

The Effect of Carbon Performance, Foreign Ownership, and Firm Size on Carbon Emission Disclosure

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Abstract

This study analyzes the effect of carbon performance, foreign ownership, and firm size on carbon emission disclosure. Based on the sample selection criteria, researchers analyzed 14 companies from the energy, raw goods, and primary consumer goods sectors listed on the Indonesia Stock Exchange for 2019-2021. The analytical method used is panel data regression analysis with a random effect model. The results of the study show that carbon performance positively affects on carbon emission disclosure. Companies with high carbon emissions tend to disclose more carbon emission items. Foreign ownership and firm size negatively affect carbon emission disclosure. Companies with fewer foreign investors and fewer assets disclose their carbon emissions to earn investors' trust and improve their access to sources of capital necessary for business growth and development.

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1. Introduction

The environmental impacts arising from increased company activities make companies disclose carbon emissions which can help ensure that companies carry out business activities that are sustainable and socially and environmentally responsible (Elsayih et al., 2021; Desai, 2022; and Yin et al., 2023). Carbon emission disclosure (CED) is information about various climate-related activities, including measurement of emissions, company plans, technology investments, trading, and carbon offsets (Nasih et al., 2019; Jung & Kim, 2020; Desai, 2022 and Fransisca et al., 2024). Stakeholders need carbon emission reports to assess company performance related to climate change resulting from operational activities. Investors and creditors always expect maximum performance from companies (Haryanto et al., 2018; Jemunu et al., 2020; Syafira & Cahyaningsih, 2022, and Hersugondo & Aliyuna, 2024), both

financial and non-financial, such as carbon emission performance.

Developing countries play a larger role in increasing emissions due to their economies of scale and the large growth caused by the use of greenhouse gases (GHG). The United States, Brazil, Russia, India, and China show a demand for carbon-related information in developing countries. Investors in these countries place more value on corporate value for corporate improvement (Jiang et al., 2021; Li et al., 2023 and Luo & Tang, 2023).

Hughes et al. (2001) investigated the disclosures of 51 American manufacturing companies, revealing that companies with different ratings followed different disclosure strategies, suggesting that companies with the worst environmental performance disclosed more information. In addition, Qian & Schaltegger (2017) used a sample of Global Fortune 500 companies in the Carbon Disclosure Project in 2008-

2012 consisting of the European Union, United States, Japan, United Kingdom, China, Australia, and other countries that business companies (both good and bad performers) conducted carbon disclosure as an internalization of emission reduction and were beneficial for the company's survival.

Climate change caused by increased carbon dioxide emissions is the cause of the emerging agreement of the world's countries, namely by holding the Earth Summit on June 14, 1992, in Rio de Janeiro, Brazil (Forqan, 2009). This event discussed the issue of climate change due to increasing GHG. The results of this agreement are called the United Nations Framework Convention on Climate Change (UNFCCC). Furthermore, the UNFCCC created amendments to control GHG emissions in the atmosphere, known as the Kyoto Protocol in 1997, to avoid harming the climate on Earth. Halimah & Yanto (2018) stated that after the emergence of the protocol, several countries began to ratify it in the form of laws of their respective countries, one of which is Indonesia.

Indonesia is one of the countries trying to reduce greenhouse gas emissions. This effort was realized by issuing Presidential Regulation No. 61 of 2011. The regulation aims to reduce carbon emissions by at least 26% with their efforts and 41% if they get international assistance (Perpres, 2011). This regulation encourages companies to take responsibility for environmental changes as a direct or indirect impact on the company's operational activities and disclose environmental change mitigation to reduce the risks resulting from climate change.

The state may try, but in reality, there are cases of air pollution involving the construction of The steam-electric power station Java 9 and 10 which will be built at Kelapa Tujuh Beach, Suralaya, Cilegon, Banten (Syahni, 2020). [PT Barito Pacific Tbk. \(BRPT\)](#) through its subsidiary, PT Indo Raya Energi (IRT), acquired land to support the construction of a new power plant in Lebak Gede Village, Cilegon, Banten (Saleh, 2020). This development caused the surrounding community to complain about air pollution from burning coal. BRPT explained that the steam-electric power station construction uses renewable technology, namely Ultra Super-Critical (USC) 2x1000mw, which is included in the sustainability report (Tallo, 2019). However, that only helps the steam-electric power station become more efficient and

does not reduce emissions much. As a result, companies that produce more CO₂ emissions are encouraged to reduce and disclose carbon dioxide emissions to the public as part of their commitment to SEOJK Number 16 /SEOJK.04/2021.

According to legitimacy theory, companies disclose environmental information, especially CED, to build legitimacy from stakeholders, create transparency, and reduce information asymmetry (Cahyaningsih & Septyaweni, 2022; and Ramadhan et al., 2023). Companies cannot ignore the interests of the state and society in their business. The company will show the community that its operational activities do not conflict with applicable regulations (Kusumawardani & Sudana, 2017) and contribute to climate change issues.

Carbon performance (CP) is thought to affect CED. Companies with high carbon intensity tend to make disclosures to secure the company's legitimacy status (Luo, 2017). (Qian & Schaltegger, 2017) stated that high levels of carbon emissions encourage companies to make disclosures to avoid bad things in the future. However, Ratmono et al. (2021) said there is no influence between CP and CED. Companies are worried about making disclosures for fear of undermining public trust resulting from inefficient company operations.

Foreign ownership (FO) is suspected to affect CED. FO is the proportion of the company's ordinary shares owned by individuals, legal entities, and governments with foreign status (Wiranata & Nugrahanti, 2013; Feng et al., 2020; and Cuervo-Cazurra & Li, 2021). Foreign investors are more concerned about the environment and more compliant with ecological laws than local investors, placing more significant pressure on companies (Rustam et al., 2019). Research conducted by Kim et al. (2021) shows that companies with foreign investors tend to disclose environmental information about carbon emissions voluntarily. On the contrary, according to Pramuditya & Budiasih (2020), foreign investors do not have a dominant influence on making company decisions, so they cannot yet influence decisions regarding company disclosures.

Firm size is also suspected of influencing CED. FS is the size of a company that describes the number of company operational activities (Rini et al., 2021). Large companies get a lot of attention from the public, so they get a lot of pressure to make more environmental disclosures, such as disclosing carbon emissions

(Dewayani & Ratnadi 2021). On the other hand, Wiratno & Muaziz (2020) state that FS does not affect CED.

The practice of disclosing carbon emissions is still limited in Indonesia. Researchers who analyze CED are also rare. Therefore, the researcher is motivated to conduct this research inspired by climate change and the increasing interest in environmental accounting. The purpose of this study is to analyze the effect of carbon performance, foreign ownership, and firm size on carbon emission disclosure.

2. Hypothesis Development

Carbon Performance and Carbon Emission Disclosure

CP describes climate-changing greenhouse gas emissions and the steps and processes to reduce them (Velte et al., 2020). CED is a historical and prospective CP report to stakeholders (Pitrakkos & Maroun, 2020). The company provides information on improving its CP through CED to be more objective and credible as a complex strategy for other companies to imitate (Clarkson et al., 2008). Companies that have high carbon levels are expected to report their activities to gain legitimacy for their actions (Velte et al., 2020). Companies with high emission levels tend to disclose more information about carbon accounting to avoid negative impacts and future market penalties caused by withholding carbon information (Matsumoto, 2002). Luo (2017) and Qian & Schaltegger (2017) found that CP affects CED.

H₁: Carbon performance influences carbon emission disclosure.

Foreign Ownership and Carbon Emission Disclosure

Foreign ownership is the percentage of company share ownership by foreign investors to the total outstanding share capital (Yoantha et al., 2015; and Do et al., 2020). CED includes climate-related activities, including emissions measurement, organizational preparations, technology investments, and trade and offsets (Jung & Kim, 2020). Multinational or foreign-owned companies see legitimacy benefits derived from their stakeholders, which are typically based on the home market (the market in which they operate) which can provide high existence in the long term (Barkemeyer, 2007). High share ownership encourages companies to make disclosures to reduce information asym-

metry caused by geographical and language barriers for foreign ownership so that the public invests and believes in the low risk of investment, then the company must disclose social responsibility (Putri, 2017). If the published social responsibility is under the expectations of the environment and society, the company is said to have received legitimacy in the form of community support (Asmaranti & Lindriansari, 2014). Stojanovic-Aleksic & Boskovic (2017) and Kim et al. (2021) stated that FO affects CED.

H₂: Foreign ownership influences carbon emission disclosure.

Firm Size and Carbon Emission Disclosure

FS can be assessed from total assets, sales, and employees (Effendi & Ulhaq, 2021). CED is one of the company's efforts to inform their responsibilities regarding the environment (Rini et al., 2021). The public will put pressure on the company if there are company activities that have a direct impact on the environment or are not under established norms. The company disclosed related to its performance in response to such public pressure (Irwhantoko & Basuki, 2016). High pressure from society makes companies raise their concern for the environment causing information to be disclosed more widely (Rini et al., 2021). Research conducted by Faisal et al. (2018), Nasih et al. (2019), and Dewayani & Ratnadi (2021) suggest that FS affects CED.

H₃: Firm size influences carbon emission disclosure.

3. Data and Methods

This study analyzes companies in the energy, raw goods, and primary consumer goods sectors listed on the IDX for 2019-2021. Researchers set some criteria for selecting the sample. First, companies that are consistently registered and publish annual and sustainability reports for the 2019-2021 period. Second, companies that disclose carbon emissions (scope 1 and scope 2) and CEI. Third, companies that have FO. Based on these criteria, a sample of 14 companies consisting of four companies from the energy sector, six companies from the raw goods sector, and four companies from the primary consumer goods sector, with 42 observations.

The dependent variable is carbon emissions disclosure as measured by the content analysis method, which examines the com-

pany's annual report and sustainability report. The extent of disclosure was carried out using an analysis that adopted parameters from Choi et al. (2013) to determine the extent of CED, including 18 items based on the Carbon Disclosure Project. If the company discloses certain items, it is given a score of 1, otherwise 0 (Setiawan et al., 2022).

$$CED = \frac{\text{Corporate Disclosures}}{\text{Total Disclosure Items}}$$

Carbon performance is the first independent variable. According to Hoffmann & Busch (2008) CP is indicated by carbon intensity, dependency, exposure, and risk. Carbon emissions are scaled by total sales at the end of the year to get CEI. CEI reflects the company's pollution level, so CP must be read as the inverse of CEI (Qian & Schaltegger, 2017). CP is measured by the ratio of total scope emission 1 and 2 to total sales at the end of the fiscal year (Giannarakis et al., 2017; Qian & Schaltegger, 2017).

$$CP = \frac{\text{Scope Emission 1 + 2}}{\text{Total Sales}}$$

Foreign ownership is the third independent variable. FO is the proportion of company common stock owned by individuals, legal entities, and governments with foreign status (Wiranata & Nugrahanti, 2013). Foreign investors can encourage companies to focus more on reducing carbon emissions. The presence of foreign investors can reduce the information gap leading to more transparent environmental information. FO is measured by dividing the number of shares foreigners hold by the number of outstanding shares (Singal & Putra, 2019).

$$FO = \frac{\text{Number of Foreign Shareholdings}}{\text{Number of Outstanding Shares}}$$

This study assesses firm size from its total assets (Cahyaningsih & Lestari, 2021; Effendi & Ulhaq, 2021). FS is measured by the natural logarithm of total assets (Cahyaningsih & Lestari, 2021; Nasih et al., 2019; and Harmono et al., 2023)

$$FS = \text{natural logarithm (Total Assets)}$$

This study uses panel data regression analysis with the following panel data regression equation. The multiple linear regression equation is presented as follows:

$$Y = \alpha + \beta_1 CP_{1it} + \beta_2 FO_{2it} + \beta_3 FS_{3it} + e$$

Where: CED= Carbon Emission Disclosure; CP= Carbon Performance; FO= Foreign Ownership; and FS= Firm Size

4. Result

Table 1 presents the descriptive statistic analysis results of the research variables. CED has a mean value of 0.630. This value indicates that the mean company discloses carbon emissions as much as 11 out of 18 items. The lowest CED value of 0.444 which revealed eight items. This value indicates that companies less disclose accounting and accountability for carbon emissions. The low level of disclosure items indicates that the company has not maximized its efforts in establishing a sustainability strategy. The highest CED value is 0.889, which revealed 16 items. The company has implemented carbon accounting and can communicate climate activities to stakeholders so that the company's awareness of responsibility for operational activities regarding the environment is good. CED companies in the energy, raw goods, and primary consumer goods sectors have shown an increasing trend over the last three years (see Figure 1). CED has grown in importance in recent years because, through carbon disclosure, it is becoming a means for businesses to communicate quantitative and qualitative information on past and future predictions regarding a company's level of carbon emissions.

Table 1. Descriptive Statistic

| | CED | CP | FO | FS |
|-----------|-------|-------|-------|--------|
| Mean | 0.630 | 0.189 | 0.318 | 17.150 |
| Median | 0.611 | 0.055 | 0.288 | 17.153 |
| Maximum | 0.889 | 0.817 | 0.909 | 18.699 |
| Minimum | 0.444 | 0.000 | 0.001 | 14.883 |
| Std. Dev. | 0.126 | 0.299 | 0.270 | 0.927 |

Carbon performance has a mean value of 0.189. This figure shows that the mean company emits 0.189 tons of total carbon emissions per million rupiah of sales. The lowest CP value of 0.000 in 2021. It shows that the company's pollution is low, so its CP is superior. It means that the company's operational activities are efficient. The highest CP value is 0.817, indicating the company's high pollution, so the CP is lacking. This high emission intensity or poor company performance indicates the company's operational activities are inefficient. The CP of companies in the energy, raw goods, and primary consumer goods sectors have shown a

downward trend over the past three years (see Figure 2). Companies are suspected of experiencing increased carbon emission intensity due to less efficient operational activities.

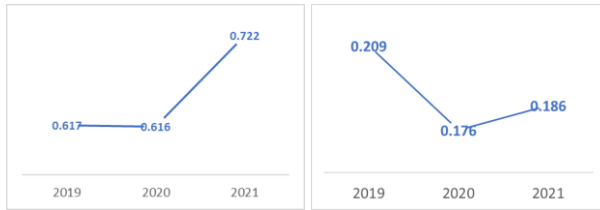


Figure 1. Carbon Emission Disclosure



Figure 2. Carbon Performance

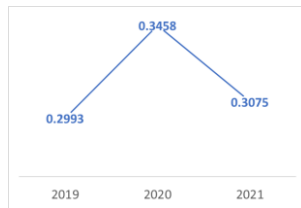


Figure 3. Foreign Ownership

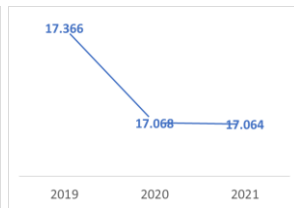


Figure 4. Firm Size

Foreign ownership has a mean value of 0.318. The lowest FO value of 0.001 in all study periods, means the company is majority owned by domestic investors. The highest FO value of 0.909 in 2020, means company is majority owned by foreign investors. FO of companies in the energy, raw goods, and primary consumer goods sectors have fluctuated over the last three years (see Figure 3). FO fluctuations are suspected to be affected by the Covid-19 Pandemic.

Firm size has a mean value of 17.105. The lowest FS of 14.882 in 2020. The highest FS is 18.699, indicating that company is included in the large firm category. The FS of companies in the energy, raw goods, and primary consumer goods sectors have shown a downward trend over the last three years (see Figure 4). The decline in FS is suspected to have been affected by the Covid-19 Pandemic.

Table 2. Classic Assumption Test

| Test | Result | Decision |
|--------------------|----------------|----------|
| Normality | JB Prob. 0.469 | Normal |
| Autocorrelation | DW = 1.947 | Free |
| Heteroscedasticity | Prob. 0.818 | Free |
| Multicollinearity | VIF < 10 | Free |

Table 3. Model Selection Test

| Test | Result | Decision |
|---------|------------------------|----------|
| Chow | Chi-Square Prob. 0.023 | FEM |
| Hausman | Prob. 0.196 | REM |
| LM | Breusch-Pagan 0.000 | REM |

Based on Table 2, all data pass the classical assumption test. Table 3 presents the panel data regression model selection test, which the selected model is the Random Effect Model (REM).

Table 4. Result

| | Coefficient | t-Statistic | Prob. |
|-------------------------|-------------|-------------|-------|
| C | 1.516 | 4.956 | 0.000 |
| CP | 0.346 | 5.800 | 0.000 |
| FO | -0.351 | -5.539 | 0.000 |
| FS | -0.049 | -2.764 | 0.010 |
| Adjusted R ² | 0.609 | | |
| F-Statistic | 14.508 | | 0.000 |

Table 5 shows that CP positively affects CED, meaning H₁ is supported. FO and FS negatively affect CED, so H₂ and H₃ are supported. The adjusted r-squared value of 0.609 means that CP, FO, and FS can explain carbon emission disclosure by 60.9%, and other variables explain the rest.

5. Discussion

Effect of Carbon Performance on Carbon Emission Disclosure

The research findings show that carbon performance positively affects carbon emissions disclosure. These results indicate that the lower the CP, the less CED. Conversely, the higher the CP, the more CED. Companies with a high intensity of carbon emissions tend to make companies disclose more information about carbon emissions to avoid the negative impacts that will arise.

This evidence supports the legitimacy theory. High carbon emission intensity indicates that the company's CP is low. Companies with high carbon intensity tend to provide reports containing the impact of the company's operational activities by considering the effects and risks that will be faced and providing efforts to mitigate them. Companies with high emission intensity are worried about undermining the public's trust because their operational activities are less efficient. Therefore, companies disclose carbon emissions to avoid threats to legitimacy in the future and serve as an image management tactic. Companies are encouraged to maintain and provide information to the public regarding improvements in their CP through CED that is more objective, credible, and difficult to imitate by other companies that have not implemented this strategy. Companies with a superior environment will be motivated to disclose information about their

excellent performance to differentiate themselves from companies with an environment that is not superior. This finding is in line with research conducted by Luo (2017) and Qian & Schaltegger (2017). Meanwhile, Ratmono et al. (2021) found that carbon performance did not influence carbon emission disclosure.

Effect of Foreign Ownership on Carbon Emission Disclosure

This finding indicates that foreign ownership negatively affects carbon emissions disclosure. This result suggests that the less FO, the more CED. Conversely, companies that have more FO disclose less carbon emissions. Foreign investors put more pressure on companies to reduce CEI. This can reduce the negative impact of company activities so that less information about negative environmental impacts needs to be disclosed.

Companies with high foreign ownership may face greater challenges in understanding and complying with local regulations in the countries in which they operate. In response to this uncertainty, they may tend to limit voluntary disclosure or follow more general international standards.

This finding supports the legitimacy theory. Companies that only have a few foreign investors mean that they have more domestic investors and tend to disclose more carbon emissions. So, foreign investors provide an indirect monitoring mechanism, while domestic investors provide a direct monitoring mechanism, thereby increasing improvements in the company's overall performance and disclosure of environmental information. Domestic investors can provide direct monitoring, placing more significant pressure on companies. Domestic investors have better knowledge of various regulations related to the environment and feel the direct impact of air pollution and environmental damage.

Stakeholders highly value corporate engagement with local communities. If companies with low foreign ownership do not actively engage with local communities or do not understand local values, the risk of losing legitimacy may increase. To reassure companies with low foreign ownership, companies make voluntary disclosures about social and environmental responsibility activities to demonstrate this engagement.

This result does not support Kim et al. (2021) and Stojanovic-Aleksic & Boskovic (2017) who found that high foreign ownership can in-

crease carbon emission disclosure. Meanwhile, Pramuditya & Budiasih (2020) found that foreign investors do not have a dominant influence on decision-making in the company. Therefore, foreign investors have not been able to influence company decisions regarding carbon disclosure.

Effect of Firm Size on Carbon Emission Disclosure

The study results show that firm size negatively affects carbon emissions disclosure. This result indicates that the larger firm, the less CED. Large companies have more resources to invest in the environment. Large companies have better technology to reduce energy consumption so that the carbon emissions intensity produced is lower. Conversely, the smaller companies, the more CED.

According to legitimacy theory, smaller companies are at higher risk of losing legitimacy because their social and economic impact is more limited. Therefore, companies prove their value and contribution through voluntary disclosure.

In addition, small companies choose to disclose carbon emissions as a smart business strategy to earn investors' trust and increase their access to sources of capital needed for business growth and development. Companies must continuously ensure that the operations carried out do not deviate from society's social norms and values. Companies can demonstrate social and environmental responsibility by publishing information about carbon emissions and company actions to reduce them. Such disclosure creates transparency and builds legitimacy to gain support from consumers, investors, regulators, and the wider community. This evidence not supports Dewayani & Ratnadi (2021), Faisal et al. (2018), and Nasih et al. (2019) who found that the larger the firm size, the higher the level of disclosure made by the firm.

6. Conclusion and Suggestion

Conclusion

This study aimed to examine the effect of CP, FO, and FS on CED. The study results show that CP positively affects CED. Foreign ownership and firm size negatively affect carbon emissions disclosure.

Suggestion

Future research can investigate other variables that influence carbon emission disclosure. Researchers should not only focus on how companies secure their legitimacy but also on how companies internalize legitimacy pressures and demands to create real improvements. Future research can examine different types of ownership, such as managerial, institutional, government, and public ownership. In addition, future researchers need to other corporate sectors because the results may differ, such as sectors with high emissions or revenues. The results provide practical implications for various parties. Companies are expected to improve carbon performance by reducing CEI and disclosing it as a form of environmental and social accountability. Investors are expected to be more selective when making investment decisions by investing in companies with high carbon performance and CED. The government is expected to monitor and take action against companies that pollute and damage the environment. The community is expected to monitor company activities to prevent negative impacts from spreading. Consumers are expected to be wiser to consume environmentally friendly products.

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