

THE EFFECT OF FIRM AGE, INSTITUTIONAL OWNERSHIP, LEVERAGE, PROFITABILITY, FIRM SIZE, AND PROPER ON CARBON EMISSION DISCLOSURE

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Abstract

Climate change has become one of the most critical environmental issues, closely linked to the contribution of carbon emissions generated by companies. This study aims to provide empirical evidence regarding the factors influencing carbon emission disclosure. The population of this study consisted of energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2021–2023 period. The sampling technique employed was purposive sampling, resulting in a total of 87 research observations. This study utilized secondary data obtained through documentation techniques. Data analysis was conducted using multiple linear regression with the assistance of SPSS version 26 software. The results indicate that firm age and firm size have a positive effect on carbon emission disclosure. Meanwhile, other factors, namely institutional ownership, leverage, profitability, and PROPER, do not have a significant effect on carbon emission disclosure. These findings imply that companies need to enhance compliance with environmental regulations related to greenhouse gas (GHG) emissions and climate change to avoid sanctions, fines, or legal consequences resulting from non-compliance. In addition, transparency in carbon emission disclosure can increase stakeholder trust. Furthermore, such disclosure can encourage companies to develop cleaner and more efficient technologies, as well as adopt more environmentally friendly practices to reduce their carbon emissions.

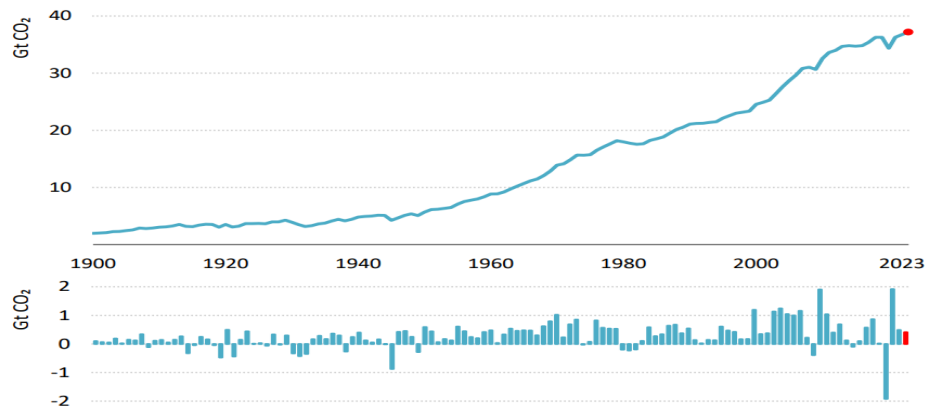
Keywords: Carbon Emission Disclosure; Firm Age; Firm Size; Institutional Ownership; PROPER

INTRODUCTION

Climate change has become a global issue that has attracted the attention of many countries, as it can lead to forest fires, droughts, floods, and other environmental disasters. The increasing temperature of the Earth due to climate change has become a major concern. Consequently, in June 1992 in Rio de Janeiro, the concept of sustainable development was agreed upon during the Earth Summit. In relation to this, one of the United Nations conventions, the United Nations Framework Convention on Climate Change (UNFCCC), established an international protocol (agreement) on climate change known as the Kyoto Protocol in 1997. The greenhouse gas (GHG) emissions regulated under the Kyoto Protocol include CO₂, PFC, CH₄, SF₆, N₂O, and HFC. Among these, CO₂ is one of the components of GHG emissions that has a significant influence on climate change.

Based on global CO₂ emission data related to energy, emissions increased by 1.1% in 2023, rising by 410 Mt and reaching a new record high of 37.4 Gt, with coal emissions contributing more than 65% of the increase in 2023 (IEA, 2023).

Figure 1
Global Energy-Related CO₂ Emissions and Their Annual Changes, 1900–2023



Source: (International Energy Agency, 2023)

According to the Centre for Research on Energy and Clean Air (CREA) and the Global Energy Monitor (2023), G20 countries account for 93% of the world's operating coal capacity and 88% of the coal capacity currently under pre-construction. Meanwhile, data from the Energy Institute indicate that global coal production reached the highest level in history (179 EJ), surpassing the previous record set in the preceding year. The Asia Pacific region contributes nearly 80% of global production, with activities concentrated in four countries: Australia, China, India, and Indonesia. Although these countries have also ratified the Kyoto Protocol, which implies their responsibility to contribute to global climate action, their high dependence on coal remains undeniable. In Indonesia, the Indonesian Business Links organization was established in 1999 to promote and encourage companies to adopt transparency, ethical and responsible business practices, and effective corporate governance. In 2002, Business Watch Indonesia was launched to hold companies accountable for their negative impacts on society and the environment and became the first Indonesian civil society

representative to advocate for the inclusion of corporate sustainability practices (Laskar & Gopal Maji, 2018). These initiatives are closely related to sustainable business practices and compliance with existing regulations, including those related to environmental protection. In addition, several government regulations have been issued, including Presidential Regulation of the Republic of Indonesia No. 61 of 2011 concerning the National Action Plan for Greenhouse Gas Emission Reduction (RAN-GRK) and Presidential Regulation No. 71 of 2011 concerning the implementation of the national greenhouse gas inventory. Based on these regulations, corporations have social responsibilities in efforts to reduce emissions and prevent sustainable global warming (Hilmi et al., 2020). Subsequently, these regulations were replaced by Presidential Regulation No. 98 of 2021 concerning the implementation of carbon economic value to achieve nationally determined contribution (NDC) targets and control greenhouse gas emissions in national development. This regulation serves as the legal foundation for Indonesia's efforts to encourage and achieve its NDC targets by controlling GHG emissions through the implementation of carbon economic value mechanisms. Therefore, this regulation represents an important instrument for achieving Indonesia's net zero emission target by 2060.

However, in practice, the Indonesian government continues to develop investments and infrastructure that contribute to increasing greenhouse gas emissions, such as coal-fired power plants (PLTU), fossil fuel-based transportation, and large-scale land and forest clearing for monoculture plantations (Wahana Lingkungan Hidup Indonesia, 2022). In addition, the industrial sector in Indonesia continues to expand. Industrial growth may positively correlate with increased emissions from corporate operational activities (Ambarwati, 2022). Meanwhile, in Indonesia, carbon emission disclosure remains voluntary, and its implementation is still relatively limited among business actors (Dwinanda, 2019). The issue of carbon emissions has therefore become increasingly urgent, as it is no longer merely an environmental concern but has evolved into legal, financial, and reputational risks for both corporations and governments. This study refers to previous research conducted by Prasetya and Yulianto (2018). The difference lies in the inclusion of institutional ownership and firm size variables, following the recommendations of previous researchers. Furthermore, this study measures carbon emission disclosure using the GRI 305 emissions standard, whereas Prasetya and Yulianto (2018) employed the Carbon Disclosure Project (CDP) instrument developed by Bae Choi et al. (2013). However, this study does not include the industry type variable, as incorporating dummy variables in studies with relatively small sample sizes may lead to overfitting and generalization issues.

Previous studies examining factors influencing carbon emission disclosure have produced inconsistent results, indicating the existence of a research gap in similar studies. Therefore, further research on the determinants of carbon emission disclosure is necessary to obtain more consistent findings. This study focuses on companies in the energy sector, as this sector generates carbon emissions with relatively high carbon intensity. The complex and interconnected systems involved in electricity generation and the transportation of oil and gas make the energy sector one of the most climate change vulnerable sectors worldwide (Bauri et al., 2024). Accordingly, this study aims to obtain empirical evidence regarding the influence of firm age, institutional ownership, leverage, profitability, firm size, and PROPER ratings on carbon emission disclosure.

REVIEW OF LITERATURE

Legitimacy Theory

According to Lindblom (1994), legitimacy occurs when the value system of an entity aligns with the broader value system of the society in which it operates. When a discrepancy arises between these systems, the entity's legitimacy may be threatened (Ghozali, 2020). Legitimacy theory is based on the concept of a social contract between companies and society. Since corporate activities affect the public environment, companies are expected to address environmental issues and the impacts resulting from their operations (Amaliyah & Solikhah, 2019). Society allows organizations to continue operating as long as they meet social expectations. Therefore, companies are expected to consider environmental and social impacts in their activities. Compliance with societal norms and regulations helps companies maintain legitimacy and avoid conflicts with the community (Angelina & Handoko, 2023). Carbon emission disclosure can serve as a strategy for companies to build and maintain legitimacy regarding their environmental responsibility (Kholmi et al., 2020).

Stakeholder Theory

Freeman (1984) defines stakeholders as individuals or groups that can affect or be affected by the achievement of a company's objectives (Solihin, 2009). Stakeholder theory states that companies operate not only for their own interests but also for the benefit of stakeholders (Ghozali, 2020). Stakeholders can be classified into internal stakeholders, such as management and employees, and external stakeholders, such as shareholders, creditors, and government (Pranasyahputra et al., 2020). According to Gray, Kouhy, and Adams (1994), a company's survival depends on stakeholder support, which can be obtained through responsible corporate activities, including environmental disclosure such as carbon emission reporting (Prasetya & Yulianto, 2018).

Effect of Firm Age on Carbon Emission Disclosure

Firm age reflects a company's ability to sustain its operations and compete in the market. Older firms generally have more experience in managing their business and environmental impacts. They also have greater opportunities to develop environmental reporting practices (Dwinanda, 2019). From a legitimacy perspective, older firms receive greater public and media attention, encouraging them to disclose more environmental information, including carbon emissions, to maintain social acceptance (Prasetya & Yulianto, 2018). Empirical studies by Ambarwati et al. (2020) and Ambarwati (2022) support this relationship.

H1: Firm age positively affects carbon emission disclosure.

Effect of Institutional Ownership on Carbon Emission Disclosure

Institutional investors are important stakeholders because they have a long-term interest in a company's sustainability (Pramuditya & Budiasih, 2020). Higher institutional ownership increases monitoring and pressure on management to maintain transparency and corporate reputation. Institutional shareholders may encourage companies to comply with

environmental regulations and voluntarily disclose carbon emissions to reduce reputational risk (Ramadhan et al., 2021). Prior studies by Pratiwi (2018) and Ramadhan et al. (2021) support this relationship.

H2: Institutional ownership positively affects carbon emission disclosure.

Effect of Leverage on Carbon Emission Disclosure

Leverage indicates the extent to which a company's assets are financed by debt (Ambarwati, 2022). High leverage increases creditor scrutiny and expectations regarding corporate performance, including environmental performance. To maintain credibility and stakeholder trust, companies with higher leverage may disclose more environmental information, including carbon emissions. This relationship is supported by Ambarwati (2022).

H3: Leverage positively affects carbon emission disclosure.

Effect of Profitability on Carbon Emission Disclosure

Profitability reflects a company's ability to generate profits and indicates strong financial performance. Firms with higher profitability generally have greater financial resources to support environmental reporting and sustainability initiatives (Pratiwi et al., 2021). Companies with higher profits may also face greater public expectations, encouraging them to disclose environmental information as part of their accountability (Ambarwati, 2022). Previous studies by Yusuf (2021), Pratiwi et al. (2021), and Ambarwati (2022) support this relationship.

H4: Profitability positively affects carbon emission disclosure.

Effect of Firm Size on Carbon Emission Disclosure

Firm size reflects the scale of a company's resources and operational activities (Yusuf, 2021). Larger firms typically have greater environmental impacts and receive more scrutiny from stakeholders and regulators. According to legitimacy theory, larger companies tend to disclose more environmental information to respond to public pressure and maintain their reputation (Pratiwi et al., 2021). This relationship is supported by Ambarwati et al. (2020), Pratiwi et al. (2021), and Yusuf (2021).

H5: Firm size positively affects carbon emission disclosure.

Effect of PROPER on Carbon Emission Disclosure

PROPER ratings reflect corporate environmental performance. Companies with higher PROPER ratings tend to disclose more environmental information, including carbon emissions, to demonstrate their commitment to sustainability and maintain legitimacy (Kholmi et al., 2020). Conversely, companies with lower environmental performance may limit disclosure to avoid reputational risk. Studies by Yusuf (2021) and Prasetya & Yulianto (2018) support the relationship between PROPER ratings and carbon emission disclosure.

H6: PROPER positively affects carbon emission disclosure.

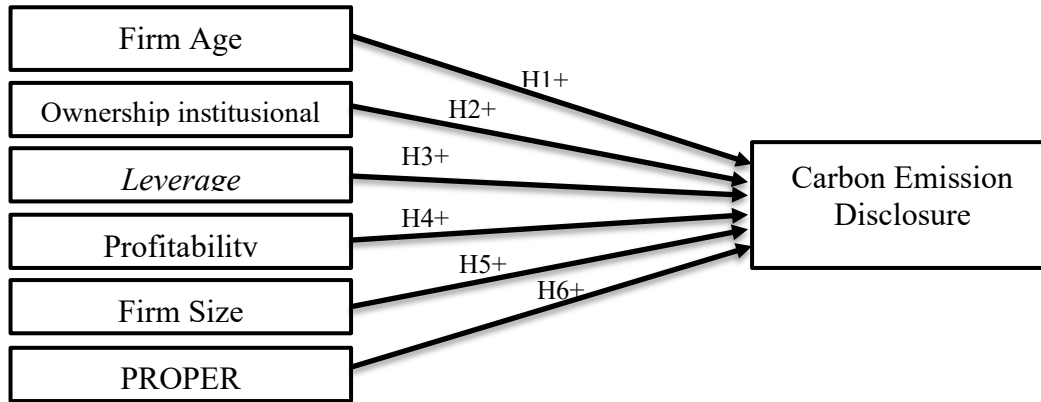


Figure 1. Research Model

RESEARCH METHOD

- 1) This study employs a quantitative research approach using secondary data in the form of annual reports and sustainability reports of energy sector companies during the 2021–2023 period. The data were obtained from the official website of the Indonesia Stock Exchange (www.idx.co.id) and the official websites of the respective energy companies. The population of this study consists of all companies in the energy sector listed on the Indonesia Stock Exchange (IDX). The sample was selected using a non probability sampling technique with a purposive sampling method, based on the following criteria:
energy sector companies that consistently and completely published annual and sustainability reports during the 2021–2023 period;
- 2) energy sector companies that were not subject to suspension sanctions by the IDX during the 2021–2023 period;
- 3) energy sector companies that did not experience losses during the 2021–2023 period; and
- 4) energy sector companies that consistently disclosed carbon emissions (at least one carbon emission disclosure item) during the 2021–2023 period.

Based on these criteria, a total of 87 research observations were obtained.

The dependent variable in this study is carbon emission disclosure, while the independent variables include firm age, institutional ownership, leverage, profitability, firm size, and PROPER rating. The data were analyzed using multiple linear regression analysis with the assistance of SPSS version 26. The multiple linear regression model used in this study is as follows:

$$CE_Disc = \alpha + \beta_1 Age + \beta_2 KI + \beta_3 Lev + \beta_4 Pro + \beta_5 UP + \beta_6 PP + e$$

The formula above indicates that variable Y represents CE_Disc = carbon emission disclosure, α represents the constant, β_1 – β_6 represent the regression coefficients, Age

represents firm age, KI represents institutional ownership, Lev represents leverage, Pro represents profitability, UP represents firm size, and PP represents the PROPER rating.

Table 1. Operationalization of Variables

| Variable | Measurement |
|--------------------------------------|---|
| Carbon Emission Disclosure (CE_Disc) | Based on GRI 305 (Emission) indicators: 305-1: Direct GHG emissions disclosure (Scope 1). 305-2: Energy indirect GHG emissions disclosure (Scope 2). 305-3: Other indirect GHG emissions disclosure (Scope 3). 305-4: GHG emissions intensity disclosure. 305-5: GHG emissions reduction disclosure. 305-6: Ozone-depleting substances (ODS) emissions disclosure. 305-7: Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions disclosure. (Rooschella & Sulfitri, 2023) |
| Firm Age (Age) | Firm Age = Year of observation – Year of establishment. (Ambarwati, 2022) |
| Institutional Ownership (KI) | Institutional Ownership = (Total Institutional Share Ownership / Total Outstanding Shares) × 100. (Pramuditya & Budiasih, 2020) |
| Leverage (Lev) | Debt to Asset Ratio (DAR) = (Total Debt / Total Assets) × 100. (Florencia & Handoko, 2021) |
| Profitability (Pro) | Return on Assets (ROA) = (Net Income / Total Assets) × 100. (Witri Astiti & Wirama, 2020) |
| Firm Size (UP) | Firm Size = ln (Total Assets). (Pratiwi et al., 2021) |
| PROPER Rating (PP) | PROPER Rating Scale: 0 = Not Participating 1 = Black (Very Poor) 2 = Red (Poor) 3 = Blue (Good) 4 = Green (Very Good) 5 = Gold (Excellent) (Hilmi et al., 2020) |

RESULTS AND DISCUSSION

Descriptive Statistical Analysis

Descriptive statistical analysis provides a description or overview of the data based on the minimum value, maximum value, mean value, and standard deviation. The results of the descriptive statistical analysis are presented in Table 2 below.

Table 2. Descriptive Statistics

| Variable | N | Minimum | Maximum | Mean | Std. Deviation |
|-------------------------|----|---------|---------|---------|----------------|
| Firm Age | 87 | 10 | 58 | 28.76 | 13.357 |
| Institutional Ownership | 87 | 10.00 | 94.52 | 68.1629 | 19.89234 |
| Leverage | 87 | 4.80 | 85.46 | 43.4587 | 19.43650 |
| Profitability | 87 | 0.02 | 61.63 | 16.9994 | 16.32423 |
| Firm Size | 87 | 27.23 | 32.76 | 30.3068 | 1.36305 |
| PROPER Rating | 87 | 0.00 | 3.23 | 1.3678 | 1.13655 |

| Variable | N | Minimum | Maximum | Mean | Std. Deviation |
|----------------------------|-----------|----------------|----------------|-------------|-----------------------|
| Carbon Emission Disclosure | 87 | 14.29 | 100.00 | 58.6206 | 30.50087 |
| Valid N (listwise) | 87 | | | | |

Descriptive Statistical Analysis

Descriptive statistical analysis provides an overview of the data based on the minimum value, maximum value, mean, and standard deviation. The results of the descriptive statistical analysis are presented in Table 2. Based on these results, the characteristics of each independent variable can be explained. The firm age variable shows a minimum value of 10, a maximum value of 58, a mean value of 28.76, and a standard deviation of 13.357. This indicates that most companies in the energy sector have been operating for a relatively long period of time. Meanwhile, the institutional ownership variable has a minimum value of 10.00, a maximum value of 94.52, a mean value of 68.1629, and a standard deviation of 19.89234. This result indicates that the proportion of institutional share ownership in energy sector companies is relatively high, with an average ownership ranging from 60% to 80%. The leverage variable shows a minimum value of 4.80, a maximum value of 85.46, a mean value of 43.4587, and a standard deviation of 19.43650. This indicates that the average leverage level of energy sector companies is above 40%–50%, suggesting that nearly half of the companies’ assets are financed by debt. The profitability variable has a minimum value of 0.02, a maximum value of 61.63, a mean value of 16.9994, and a standard deviation of 16.32423. This finding indicates that the average profit generated by companies in the energy sector is still relatively small.

Furthermore, the firm size variable shows a minimum value of 27.23, a maximum value of 32.76, a mean value of 30.3068, and a standard deviation of 1.36305. This suggests that the size of companies in the energy sector, measured by their total assets, is relatively large. The PROPER rating variable has a minimum value of 0, a mean value of 1.3678, and a standard deviation of 1.13655, indicating that participation in the PROPER program organized by the Ministry of Environment and Forestry (KLHK) among energy sector companies is still not optimal. Meanwhile, the dependent variable, carbon emission disclosure, shows a minimum value of 14.29, a maximum value of 100.00, a mean value of 58.6206, and a standard deviation of 30.50087. These results indicate that carbon emission disclosure based on the GRI 305 standard, or at least disclosure related to emissions, has generally been implemented quite well, although some companies have not yet carried it out optimally. Among the disclosure items, item 305-4 related to greenhouse gas (GHG) emission intensity is the most frequently disclosed, while item 305-6 related to the disclosure of ozone-depleting substance emissions is the least frequently reported. In addition, item 305-3 is also rarely disclosed by companies, whereas other items such as 305-1, 305-2, 305-5, and 305-7 are more commonly used to report emission-related information.

Classical Assumption Test

Before conducting multiple linear regression analysis, classical assumption tests were performed to ensure that the regression model met the basic assumptions required in regression analysis. These tests include the normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test. The normality test in this study used the One Sample Kolmogorov–Smirnov test. Based on the results, the Asymp. Sig. (2-tailed) value

was 0.200. Since the significance value of the unstandardized residual is greater than 0.05 (0.200 > 0.05), it indicates that the data meet the normality assumption.

The multicollinearity test was conducted using tolerance and Variance Inflation Factor (VIF) values. The results show that all independent variables meet the required criteria, where the tolerance values are greater than 0.1 and the VIF values are less than 10. Specifically, firm age has a tolerance value of 0.830 and VIF of 1.205, institutional ownership has a tolerance value of 0.798 and VIF of 1.253, leverage has a tolerance value of 0.621 and VIF of 1.609, profitability has a tolerance value of 0.728 and VIF of 1.374, firm size has a tolerance value of 0.315 and VIF of 3.171, and PROPER rating has a tolerance value of 0.406 and VIF of 2.461. These results indicate that there is no multicollinearity problem in the regression model. The heteroscedasticity test in this study used Spearman’s rho test. The results show that the significance values (2-tailed) for all independent variables are greater than 0.05. Firm age has a significance value of 0.720, institutional ownership 0.349, leverage 0.885, profitability 0.454, firm size 0.688, and PROPER rating 0.869. These findings indicate that the regression model does not experience heteroscedasticity. Finally, the autocorrelation test was conducted using the Durbin–Watson test. The results show that the value of dL is 1.5075, dU is 1.8010, DW is 1.828, and 4–dU is 2.199. Since the value satisfies the condition $dU < DW < 4-dU$ (1.8010 < 1.828 < 2.199), it can be concluded that there is no autocorrelation in the regression model.

Multiple Regression Analysis

Table 3. Multiple Linear Regression Result

| Model | B (Unstandardized Coefficient) | t | Sig. |
|-------------------------|--------------------------------|--------|-------|
| (Constant) | -317.335 | -3.186 | 0.002 |
| Firm Age | 0.441 | 2.084 | 0.040 |
| Institutional Ownership | -0.019 | -0.130 | 0.897 |
| Leverage | -0.094 | -0.559 | 0.578 |
| Profitability | -0.199 | -1.076 | 0.285 |
| Firm Size | 12.212 | 3.627 | 0.001 |
| PROPER Rating | 1.398 | 0.393 | 0.695 |

Based on the results of the multiple linear regression analysis presented in Table 3, the following regression equation is obtained:

$$Y = -317.35 + 0.441X_1 - 0.019X_2 - 0.094X_3 - 0.199X_4 + 12.212X_5 + 1.398X_6 + e$$

The regression model shows a constant value of -317.35, which means that if the variables firm age, institutional ownership, leverage, profitability, firm size, and PROPER rating are equal to zero, the value of carbon emission disclosure would be -317.335. The regression coefficient for firm age is 0.441, indicating that an increase of one unit in firm age will increase carbon emission disclosure by 0.441. The regression coefficient for institutional

ownership is -0.019, meaning that a one-unit increase in institutional ownership will decrease carbon emission disclosure by 0.019. The regression coefficient for leverage is -0.094, indicating that a one-unit increase in leverage will reduce carbon emission disclosure by 0.094. The regression coefficient for profitability is -0.199, which means that a one-unit increase in profitability will decrease carbon emission disclosure by 0.199. Meanwhile, the regression coefficient for firm size is 12.212, indicating that a one-unit increase in firm size will increase carbon emission disclosure by 12.212. The regression coefficient for PROPER rating is 1.398, meaning that a one-unit increase in the PROPER rating will increase carbon emission disclosure by 1.398.

The Adjusted R Square value is 0.386, indicating that the independent variables—firm age, institutional ownership, leverage, profitability, firm size, and PROPER rating—are able to explain 38.6% of the variation in the dependent variable, namely carbon emission disclosure, while the remaining 61.4% is explained by other variables outside this research model. Table 3 also shows that the F-statistic value is 10.013 with a significance level of 0.000, which is smaller than 0.05. This result indicates that the independent variables simultaneously influence carbon emission disclosure.

The Effect of Firm Age on Carbon Emission Disclosure

Based on the results of the hypothesis test (H1), firm age has a positive effect on carbon emission disclosure. This is shown by the t-test (partial test) results for the firm age variable, which indicate that $t\text{-count} > t\text{-table}$ ($2.084 > 1.990$) and $\text{sig} < 0.05$ ($0.040 < 0.05$). Therefore, H1 is accepted. These results indicate that firm age influences the disclosure of carbon emission reporting, particularly in companies whose operational activities generate carbon emissions. This finding is consistent with the studies of Ambarwati (2022) and Ambarwati et al. (2020), which found that firm age has a positive effect on carbon emission disclosure. This is also reflected in the sample data. For example, Perusahaan Gas Negara, which had been established for 58 years in 2023, provides extensive disclosure regarding carbon emissions. In contrast, younger companies such as Batulicin Nusantara Maritim and Soechi Lines still provide relatively limited carbon emission disclosures.

The length of time a company has been established reflects its ability to survive and maintain sustainable business operations. This finding is consistent with legitimacy theory. According to Ashforth & Gibbs (1990), Dowling & Pfeffer (1975), and O'Donovan (2002), companies can utilize legitimacy as a potential resource or benefit in order to survive. This theory provides a framework that encourages companies to disclose environmental information, including carbon emission disclosure, as a form of responsibility toward environmental issues in the areas where they operate. By complying with prevailing norms and values, companies can avoid conflicts and maintain the legitimacy they have obtained in conducting sustainable operational activities. Disclosing carbon emissions also serves as a strategy for companies to maintain and protect their long-established corporate reputation.

The energy sector is one of the sectors that produces high levels of carbon emissions. Therefore, greater contributions from this sector are expected in achieving the national targets for reducing greenhouse gas (GHG) emissions, as stipulated in Presidential Regulation Number 98 of 2021 concerning the implementation of carbon economic value to achieve nationally determined contributions and control greenhouse gas emissions in national development. This regulation relates to the Carbon Economic Value (NEK) mechanism

aimed at reducing GHG emissions resulting from various economic activities and promoting more environmentally friendly and sustainable business practices.

The Effect of Institutional Ownership on Carbon Emission Disclosure

Based on the results of the hypothesis test (H2), institutional ownership does not influence carbon emission disclosure. This is indicated by the t-test results, where $t\text{-count} < t\text{-table}$ ($-0.130 < 1.990$) and $\text{sig} > 0.05$ ($0.897 > 0.05$). Therefore, H2 is rejected. These findings indicate that a higher proportion of institutional share ownership does not necessarily influence the extent of carbon emission disclosure reporting. This result is consistent with the studies of Eka Chandra Pramuditya & Budiasih (2020) and Akhiroh & Kiswanto (2016), which also found that institutional ownership has no significant effect on carbon emission disclosure. This phenomenon can also be observed in the sample data. For instance, Baramulti Suksessarana and Mitrabara Adiperdana have relatively high institutional ownership but still provide limited carbon emission disclosures. This indicates that higher institutional share ownership does not guarantee broader carbon emission disclosure by companies.

This finding reinforces the implications of stakeholder theory, which states that companies must provide benefits to their stakeholders rather than operating solely for their own interests. Not all institutional investors prioritize environmental issues such as carbon emission disclosure, as some institutional investors focus more on short term profits and stock value growth. Consequently, company management will carefully consider every decision and action taken, aligning them with stakeholder interests in order to generate benefits and value for stakeholders. Furthermore, institutional owners, as external parties, often delegate control and supervision to company management. As a result, management may determine whether environmental information, including carbon emission disclosures, will be disclosed extensively based on the perceived benefits and strategic considerations.

However, regardless of whether institutional ownership in energy sector companies is high or low, companies still play a crucial role in reducing greenhouse gas emissions as part of climate change mitigation efforts to achieve the Nationally Determined Contribution (NDC) targets. This is in line with Presidential Regulation Number 98 of 2021, Article 7 paragraph (1), which states that climate change mitigation implementation is carried out across sectors and subsectors. Paragraph (2) letter (a) specifically mentions the energy sector, emphasizing that corporate contributions to reducing carbon emissions are not determined by the level of institutional ownership.

The Effect of Leverage on Carbon Emission Disclosure

Based on the results of the hypothesis test (H3), leverage (DAR) does not influence carbon emission disclosure. This is indicated by the t-test (partial test) results for the leverage variable, which show that $t\text{-count} < t\text{-table}$ ($-0.559 < 1.990$) and $\text{sig} > 0.05$ ($0.578 > 0.05$). Therefore, H3 is rejected. These findings indicate that companies with either high or low levels of leverage (debt-to-asset ratio) do not influence the extent of carbon emission disclosure reporting. This study is consistent with the findings of Yusuf (2021), Witri Astiti & Wirama (2020), Farida & Sofyani (2018), Florencia & Handoko (2021), and Pranasyahputra et al. (2020), which conclude that leverage does not affect carbon emission disclosure.

This can also be observed from the sample data. For example, Indo Tambangraya Megah Tbk and Bukit Asam Tbk have relatively low leverage levels but disclose carbon emissions

extensively. Meanwhile, companies with higher leverage levels, such as Baramulti Suksessarana and Transcoal Pacific, still provide relatively limited carbon emission disclosures. These data indicate that higher leverage levels do not guarantee that companies will disclose carbon emissions more extensively.

These findings support the implications of stakeholder theory. According to Gray, Kouhy, and Adams (1994), a company's survival depends on support from its stakeholders, and therefore companies must seek to maintain such support in their operations. One way to obtain stakeholder support is by acting cautiously to avoid negative perceptions from stakeholders regarding the company's financial condition, particularly related to leverage levels. When leverage is high, companies tend to reduce expenditures that may increase their financial burden, including the costs associated with extensive environmental disclosures such as carbon emission reporting, which may require additional resources.

Companies may prioritize spending to fulfill their operational responsibilities rather than allocating additional costs for extensive environmental disclosure. Based on financial reports of companies in the energy sector, some companies show that a large portion of their liabilities consists of long-term bank loans. Financing obtained from financial institutions, such as bank loans, does not always consider environmental disclosure—including carbon emission disclosure—as a requirement for credit approval.

However, companies cannot wait for their leverage levels to decrease before contributing to efforts to reduce greenhouse gas (GHG) emissions. According to Presidential Regulation Number 98 of 2021, companies in the energy sector are among the sectors expected to contribute to reducing greenhouse gas emissions.

The Effect of Profitability on Carbon Emission Disclosure

Based on the results of the hypothesis test (H4), profitability does not influence carbon emission disclosure. The t-test (partial test) results for profitability show that t count $< t$ -table ($-1.076 < 1.990$) and $\text{sig.} > 0.05$ ($0.285 > 0.05$). Therefore, H4 is rejected. These findings indicate that companies with higher levels of profitability (return on assets) do not necessarily disclose carbon emissions more extensively. This finding is consistent with studies conducted by Irwhantoko & Basuki (2016), Kholmi et al. (2020), Farida & Sofyani (2018), Witri Astiti & Wirama (2020), and Florencia & Handoko (2021), which also found that profitability does not influence carbon emission disclosure. This phenomenon can also be observed in the sample data. For example, Perusahaan Gas Negara and AKR Corporindo have relatively low profitability but provide good carbon emission disclosures. Meanwhile, Baramulti Suksessarana and Mitrabara Adiperdana have relatively high profitability but still disclose carbon emissions minimally. These data indicate that higher profitability does not necessarily reflect broader carbon emission disclosure.

This study reinforces legitimacy theory, which states that companies disclose social and environmental responsibilities to obtain legitimacy from the society in which they operate and to maintain their financial strength in the long term. This theory emphasizes long-term legitimacy that supports the sustainability of corporate financial stability across various aspects of financial management, including assets, liabilities, equity, and cash flows, rather than focusing solely on profit generation. Profitability reflects a company's ability to generate profit. Companies with high profitability may focus more on maintaining and increasing their profits. Since carbon emission disclosure is largely a managerial policy, it is not necessarily influenced by the level of profitability achieved by the company. Nevertheless, Presidential

Regulation Number 98 of 2021 emphasizes that the energy sector plays an important role in climate change mitigation.

The Effect of Firm Size on Carbon Emission Disclosure

Based on the results of the hypothesis test (H5), firm size has a positive effect on carbon emission disclosure. The t-test (partial test) results show that $t\text{-count} > t\text{-table}$ ($3.627 > 1.990$) and $\text{sig.} < 0.05$ ($0.001 < 0.05$). Therefore, H5 is accepted. These findings indicate that the size of a company positively influences the extent of carbon emission disclosure. This result is consistent with previous studies conducted by Rooschella & Sulfitri (2023), Farida & Sofyani (2018), Yusuf (2021), Pratiwi et al. (2021), and Ambarwati et al. (2020), which found that firm size significantly affects carbon emission disclosure. This can also be observed from the sample data. Large companies such as ABM Investama, Perusahaan Gas Negara, Indika Energy, Indo Tambangraya Megah, Bukit Asam, and AKR Corporindo have substantial total assets and disclose carbon emissions more extensively. Furthermore, several energy sector companies with increasing total assets have also increased their carbon emission disclosure reporting, such as Adaro Minerals Indonesia, Elnusa, Golden Energy Mines, Harum Energy, Energi Mega Persada, Resource Alam Indonesia, and Petrosea.

Based on financial reports of companies in the energy sector, fixed assets dominate the total assets compared to current assets. These fixed assets are largely composed of property, plant, and equipment (PP&E). The energy sector includes industries such as coal, oil and gas, and oil, gas, and coal support services, which rely heavily on PP&E to support their operational activities. Production facilities such as power plants, oil refineries, and gas processing plants are categorized as PP&E and are major sources of carbon emissions. Therefore, the larger the size of a company measured by its total assets the greater its operational activities and the higher the potential carbon emissions generated. Consequently, large companies are expected to disclose carbon emissions more extensively.

These findings support legitimacy theory, which is based on the concept of a social contract between organizations and society. Society expects successful companies to respond to and consider the environmental and social impacts of their operations. Larger companies generally have greater environmental impacts due to their extensive operational activities, which encourages them to address environmental issues and adopt more environmentally friendly business practices to maintain their legitimacy. Additionally, large companies tend to face stricter environmental regulations because of their greater environmental impact. Therefore, Presidential Regulation Number 98 of 2021 encourages large companies to take greater responsibility for their carbon emissions and contribute more significantly to reducing greenhouse gas emissions.

The Effect of PROPER Rating on Carbon Emission Disclosure

Based on the results of the hypothesis test (H6), the PROPER rating does not influence carbon emission disclosure. The t-test (partial test) results for the PROPER rating variable show that $t\text{-count} < t\text{-table}$ ($0.393 < 1.990$) and $\text{sig.} > 0.05$ ($0.695 > 0.05$). Therefore, H6 is rejected. These results indicate that the PROPER rating obtained by companies does not influence the extent of carbon emission disclosure. This finding is consistent with studies conducted by Ramadhan et al. (2021), Kholmi et al. (2020), and Pratiwi et al. (2021), which found that environmental performance measured through the PROPER rating does not significantly affect carbon emission disclosure.

This phenomenon can also be observed in the sample data. For example, Delta Dunia Makmur, Mitrabahtera Segara Sejati, and Wintermar Offshore Marine are companies that have not participated in the PROPER program but still disclose carbon emissions relatively well. Meanwhile, companies with favorable PROPER ratings, such as Prima Andalan Mandiri, Baramulti Suksessarana, and Dana Brata Luhur, still provide limited carbon emission disclosures. These findings support legitimacy theory, which suggests that environmental disclosure is often voluntarily carried out by companies with good environmental performance. However, a high PROPER rating does not necessarily correspond to broader carbon emission disclosure, as companies may prioritize the disclosure of other environmental aspects.

Furthermore, companies that have not yet obtained a PROPER rating but voluntarily disclose carbon emission information may also demonstrate good environmental performance. Both companies with and without PROPER ratings are still subject to the regulations stipulated in Presidential Regulation Number 98 of 2021, which states that the energy sector must contribute to reducing greenhouse gas emissions regardless of whether a company participates in the PROPER program. Although both relate to environmental protection, the PROPER program and Presidential Regulation Number 98 of 2021 have different objectives and mechanisms. PROPER focuses on evaluating the environmental performance of individual companies, while Presidential Regulation Number 98 of 2021 establishes a carbon economic framework aimed at achieving national climate targets.

CONCLUSION

Based on the hypothesis testing results, it was found that firm age and firm size have a positive effect on carbon emission disclosure. The longer a company has been established and continuously operates its business activities, the longer it contributes to generating carbon emissions. Similarly, the larger the size of a company, the greater the scale of its operational activities, which leads to higher carbon emissions. Because these companies have a significant and tangible impact on the environment and climate change, they tend to provide broader carbon emission disclosure in their reporting. Meanwhile, institutional ownership, leverage, profitability, and PROPER rating do not influence carbon emission disclosure. Based on these findings, it is recommended that regulators, as policy makers, require companies to provide more comprehensive reporting related to carbon emission disclosure, particularly for companies whose operational activities produce high levels of carbon emissions. This measure is important to assess the seriousness of companies in reducing their carbon footprint and contributing to climate change mitigation, as well as to support Indonesia's commitment to achieving Net Zero Emissions (NZE) by 2060. For company management, it is expected that they improve their environmental performance, including expanding the scope of carbon emission disclosure. This effort should not only aim to comply with environmental regulations but also reflect corporate awareness and responsibility toward environmental sustainability, ensuring a better and more livable environment for future generations.

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