The results of this study are expected to have both theoretical impact on the advancement of environmental accounting research and practical consequences for businesses and authorities seeking to raise the standard of sustainability reporting in Indonesia.

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II. Literature Review and Hypothesis Development

Two theoretical frameworks are used in this study: stakeholder theory and legitimacy theory. The impact of business size and profitability on carbon emission reporting is explained by legitimacy theory (Liu et al., 2023), but the impact of leverage on carbon emission reporting is explained by stakeholder theory. The connection between businesses and the communities in which they operate, which creates a social compact for the use of financial resources, is the central focus of legitimacy theory (Saputri, 2023). Meanwhile, stakeholder theory states that information about a company's operations must be disclosed to all stakeholders, because stakeholder support is essential for the company's sustainability (Maryati, 2025; Sari & Adi, 2023). Multiple linear regression analysis approaches are used in this work. Because there are many independent variables in this study, profitability, leverage, and business size, multiple linear regression analysis is employed.

For energy-sector companies, legitimacy is important because their operations can have significant environmental impacts, such as carbon emissions. Therefore, energy companies need to maintain their image and public trust by demonstrating environmental responsibility through carbon emission reporting (Saputri, 2023). The relationship between the research variables and the research variables can be seen in how profitability, leverage, and company size influence a company's decision to make such reportings. Companies with high profitability tend to have greater resources to implement and report on environmental activities in order to maintain their social legitimacy. Meanwhile, companies with high leverage may face pressure from creditors to maintain their reputation in order to remain trusted by external parties. Large businesses are more likely to report carbon emissions in order to preserve their credibility in the eyes of the public and regulators as their size frequently indicates a higher degree of public exposure. Therefore, legitimacy theory serves as a crucial foundation for comprehending the connection between business traits and the degree of environmental openness in the energy industry (Saputri, 2023). The impact of profitability, leverage, and firm size on the degree of disclosure may help explain the link between stakeholder theory and study factors. Profitable businesses often have more resources to provide more thorough sustainability reporting in response to stakeholder requests. Meanwhile, companies with high leverage face pressure from creditors and investors to maintain their reputations and public trust by increasing environmental transparency. Company size is influential because larger companies have high public exposure and more stakeholders monitoring their activities, thereby encouraging companies to disclose carbon emissions more extensively. Stakeholder theory thus offers a foundation for understanding how business attributes affect a company's commitment to environmental responsibility disclosure, especially in the energy industry (Saputri, 2023).

Publication of carbon emissions is a way for businesses to fulfill their moral and ethical obligations to the community by supporting initiatives that decrease carbon emissions. This initiative emerged in response to public pressure to reduce environmental damage caused by carbon emissions from corporate activities. In addition, by disclosing their carbon emissions, companies contribute to government efforts to reduce them. Currently, businesses are expected to communicate details of their operations more openly. Transparency and accountability are demonstrated through the disclosure of information in annual reports, which is divided into two categories: mandatory disclosure and voluntary disclosure. One of the factors contributing to carbon emissions is business activities. Companies are required to report climate change-related actions, such as carbon emissions. Details on carbon emissions are disclosed voluntarily and are regarded as voluntary disclosure by corporate entities in Indonesia. However, in practice, many companies have not disclosed their carbon emissions. To take responsibility for climate change, it is crucial that all business actors report their carbon emissions to stakeholders. As a result, this study will look at a number of variables that may account for why businesses disclose their carbon emissions (Putri & Muhammad Nuryatno Amin, 2022). Environmental disclosure as proposed by (Bae Choi et al., 2013a):

1. Disclosure CC-1: Assessment/description of risks related to climate change, both from specific and general regulations, as well as measures taken to manage these risks.

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2. CC-2 Disclosure: Assessment/description of the current and future financial, business, and opportunity implications of climate change.
3. GHG-1 Disclosure: Explanation of the methodology used to calculate greenhouse gas emissions, such as the GHG Protocol or ISO standards.
4. Disclosure GHG-2: Information on external verification of greenhouse gas emissions, including who performed the verification and what basis was used.
5. Disclosure GHG-3: Total greenhouse gas emissions generated, expressed in metric tons of CO2-e.
6. GHG Disclosure 4: Disclosure regarding the scope of direct GHG emissions, both from scope 1 and 2, as well as 3.
7. GHG Disclosure 5: Reporting of greenhouse gas emissions based on source or origin, such as coal, electricity, and others.
8. GHG Disclosure 6: Disclosure of greenhouse gas emissions grouped by specific facilities or segments.
9. GHG Disclosure 7: Comparison of greenhouse gas emissions with data from previous years.
10. EC Disclosure 1: Total energy consumption, which can be measured in terajoules or peta joules.
11. EC Disclosure 2: Quantification of energy obtained from renewable resources.
12. Disclosure EC-3: Disclosure of energy by type, facility, or specific segment.
13. Disclosure RC-1: Details regarding existing plans or strategies to reduce greenhouse gas emissions.
14. Disclosure RC-2: Specifications regarding greenhouse gas emission reduction targets, including the level and year set.
15. Disclosure RC-3: Information on emission reductions and costs or savings achieved as a result of carbon reduction plans.
16. Disclosure RC-4: Estimates of future emission costs considered in capital expenditure planning.
17. Disclosure AEC-1: Explanation of the responsibilities of the board committee or other executive body regarding actions related to climate change.
18. AEC-2 Disclosure: Description of the mechanisms used by the board or other executive body to assess the company's progress in terms of climate change.

A ratio called profitability is used to assess how effectively a business can turn a profit from its operations over a given time frame. A company's profitability may be determined by how well it makes use of its resources. Profitability may thus be assessed by contrasting the profit made during a specific time period with the overall assets or capital of the business. The business's potential to generate revenue increases with a higher profitability ratio, thereby improving the company's transparency across all operations (Saputri, 2023). Leverage is a circumstance in which a firm employs its assets and resources to maximize earnings for all shareholders. A ratio called leverage is used to assess a company's capacity to pay down both short-term and long-term debt. Leverage reflects the use of company assets and funds with fixed costs, namely funds obtained through loans that incur interest as a fixed expense, with the aim of increasing shareholders' potential profit (Aprilyani Dewi & Budiadnyani, 2024). A high level of leverage can result in a decrease in a company's carbon emissions reporting. Therefore, companies need to manage their finances carefully, as carbon emissions reporting can increase operating costs.

There are two categories of businesses: small-scale and large-scale. One factor for categorizing a corporation is its size. Total assets, stock market price, the natural logarithm of total assets, and other metrics used to determine a company's size may all be used to assess a company’s size (Simanungkalit et al., 2025). Companies with high profitability have greater resources to implement and report on environmental activities to maintain social legitimacy and respond to stakeholder demands through comprehensive sustainability reporting. Firms with high leverage tend to face pressure from creditors to maintain their corporate reputation and sustain external trust through environmental transparency. Larger businesses, on the other hand, are urged to reveal their carbon emissions in order to preserve their credibility with the public and authorities (Saputri, 2023). The conceptual framework used in the study is illustrated in Figure 1.

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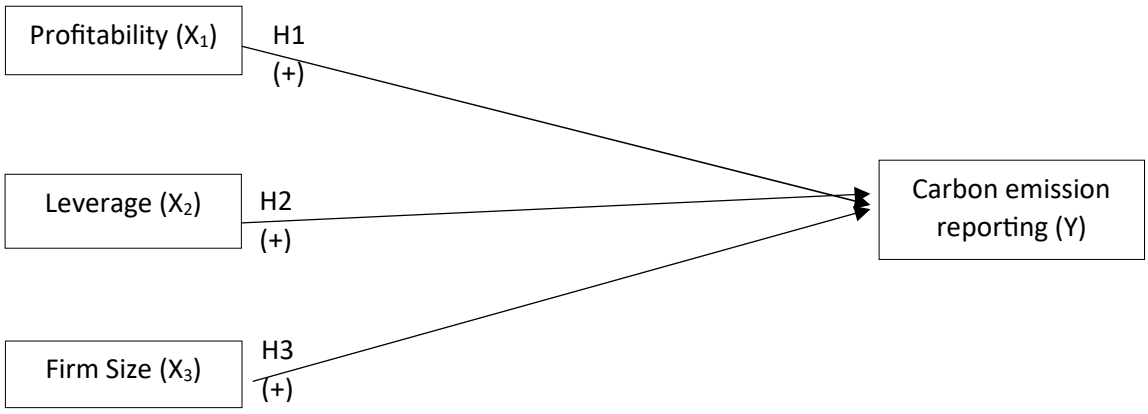

Figure 1. Research Conceptual Framework

Based on Legitimacy theory, society always expects companies to show concern for environmental issues in their surroundings. Because they have greater resources to provide environmental information, such as carbon emissions, prosperous businesses are often better equipped to satisfy these expectations than less lucrative businesses. Therefore, highly profitable companies can more easily gain societal legitimacy (Maryati, 2025). Research conducted by (Sandi et al., 2021), (Putri & Muhammad Nuryatno Amin, 2022), (Nisak & Yuniarti, 2018) and (Saraswati et al., 2020) demonstrate that reporting of carbon emissions is positively impacted by profitability. Increased prosperity gives businesses more resources, which facilitates the reporting of environmental data, such as carbon emissions. Consequently, the following is the formulation of the first hypothesis:

Hypothesis 1: Profitability has a positive effect on Carbon Emission Reporting in Energy Sector Companies

According to stakeholder theory, businesses have relationships with stakeholders, or outside parties, who can influence or be influenced (Melinda Farza Musyifa & Risa, 2025). Leverage, or a company's capacity to rely on debt to fund assets and satisfy operational demands, provides the foundation for the second hypothesis' development. Companies with high leverage will face significant pressure from creditors. Therefore, companies need to remain focused and cautious in their reportings, and prioritize debt repayment before disclosing greenhouse gas emissions. Conversely, companies with low debt levels are better able to cope with various pressures. If a company discloses its emissions while in poor financial condition, this can raise concerns among stakeholders. Research conducted by ((Putri & Muhammad Nuryatno Amin, 2022), (Nisak & Yuniarti, 2018) shows that the degree to which businesses disclose their carbon emissions is correlated with the usage of debt by businesses to fund assets. Consequently, the following is the formulation of the second hypothesis:

Hypothesis 2: Leverage has a positive effect on Carbon Emission Reporting in Energy Sector Companies.

According to legitimacy theory, a company's size may be used to calculate its total assets. The quantity of important assets is reflected in this metric. Because their operations are seen as significantly influencing the environment, big businesses are frequently in the public's attention in this regard. Therefore, large companies are more pressured by environmental issues, so they tend to increase their response to these issues (Arsy & Amin, 2025). Research conducted by ((Pangestu & Hati, 2024), ((Heriana & Irawan, 2024), (Nasih et al., 2019) and (Kartikasary et al., 2023) demonstrate that reporting of carbon emissions is positively impacted by a company's size. This can be seen in the sample of this study, where large companies tend to report high carbon emissions reporting, even almost complete, by listing all items in their annual reports. In addition, large

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companies can meet ECD requirements thanks to substantial resources, including their assets. Consequently, the following is the formulation of the third hypothesis:

Hypothesis 3: Firm Size has a positive effect on Carbon Emission Reporting in Energy Sector Companies.

III. Research Method

The study's population comprises all 91 energy industry businesses listed on the Indonesia Stock Exchange in 2024. The sampling method employed is the census (total sampling) method with specific criteria (1) firms publicly listed on the Indonesia Stock Exchange in 2024; (2) firms that issued annual reports, consolidated financial statements, and sustainability reports in 2024; and (3) firms that provided the data required for this research, resulting in 75 companies selected as the final observations. The criteria applied shows on Table 1 are as follows:

Table 1. Sample Selection Procedure

No	Sample Selection Criteria	Total
1.	Energy sector companies listed on the Indonesia Stock Exchange in 2024	91
2.	Energy sector companies that did not publish annual reports, consolidated financial statements, and sustainability reports consecutively during 2024	(11)
3.	Energy sector companies with incomplete or inaccessible data related to the variables used in this study	(5)
4.	Total Sample	75
5.	Year of observation	1
	Number of observations	75

The dependent variable in this study is carbon emission reporting, and content analysis is used to measure it. To assess advancements in carbon emissions reporting, this study examines the annual and sustainability reports of a sample of organizations. The scope of carbon emission reporting items uses an index developed by (Bae Choi et al., 2013a)(Bae Choi et al., 2013) derived from a request sheet created by the CDP (Carbon Reporting Project). Each company that discloses an item in accordance with the established criteria is assigned a score of 1. Conversely, if the item is not disclosed, the company receives a score of 0. Carbon emission reporting can be calculated using the following formula (Maryati, 2025):

$$CED = \frac{\Sigma\, di}{M} \times 100\% \quad \text{..... (1)}$$

Description:

CED = Carbon Emission Reporting

Σ di = Total number of disclosed items scored 1

M = Maximum number of items that can be disclosed

The independent variables in this study consist of profitability, leverage, and firm size. Profitability is measured by ROA (Return on Assets), which directly reflects how effectively management uses the company's assets to generate profits. This efficiency in asset utilization is associated with the company's ability to finance operational and investment activities, including those related to sustainability and carbon emission reduction (Fitriana et al., 2025). ROA can be measured using the following formula (Maryati, 2025; Prabowo & Ananta Vidada, 2025):

$$Return\ on\ Assets = \frac{Net\ Income\ After\ Tax}{Total\ Asset} \times 100\% \quad \text{..... (2)}$$

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Leverage is measured using the Debt to Equity Ratio (DER), as it provides an overview of the company's capital structure and financial risk (Padila et al., 2025). DER can be measured using the following formula (Maryati, 2025; Oktaviani & Zulvia, 2025):

$$Debt\ to\ Equity\ Ratio = \frac{Total\ Liabilities}{Total\ Equity} \quad (3)$$

This research measures the size of the firm using the natural logarithm (In) of total assets. The goal is to simplify the overall asset numbers and minimize data fluctuations without altering the original value. Because firm size is thought to affect a company's capacity to carry out a variety of activities, such as sustainability efforts and carbon emissions reporting, the natural logarithm of total assets was used in this study. Bigger businesses often have greater financial stability, more sophisticated management, and more resources to publicly and routinely disclose carbon emissions (Eka Dewayani & Ratnadi, 2021). The company size formula is described by (Suhardi, 2025) as follows:

Size = Ln (Total Asset)

This study used secondary data and was quantitative in nature. Information was gathered from the selected energy businesses' official websites using the documentation technique, including financial statements, annual reports, and sustainability reports. SPSS version 27 software was used to analyze the data. The study's regression model is displayed as follows:

$$CED = \alpha + \beta 1\ ROA + \beta 2DER + \beta 3SIZE + \varepsilon \quad (4)$$

CED : *Carbon Emission Reporting*
α : Constant
ROA : Profitability
DER : *Leverage*
SIZE : Firm Size
ε : *error*

The analysis technique used in this study was SPSS version 27, which included descriptive statistics, classical assumption tests (normality, multicollinearity, and heteroscedasticity), model feasibility tests (F-test), multiple linear regression tests, and the Coefficient of Determination (R^2) test. The classical assumption test is used in research to assess whether a regression model is suitable for further testing (Muliasari & Hidayat, 2020). Performing a classical assumption test is very important to obtain a linear and unbiased estimator with minimum variance (Best Linear Unbiased Estimator = BLUE). The normality test uses the One Sample Kolmogorov-Smirnov test as the test that will be used for analysis using a significance level of 0.05. The data is declared normal if the significance is greater than 5% or 0.05 (Berliana & Putri, 2024). The multicollinearity test looks at the tolerance value and its counterpart, the variance inflation factor (VIF). If VIF ≤ 10, it can be interpreted as indicating that the independent variables used in the model are accurate and objective. If the tolerance value is greater than 0.10 or the VIF is less than 10, this indicates no multicollinearity (Berliana & Putri, 2024). The heteroscedasticity test indicates that a good regression model is one that does not exhibit heteroscedasticity or has homogeneous variance. The heteroscedasticity test is performed using the Glesjer test, if the significance level is 0.05. If the significance value is > 0.05, then there is no heteroscedasticity (Saputri, 2023).

The model feasibility test, or F test, is used to test the validity of the regression coefficients as a whole. The F value is calculated compared to a significance level of 5%. The conditions used are: a) If the significance value is > 0.05, the model used in the study is not suitable and cannot be used for further analysis; b) If the significance value is < 0.05, then the model used in the study is feasible and can be used for further analysis (Saputri, 2023). Multiple linear regression tests in this study were measured with the following significance

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levels: a) If the significance value of t > 0.01; 0.05; and 0.10, then the hypothesis is rejected; b) If the significance value of t < 0.01; 0.05; and 0.10, then the hypothesis is accepted (Saputri, 2023).

The degree to which the model can account for the fluctuation in variables is fundamentally measured by the coefficient of determination (R2). The value of the coefficient of determination ranges from zero to one. A small R2 value indicates that independent factors have very little capacity to explain dependent variables. One of the factors to consider when choosing a suitable model is the coefficient of determination. The reason is that if a linear regression model produces a high coefficient of determination but is inconsistent with the economic theory chosen by the researcher or fails the classical assumption test, then the model is not a good estimator and should not be chosen as an empirical model (Saputri, 2023).

IV. Result and Discussion

An essential component of the country's financial system, the Indonesian capital market serves as a platform for public investment and a way to raise long-term capital. The Financial Services Authority (OJK) coordinates and oversees capital market operations to provide efficient, equitable, and orderly securities trading. The Indonesia Stock Exchange (IDX) serves as both an institution that organizes securities trading and a means for public companies to obtain funding through the issuance of shares and other financial instruments. Through the IDX, companies from various industrial sectors gain access to funding that supports business development and improves company performance (Kemala et al., 2024). One sector that plays a strategic role in the national economy is the energy sector, given its contribution to meeting the energy needs of industry, transportation, and the community. Energy sector companies listed on the Indonesia Stock Exchange span various subsectors, including fossil energy, renewable energy, and energy support services, whose performance is influenced by macroeconomic conditions, government policies, and global energy price dynamics (Muhayatul & Umar, 2025). In 2024, the energy sector showed significant development in line with the increased focus on energy security and the transition to sustainable energy. Therefore, energy-sector companies listed on the IDX in 2024 are considered relevant as research objects to obtain an overview of their conditions and characteristics, based on information presented in their annual reports and sustainability reports (Muhayatul & Umar, 2025).

4.1. Descriptive Statistic

The results of the analysis in Table 2 show that the minimum profitability value is -38,27 and the maximum value is 69,04. The average (mean) profitability is 6,2161, with a standard deviation of 13,04261. This indicates that the companies' ability to generate profit from their total assets tends to vary considerably, as reflected in the wide range of values from significantly negative to highly positive. The standard deviation, which is higher than the mean value, suggests a relatively high level of data dispersion, indicating that the profitability of energy sector companies in the sample is not homogeneous. While some companies experience low profitability or even losses (negative values), others demonstrate very high profitability.

The minimum leverage value in Table 2 is 0,04, while the maximum value is 35,33. The average leverage is 1,7561, with a standard deviation of 4,30100. This indicates that the level of debt usage among the sampled companies varies considerably, as reflected in the wide range of values. The standard deviation, which exceeds the mean, suggests a relatively high dispersion of leverage data, indicating that the companies' capital structures are not homogeneous. Some companies exhibit very low leverage, while others have very high leverage, indicating greater reliance on debt financing and potentially higher financial risk. Firm size in Table 2 shows a minimum value of 25,67 and a maximum value of 32,52. The average firm size is 28,8813, with a standard deviation of 1,87792. This suggests that firm size within the sample varies, but the degree of variation is relatively lower compared to the other variables, as the standard deviation is much smaller than the mean. The range of values indicates differences in company size; however, overall, firm size in the sample is more homogeneous.

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Table 2. Results of Descriptive Statistical Analysis

	N	Min	Max	Mean	Std. Deviation
Profitability	75	-38,27	69,04	6,22	13,04
Leverage	75	,04	35,33	1,76	4,30
Firm Size	75	25,67	32,52	28,88	1,88
Carbon Emission Reporting	75	,04	1,00	,51	,26
Valid N (*Listwise*)	75				

Carbon emission reporting in Table 2 shows a minimum value of 0.04 and a maximum value of 1.00. The average value is 0.5056, with a standard deviation of 0.26291. These findings show that the sampled companies' degree of carbon emission reporting falls within the moderate range, with significant differences in reporting procedures across businesses. The standard deviation, which is lower than the mean, suggests a moderate level of data dispersion, indicating that the level of carbon emission reporting is not entirely homogeneous. While some companies exhibit very low levels of reporting, others demonstrate high levels of reporting, reflecting more comprehensive carbon emission reporting.

4.2. Classical Assumption Test

Table 3 shows a significance value of 0,200, which is greater than 0,05 (0,200 > 0,05); therefore, it can be concluded that the data are normally distributed.

Table 3. Normality Test Results

		Unstandardized Residual
N		75
Normal Parameters[a,b]	Mean	,0000000
	Std. Deviation	,24437408
Most Extreme Differences	Absolute	,076
	Positive	,200[d]
	Negative	

Table 4 shows that all variables have tolerance values greater than 0,10. Likewise, the Variance Inflation Factor (VIF) values for all variables are below 10. Therefore, the regression model is not subject to multicollinearity, indicating that profitability, leverage, and firm size can be used simultaneously to explain carbon emission reporting.

Table 4. Multicollinearity Test Results

Model		Collinearity Statistics	
		Tolerance	VIF
1	Profitability	,853	1,172
	Leverage	,873	1,145
	Firm Size	,971	1,030

a. Dependent Variable: Carbon Emission Reporting

Based on the heteroscedasticity test using the Glejser method on Table 5, the significance obtained are 0,463 for profitability, 0,905 for leverage, and 0.386 for firm size. All these significance values are greater than 0,05; consequently, heteroscedasticity does not affect the regression model.

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Table 5. Heteroscedasticity Test Results

	t	Sig
(Constant)	-,029	,977
Profitability	-,738	,463
Leverage	-,119	,905
Firm Size	,872	,386

a. *Dependent Variable*: ABS_RES

4.3. Model Feasibility Test

Table 6 displays an F-value of 3,727 with a significance level of 0,015 from the ANOVA test, often known as the F-test. The link between the independent and dependent variables is examined using the F-test value, which yields an F-value of 3,727 with a significance of 0,015. It may be inferred that business size, leverage, and profitability all affect carbon emission reporting simultaneously, as the significance value is less than 0,05. As a result, the multiple linear regression model employed in this investigation is thought to be suitable for elucidating the relationship between the independent and dependent variables.

Table 6. Model Feasibility Test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,696	3	,232	3,727	,015[b]
	Residual	4,419	71	,062		
	Total	5,115	74			

a. Dependent Variable: Carbon Emission Reporting

4.4. Profitability and Carbon Emission Reporting

Table 7 displays the results of the multiple linear regression test, which yielded a significance value of 0,623 and a profitability variable coefficient value of 0,001. The result in Table 7 indicates that profitability does not significantly affect carbon reporting practices; therefore, H1 is not supported. This finding is inconsistent with legitimacy theory, suggesting that financial performance has not become the primary driver of environmental transparency among energy sector companies. The voluntary nature of this reporting practice may explain why firms prioritize financial stability, business expansion, and returns to investors rather than increasing the extent of environmental transparency, which is not yet strictly mandated. Even though Indonesia's energy industry is one of the biggest sources of greenhouse gas emissions, decisions to improve reporting seem to be more heavily impacted by stakeholder expectations, regulatory pressure, and reputational factors than by profitability alone. This finding is consistent with the results of (Melinda Farza Musyifa & Risa, 2025), (Wulandari & Sasongko, 2024), (Saputri, 2023), (Trilestari & Murwanto, 2022), and (Kamila et al., 2024), who discovered that reporting of carbon emissions is not significantly impacted by profitability. (Saputri, 2023) states that profitability cannot be the reason for companies to be willing to disclose carbon emissions.

Table 7. The results of multiple linear regression analysis.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,939	,452		-2,076	,042
	Profitability	,001	,002	,059	,494	,623
	Leverage	,007	,007	,109	,921	,360
	Firm Size	,049	,016	,352	3,148	,002

a. Dependent Variable: Carbon Emission Reporting

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4.5. Leverage and Carbon Emission Reporting

Table 7 displays the results of the multiple linear regression test, which yielded a significance value of 0,360 and a leverage variable coefficient value of 0,007. The regression results show that leverage does not significantly influence environmental reporting practices; therefore, H2 is not supported. This result contradicts stakeholder theory, suggesting that debt levels are no longer a determining factor in promoting increased openness. Firms with high financial obligations tend to prioritize maintaining liquidity and meeting debt commitments over allocating additional resources to voluntary sustainability reporting. Since this practice remains non-mandatory, creditors appear to prioritize financial performance indicators over environmental transparency. Consequently, pressure from lenders has not directly translated into improvements in emission-related reporting. Creditors often place more emphasis on a company's capacity to sustain financial ratios and repay debt than on the caliber of carbon emission reporting. As a result, advancements in environmental openness have not been directly prompted by pressure from creditors. These findings is in line with the results of (Maryati, 2025), (Trilestari & Murwanto, 2022), dan (Berliana & Putri, 2024), which indicate that reporting of carbon emissions is not much impacted by leverage. (Maryati, 2025) claims that leverage has little bearing on the reporting of carbon emissions because energy corporations are becoming more conscious of the significance of environmental concerns, which motivates them to put greater emphasis on factors other than corporate profitability. These results suggest that high-leverage corporations do not always declare lower carbon emissions than low-leverage ones.

4.6. Firm Size and Carbon Emission Reporting

Table 7 presents the results of the multiple linear regression test, which yielded a coefficient value of 0,049 for the firm size variable and a significance level of 0,002. H3 is supported, as the regression results indicate that business size has a positive and substantial impact on emission-related transparency. This result is consistent with legitimacy theory, which holds that businesses increase their environmental responsibilities in response to social expectations. Consequently, they tend to enhance transparency by providing more extensive information, including carbon emission reporting, in order to obtain and maintain social legitimacy. Furthermore, compared to smaller businesses, major companies usually have the resources necessary to quantify emissions, create sustainability reports, and provide more thorough environmental information. This tendency may be explained by the state of Indonesia's energy industry in 2024, where which larger businesses are more visible to the public than smaller ones. Large-scale energy companies tend to attract closer attention from the government, investors, the public, and environmental monitoring agencies due to the broad scope of their operations and their potential to generate significant carbon emissions. Such conditions encourage large firms to increase transparency through carbon emission reporting as an effort to maintain their reputation and secure social legitimacy. In addition, larger firms generally have more substantial resources, reporting systems, and managerial capacity to conduct emission measurement and provide more comprehensive carbon emission reporting. This result aligns with previous studies by (Suhardi, 2025), Wulandari and (Wulandari & Sasongko, 2024), (Trilestari & Murwanto, 2022) and (Kamila et al., 2024), which state that firm size has a significant positive effect on carbon emission reporting.

4.7. Coefficient of Determination

Table 8 displays the results of the coefficient of determination test, with a R Square value of 0,452 and an Adjusted R Square of 0,436. This shows that 43.6% of the variance in carbon emission reporting can be explained by the independent factors, with additional variables outside the study model accounting for the remaining 56,4%.

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Table 8. Determination Coefficient Test Results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,369[a]	,136	,100	,24948

a. Predictors: (Constant), Firm Size, leverage, Profitability

V. Conclusion

The following conclusions are drawn from the research findings: 1) The reporting of carbon emissions by energy sector firms listed on the Indonesia Stock Exchange in 2024 is independent of profitability. 2) The reporting of carbon emissions by energy sector firms listed on the Indonesia Stock Exchange in 2024 is unaffected by leverage. 3) The reporting of carbon emissions by energy sector firms listed on the Indonesia Stock Exchange in 2024 is positively and significantly impacted by firm size. Due to temporal restrictions in data collection, the study's observation period was limited to one year, 2024. Because of this constraint, the results could not accurately reflect the long-term trends of carbon emission reporting in businesses in the energy industry. The second limitation is that several hypotheses were not supported. Nevertheless, the researcher conducted comprehensive testing of each independent variable through partial tests (t-tests) and classical assumption tests; therefore, the results reflect the actual empirical conditions. The study's findings suggest the following suggestions for improvement:

1. In an effort to gain credibility with stakeholders and society, companies are urged to increase the openness of their carbon emissions reportings. Companies are also expected not to focus solely on financial performance but to pay attention to environmental responsibility to improve their corporate image and sustainability.
2. Investors, when making investment decisions, are advised not only to consider financial aspects such as profitability and leverage but also to evaluate the company's environmental commitment through carbon emission reporting, as it reflects the company's sustainability orientation and corporate reputation.
3. Future researchers are recommended to use a longer and more recent observation period, increase the sample size, or expand the research sector to obtain more representative and generalizable results. To provide a more thorough explanation of the factors affecting carbon emission reporting, future research is also urged to incorporate additional relevant variables.

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