Determinants of Carbon Disclosure-Indonesia Public-Listed Firm

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Abstract. This paper aims to empirically investigate the effect of profitability, institutional ownership, the size of the firm's assets, age, and the existence of an environmental committee (EEC) on carbon emission disclosure (CED). We use 155 energy and raw goods sector firms. All samples were observed for four years, from 2019 to 2022. We analyzed the collected data using panel data regression. This study confirms that profitability, firm age, and environmental committee significantly positively affect CED. On the contrary, institutional ownership and the size of the firm's assets positively impact CED. This research expands prior literature and uses environmental committees as a factor that is thought to explain CED. Prior studies still need to use environmental committees, especially in Indonesia.

Keywords: carbon emission, environmental committee, legitimate, accountability.

1 INTRODUCTION

The issue of global warming and society, government, and researcher concerns about disasters resulting from global warming that can harm living things are still hot topics of discussion on the international stage [1]. The impact of climate change can be felt in Indonesia. Chaotic climate patterns cause farmers to experience setbacks in the planting season. Apart from that, there has been an increase in the frequency and strength of tropical cyclones, whereas previously, typhoons rarely hit tropical countries like Indonesia [2].

The World Resources Institute (WRI) has created a list of carbon dioxide contributors for each country for 160 years. They first released a map of global carbon emissions based on carbon emission data from 1850 to 2011. They reported that carbon emissions were 46 billion tons worldwide. In addition, Indonesia produced 2.053 billion tons of Carbon dioxide (CO2) [3]. This achievement caused Indonesia to rank sixth as the country with the highest emissions globally.

CO2 concentrations in the world have increased since the Industrial Revolution and have caused rapid human activities that can increase emissions. Industrial development has caused many forests to change their function from producing oxygen and absorbing carbon dioxide gas (the world's lungs) to land-producing carbon dioxide gas [4]. Based

G. W. Pradana et al. (eds.), *Proceedings of the 4th International Conference on Social Sciences and Law (ICSSL 2024)*, Advances in Social Science, Education and Humanities Research 877,
https://doi.org/10.2991/978-2-38476-303-0_76

on data published by NASA on its official portal, it is shown that the presence of CO2 in the air has far exceeded natural limits that have lasted for approximately 650,000 years.

Many cases of air pollution have occurred in companies in Indonesia, one of which was in August 2019. PT Indonesia Acid Industry and PT Mahkota Indonesia were proven to have polluted the air after the DKI Jakarta Environmental Service conducted a surprise inspection. This inspection was carried out after implementing the Governor's letter Number 66 of 2019 about air quality control. PT Indonesia Acid Industry and PT Mahkota are considered to have emitted emissions that exceed the required quality standards [5]. As a result of this error, PT Indonesia Acid Industry and PT Mahkota received sanctions in the form of being forced to repair their exhaust chimneys within 45 days. This sanction refers to the Minister of Environment Regulation Number 13 of 2009 concerning Quality Standards for Stationary Source Emissions for Business and Governor's Decree Number 670 of 2000 concerning Quality Standards for Stationary Source Emissions in DKI Jakarta Province.

The rise in air pollution cases committed by several companies certainly contradicts the reality that the government has issued several regulations related to environmental conservation efforts. This has led the government to urge organizations to disclose carbon emissions as evidence of corporate social and environmental responsibility. Apart from that, CED is also carried out to gain legitimacy from the environment [6]. Legitimacy theory is one of the theories that underlie entities' carrying out voluntary disclosures of social and environmental responsibility [7].

There is previous research that can explain the variables that can influence the CED. The research results of Choi *et al. (2013) show that there was no significant influence between the financial performance of a* firm and carbon emission disclosure [8], while other research shows that profitability has a positive effect on carbon emission disclosure [9]. Companies with many institutional ownership will voluntarily disclose environmental information [10]. Meanwhile, the research of Akhiroh and Kiswanto (2016) shows that institutional ownership does not affect the CED [6]. Jannah and Muid (2014) show that company size significantly affects carbon emission disclosure [9]. However, research results from Irwhantoko and Basuki (2016) show the difference that company size does not affect carbon emission disclosure [11]. Borghei-Ghomi & Leung (2013) report that the longer the company's age, the higher the disclosure [12]. Meanwhile, research by Chithambo & Tauringana (2014) confirms that company age does not affect the CED [13]. Research conducted by Jannah and Narsa (2021) shows that the EEC positively affects CED [14]. However, the results of research from Rankin *et. al* (2011) found that the EEC did not affect CED [1].

Previous studies have used variables to explain the CED. However, the research results still need to be revised and consistent. This shows that the research results regarding the variables that influence the CED still need to be determined. This research is interesting in reviewing the results of previous research regarding the factors that influence the CED, and this research will add references regarding the CED.

2 THEORETICAL BACKGROUND AND HYPOTHESIS

Legitimacy theory states a social contract exists between a company and the community around the company's operations to create profits. Based on this foundation, disclosure of social and environmental responsibility carried out by companies is one step to gaining legitimacy from society. When this legitimacy is successfully obtained, the company can continue its operations because the entity is deemed to have paid attention to applicable norms and the conditions of the community and surrounding environment [15].

Stakeholder theory argues that an organization not only operates to increase firm performance, realize organizational goals, and increase the wealth of the firm owner but must provide benefits to all stakeholders. Thus, the operation of a company is greatly influenced by the support provided by stakeholders to the company [16]. Therefore, the company will always try to fulfill the interests of its stakeholders so that the company can continue to carry out its operational activities.

Profitability reflects the firm's financial performance. It can also be said that profitability is a ratio used to assess an organization's ability to gain profits [17]. So, profitability describes the company's performance through financial aspects by showing how much the company's financial performance is in making profits. According to legitimacy theory, society will always pressure companies to carry social responsibility towards the surrounding environment. Companies with good performance will influence the speed of their response to these pressures. In addition, companies with good performance also serve to expand disclosure. Companies with high profitability can better answer public demands [18]. This illustrates good financial capabilities so that the company can finance the resources needed for reporting and disclosure. Moreover, it maintains its operations to ensure legitimacy [8]. A high level of profitability reflects better financial capabilities so that more CED are made. On the other hand, low profitability indicates the company's financial capability is also low, so little disclosure can be made. The theory above has been proven by research by Jannah & Muid (2014), which shows that profitability positively affects carbon emission disclosure [9].

H1: Profitability has a positive impact on CED.

Institutional ownership indicates the amount of an issuer's shares owned by other entities: insurance companies, banks, investment companies, and others [19]. Institutional ownership provides maximum control to management to encourage optimal disclosure of environmental responsibility [6]. The increase in institutional ownership is marked by increased direction over company running policies to avoid opportunism [20]. Institutional ownership will influence further review of all activities related to stakeholders. Stakeholder theory means a close bond between the organization and its stakeholders, resulting in openness regarding operational activities. Companies that make disclosures will provide a positive signal for institutional investors when making investment decisions. There is an influence between institutional ownership and environmental disclosure [10]. Stakeholder theory means a close bond between the company and its stakeholders, resulting in openness regarding all organization's operational activities. Companies that make disclosures will provide a positive signal for institutional investors when making investment decisions. Chang dan Zhang (2015) stated that institutional ownership and environmental disclosure are influenced by each other. In line with research conducted by Amaliyah and Solikhah (2019), inspections by a company's institutions will encourage disclosure, increasing stakeholder trust and the stability of company shares [21].

H2: Institutional ownership has a positive effect on CED.

The size of the firm's assets is a scale used to determine the firm's size by total assets. There are three categories to measure the size of the firm's assets: large, medium, and small. The firm's large size indicates the large number of assets the company owns. Companies with high assets reflect that the organization carries out more operational activities to generate high profits, so the company will tend to make disclosures as a form of firm accountability. This indicates that large organizations have a positive impact on CED. Following legitimacy theory, large companies will be society's main focus because the activities carried out by the company impact the environment. The greater the company's operational activities, the greater the impact resulting from these activities. So, large companies face greater public pressure to enhance environmental and social responsibility than others. Research shows that company size positively relates to the CED [8]. High organizations are under greater pressure from society, the public, and the government to maintain environmental issues. With this pressure, they tend the organization to increase their response to the environment. The organization's high resources are pressured to voluntarily disclose quality carbon reports to gain legitimacy. The above description is supported by research by Jannah & Muid (2014), which states that resources of organization has positively influenced the CED [9]. Large companies are expected to provide more carbon emissions disclosures.

H3: The size of the firm's assets positively affects CED.

Company age can show that the company continues to exist and is able to compete [22]. Meanwhile, age in a company is part of the documentation that shows what the company is achieving and will achieve [23]. This means that the firm's age shows the company's ability to maintain business continuity. Following legitimacy theory, entities with a longer lifespan will have more potential to carry out environmental disclosures because they can raise the company's image in the general public so that organization activities can gain legitimacy from the public [24]. Several studies use company age as a proxy for company visibility, such as in Akhiroh & Kiswanto research, because company age is considered to reflect the company's visibility through public views, seen from the company's ability to survive and maintain its operations so that positive results are found from the relationship between company age and disclosure—carbon emissions [6]. The longer the company's age, the higher the carbon emissions disclosures made [12]. This statement aligns with research conducted by Aryni *et al.* (2021), which shows that company age positively affects carbon emissions disclosure [25].

H4: Firm age has a positive effect on CED.

The organization's operational activities are one of the contributors to carbon emissions, which have an impact on global warming. This causes demands from the community to arise against the organization. Therefore, organizations need to be responsible for the environmental impacts caused by the organization's operational activities. Legitimacy Theory states a social contract between the company and the community in which the company operates. The EEC is a legitimate motive that aims to implement policies and measurement practices related to the environment. An environmental committee (EC) was formed to manage the organization's environmental risks. In organization activities, the EEC is an essential board that contains reputation risks and environmental threats to the organization's legitimacy. The organization specifically appoints the EEC to carry out functions related to environmental issues. The EC has an important role in monitoring, measuring, recording, and ED [1]. An EC allows the company to make broader CED. The EEC motivate companies to implement strategies and practices to measure and report CED levels [26]. There is a positive relationship between EEC and CED [27]. This indicates that an EEC has positive impacts on CED. The CEC will improve the organization's environmental performance strategy and CED to ensure that the information disclosed will not hurt the organization's legitimacy and reputation.

H5: EEC has a positive effect on CED.

3 METHODS

This research is panel data, while the data source uses secondary data (annual and sustainability reports). The population used in this research is all 155 public-listed firms in the energy and raw goods sectors) from 2019-2022. The sampling method in this research is purposive sampling. The sample research is disclosed in Appendix 1:

The dependent variable is CED. This study uses several items adopted from research by Choi *et al.,* (2013). In measuring the extent of CED, The formula to measure CED:

$$\text{CED} = \frac{\text{Number of items disclosed by firm}}{\text{Total item of CED}}$$

Profitability (ROA), which is proxied by ROA.

$$\text{ROA} = \frac{Net\ Income}{Total\ asset} x100$$

Institutional Ownership (KI), which is measured using the following formula:

$$\text{Institutional Ownership} = \frac{\text{Number of shares owned by institutions}}{\text{Shares outstanding by firm}}$$

The size of the firm's assets (SIZE) is measured using the natural logarithm of total assets. Firm Age (AGE) in is measured by calculating the year of establishment up to the year of research. The EEC variable in this research is a dummy variable with the formula: giving a score of 1 for companies that have an EC and 0 for otherwise. Quantitative data processing in this research was carried out using STATA version 17 statistical software. The techniques used were descriptive statistical analysis techniques and panel data regression analysis. The panel data regression model equation in this is as follows:

$$\mathbf{CED_{i,t} = \alpha + \beta_1 ROA_{i,t} + \beta_2 KI_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 AGE_{i,t} + \beta_5 COM_{i,t} + \varepsilon_{it}}$$

4 RESULTS AND DISCUSSION

Table 2 reports that the average CED in the sample is 70.76%. These findings report a higher CED score than the findings of Mahmudah and Wahyuningrum [28] [29]. Additionally, Table 1 shows that the sample has an average ROA of 6.4%. The minimum ROA is 0, and the maximum is 43%, and it has a large ROA standard deviation score. In general (80.27%), the sample is owned by institutions. After taking the natural logarithm, the average number of assets is 10.1294, and the standard deviation is 0.9528. This data shows that the sample has assets that tend to be homogeneous. Table 1 reports that the company has an age of 47.5%, the highest age is 103 years, and the lowest is 7 years. In addition, Table 1 reports that only 31.94% of companies have an environmental committee. This score shows that the company's commitment to appointing a board member to the EC still needs to be higher.

Table 2. Descriptive Statistic.

Variables	Mean	Std. Deviation	Min	Max
CED	0.7076	0.0695	0.61	0.78
ROA	6.4027	7.1889	0	43
KI	0.8027	0.1596	0.42	1
SIZE	10.1294	0.9528	8.67	12.03
AGE	47.5	20.2776	7	103
EEC	0.3194	0.4695	0	1

The classic assumption tests used in this research are normality, multicollinearity, heteroscedasticity, and autocorrelation tests. The results of hypothesis testing are presented in Table 3.

Table 3. Hypothesis test results

Research Hypothesis	Coefficient	Sig. Score	Conclusion
H1: Profitability has a positive effect on CED	0.0025304	0.039**	Accepted
H2: Institutional ownership has a positive effect on CED	-0.0084454	0.886	Rejected

H3: The size of the firm's assets has a positive effect on CED	0.0062897	0.583	Rejected
H4: Firm age has a positive effect on CED	0.0012542	0.027**	Accepted
H5: The EEC has a positive effect on CED	0.0353493	0.099*	Accepted

** sig. at 5% level. *sig. at 10% level.

4.1. The Effect of Profitability on CED

Profitability has a significant and positive effect on the CED. This shows that companies that can generate greater profits tend to CED in their reports better. High profitability will make it easier for companies to respond to pressures related to environmental responsibility in their operating areas [30]. This research follows the legitimacy theory, which reveals that the community around the company's operational location continues to pressure the company to pay more attention to environmental issues. The company's ability to create financial profits or profitability provides more freedom in various types of disclosures that can be made voluntarily compared to companies with low profitability. Companies with low profitability tend to focus more on increasing their profits first rather than making disclosures [31]. The results of this research are in line with research conducted by Tana & Nugraheni (2021 which states that profitability has a significant positive effect on CED [32].

4.2. The Influence of Institutional Ownership on CED

Institutional ownership does not affect the CED. We report that high institutional ownership in an organization does not indicate that it will disclose its CED in detail. Stakeholder theory argues that institutional ownership is vital in directors' supervision because ownership encourages the organization to have more optimal supervision. Institutional investors want transparency over every organization's activity, including activities that impact the environment. On that basis, the company will disclose additional voluntary reports. However, the research results reveal that high institutional share ownership in companies does not affect the CED. As majority shareholders, institutional owners have great authority to encourage companies not to make voluntary disclosures, including CED, because they want to maximize their profits. Of course, this condition is inversely related to stakeholder theory. This is because institutional shareholders feel that CED is less capable of increasing company value than other factors, such as firm liquidity and profitability. In addition, the decision to make voluntary disclosures is part of management policy, so the information disclosed will vary according to management policy [33]. The results of this research are in line with Zahra & Aryati (2023), which report that institutional ownership does not affect CED [34].

4.3. The Influence of the size of the firm's assets on CED

The size of the firm's assets does not affect the CED. Company size is not a determining factor in environmental disclosure, including CED, to gain support and legitimacy from stakeholders and society. Even though high assets indicate that the firm has greater resources. Thus, the high resources do not automatically result in more disclosure to improve the company's position among the stakeholders. On the other hand, CED is necessary so that companies continue to receive attention, trust, and support from stakeholders and gain societal legitimacy. Thus, company size is not a significant factor in disclosing carbon emissions. The indirect impact causes non-optimal disclosure. The lack of influence of the size of the firm's assets on carbon emissions disclosure may be caused by the lack of effectiveness of CED by the firm's assets. This means that disclosing CED is not yet considered a policy that can provide positive benefits for the industry in the future. Thus, the firm's assets do not determine whether the company will make disclosures of CED. The results of this research align with research conducted by Setiawan & Kusuma (2023), which stated that firm size does not affect CED [35].

4.4. The Effect of Firm Age on CED

Firm age has a significant and positive effect on CED. This could mean that older companies have the potential to make broader CED. This phenomenon is caused by companies that have been around for a long time and have a wider network of relationships or stakeholders, which can encourage companies to disclose CED. Companies that have been around for longer tend to have solid strategies and goals to maintain the continuity of their operations. Long experience in operations helps companies develop a heightened awareness of issues that may impact their performance and sustainability in the future. Experience and better understanding of stakeholder needs, including the need for carbon emission disclosure, are better understood by companies with longer lifespans. In addition, older companies tend to make disclosures because this can improve the company's reputation and customer's trust in the eyes of the general public so that the company's activities continue to gain legitimacy from the public. This research is in line with the results of research conducted by Puteri & Inawati (2023), which stated that firm age significantly positively affects CED [36].

4.5. The Influence of the EEC on CED

The EEC has a significant and positive influence on CED. This provides an understanding that the possibility of disclosing CED increases with a company's EC. The existence of an EC plays a vital role in monitoring CED [22]. Establishing an EC in a company significantly impacts CED because the committee is responsible for monitoring and managing the company's environmental initiatives. By playing an essential role in formulating environmental policies, overseeing the implementation of sustainable practices, and facilitating the disclosure of environmental information, including carbon emissions, environmental committees enable companies to be more organized and focused on their efforts to reduce carbon emissions and achieve other environmental goals. In addition, forming EC can also be seen as a response to pressure from society and other stakeholders to increase transparency regarding CED and other environmental impacts by legitimacy theory. Through better disclosure practices, companies can strengthen their legitimacy as entities that care about environmental issues, build trust with stakeholders, and increase support and reputation in the eyes of the public, their customers, and stakeholders. This research is in line with the results of research conducted by Bainjab (2022), which stated that environmental committees significantly positively affect CED [37].

5 CONCLUSION

This research examines the influence of profitability, institutional ownership, The size of the firm's assets, age, and EEC on CED. The conclusion of the test results carried out by researchers is that profitability has a significant positive effect on CED. Also, we report that institutional ownership has no impact on CED, and firm size does not affect CED. Finally, we concluded that firm age significantly impacts CED, and the EEC has a significant positive effect. towards CED.

This study hoped that company management would continue to maintain company performance while still paying attention to profits so that the company could disclose CED. The company management is more concerned about existing environmental problems and encourages more optimal supervision to be more transparent regarding every operational activity. Corporate includes activities that impact the environment, such as information regarding the disclosure of the CED in sustainability reports and annual reports because CED is considered important as a form of the firm commitment to the environment.

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APPENDIX 1

Sample and Sampling criteria.

Sample Criteria	**Total**
Energy and raw goods sector firms listed on the ISE during the 2019-2022 period based on the Indonesia Stock Exchange Industrial Classification or IDX-IC 155 classification	155
Energy and raw goods sector firms that do not present annual reports and/or sustainability reports consecutively in 2019-2022	(103)
Companies that did not experience losses during the 2019-2022 period	(34)
Samples that comply with the criteria	18
Observation (years)	4
Units' analysis	72