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Determinants of Carbon Emission Disclosure

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Abstract—

This study aims to obtain empirical evidence of the influence of profitability, *leverage, media exposure*, and environmental performance on *carbon emission disclosure*. This research was conducted on *basic materials* companies listed on the IDX for the 2020-2025 period. Sample selection was obtained with 190 observations, and we used multiple linear regression for analysis. The results are that *media exposure* and environmental performance have a positive effect on *carbon emission disclosure*, while profitability and *leverage* do not affect carbon emissions. This research implies that companies need to improve communication through the media and improve environmental performance as an effort to meet stakeholder expectations and improve the company's image related to sustainability issues.
Keywords— *Carbon Emission Disclosure;* Profitability; *Leverage*; *Media Exposure*; Environmental Performance.

I. INTRODUCTION

Natural disasters, climate change, and environmental issues are the main focus today. These three issues illustrate examples of environmental pollution that is largely triggered by the growth of industrial activities in each country. Environmental pollution is an interesting topic to review in the business sector, especially related to climate change in each country. Climate change is the result of human industrial activities that result in increased greenhouse gas emissions (Wibowo et al., 2022). This is a problem that not only has an impact on the people in Indonesia, but also has a global impact due to the continued increase in air temperatures, which feel increasingly hot due to the presence of greenhouse gas emissions (Samidjo & Suharso, 2022). According to a report from the JRC *Science For Policy* (2024) Global GHG emissions reached their highest level in 2023, which is 1.9% higher than the 2022 value.

JRC *Science for Policy Report* Publish information on carbon emissions sourced from key sectors of activity. Figure 1 shows that sectors that produce the majority of fossil fuel combustion such as the electricity industry, combustion and industrial processes, buildings, transportation, fuel exploitation, agriculture, and waste are also shown and continue to increase over time (JRC, 2024). Based on these problems, concerns arise about the future condition of the earth. The authorities have tried to reduce carbon emissions by implementing a number of policies as stated in Law No. 6 of 1994 which contains related *United Nations Framework on Climate Change* which then adopted the Kyoto Protocol contained in Law Number 17 of 2004, Presidential Regulation Number 61 of 2011. The basis of this is Presidential Regulation No. 71 of 2011 and Law No. 16 of 2016. In the agreement, Indonesia has a target of reducing carbon emissions by 2030 by 29% to 41% (Septriyawati & Anisah, 2019). Carbon emission reporting is still voluntary *(voluntary disclosure),* So not all companies convey this data. In connection with these regulations, companies need to carry out carbon emission disclosure activities.

Regarding the disclosure of carbon emissions that are still voluntary, there is a case of a company that does not fully disclose information about carbon emissions, namely PT Bukit Asam Tbk in 2016-2017. PTBA is a state-owned company in the coal subsector located in South Sumatra Province. PT Bukit Asam Tbk conducts environmental disclosure with results in 2016 and 2017 only conducting environmental disclosure of 62% and low quality (Syahputra et al., 2019). Various studies have examined the factors that influence the disclosure of carbon emissions with findings as diverse as the research conducted Princess & Hermi (2024) reveals that there is no impact of carbon emission disclosure on *Media Exposure*, environmental performance, and *Leverage.* While the study conducted by Nastiti & Hardiningsih (2022) found that *Media Exposure*, and the level of profitability has a positive influence, while *Leverage* insignificant. While the study conducted by Claudia & Kiss (2023) reveal the influence of carbon emission disclosure on profitability, *firm size*and *Leverage*. This study aims to obtain empirical evidence of factors that can influence Profitability *leverage, media exposure*, and environmental performance against *carbon emission disclosure*. This research is interesting to do because it is to re-verify the results of previous research that provide different empirical evidence in testing the variables used in this study. Research on the practice of carbon emission disclosure has not been widely conducted, especially in Indonesia. The sample used is a sector company *Basic Materials* listed on the IDX because the company is included in the category of industries that intensively produce carbon emissions.

II. METHOD

Theory *Squirrel* stating that the company in running its business does not only operate for the benefit of the company but must provide benefits to all *Stakeholder*-his (Freeman & McVea, 1984). *Stakeholder* have the ability to control the company in terms of carrying out its activities, including financial control to carry out carbon emission disclosures.

As for the theory of legitimacy, companies will always try to ensure that the activities they carry out are within a scope that can be accepted by the society and the environment in which they operate. This theory is based on the existence of a social contract between society and companies. The community demands that companies report their environmental activities voluntarily so that companies will carry out these activities to gain legitimacy from the community (Dowling & Pfeffer, 1975).

Carbon emission disclosure is an example of accounting disclosure related to the environment. This includes the amount of carbon emissions, consumption of energy sources, goals and plans to reduce carbon emissions, as well as the possibilities and risks that arise due to the impacts of climate change (Bae Choi et al., 2013).

Profitability is an indicator of a company's performance. Each company sets a goal to achieve a high level of profitability (Dewi & Astuti, 2023). When a company is able to generate higher profitability, its performance will be better, thus increasing the likelihood of the company disclosing carbon emissions (Septriyawati & Anisah, 2019). In addition, they can also increase the company's value in the eyes of the public and gain recognition from the public. Related to theory *stakeholder,* A company with a high level of profit is considered to be able to run its operations effectively. This is used to maintain good relationships with stakeholders, one of which is by providing sufficient information about the carbon emissions produced. Therefore, the greater the profitability of a company, the more resources it has to report carbon emissions (Yuniharto et al., 2024).

H1: Profitability has a positive effect on *carbon emission disclosure*

Leverage Or debt ratio is a measure used to assess how much a company's assets are funded by debt. In a more general sense, *Leverage* is a measure used to assess the company's ability to fulfill all its obligations, both short-term and long-term (Fransisca, 2020). Theory *Squirrel* reveals that the level *Leverage* The high indicates that the company has a lot of debt, which results in relatively limited disclosures. Companies with levels *Leverage* High usually prefers to pay their debts rather than voluntarily disclose information, which can encourage management to cut disclosure costs. The preparation of voluntary information reports requires considerable costs, so it can increase the burden on companies. Therefore, companies tend to focus more on using existing funds to pay off these debts (Wibowo, 2022).

H2: *Leverage* has a negative effect on *carbon emission disclosure*

Media is considered a means of communication used to express information to the wider community. The position of the media is very important along with the increase in communication tools and the spread of the internet in society. Media disclosure is how a company uses available media to communicate identity as well as information about the company's activities (Nugraini & Wahyuni, 2021). According to the theory of legitimacy, *Media Exposure* It is very influential in encouraging companies to inform their activities, especially related to the environment. When the media disseminates news about company activities related to the environment, that information becomes one of the factors that the public considers in pressuring companies to legitimize their activities by conveying the carbon emissions produced. With the oversight function of the media, companies will try their best to carry out their social and environmental responsibilities (Hidayat et al., 2022).

H3: *Media Exposure* has a positive effect on *carbon emission disclosure*

Environmental performance refers to the efforts taken by a company to protect environmental sustainability and deal with issues that arise due to its operational activities. A company is considered to have positive environmental performance if the level of environmental problems caused by its activities is minimal, and vice versa (Handoko & Santoso, 2023). Theory *Stakeholder* explained that the company will operate and collaborate with various related parties to achieve mutually beneficial goals. The disclosure of information about social and environmental impacts can serve as a tool to inform related parties, especially investors or shareholders, so it is concluded that environmental performance has a positive effect on *carbon emission disclosure* (Suhardi & Purwanto, 2015).

H4: Environmental performance has a positive effect on *carbon emission disclosure*

III. RESULTS AND DISCUSSION

This study is included in quantitative research to examine the relationship between independent factors such as profitability, *Leverage*, *Media Exposure* and environmental performance on dependent variables, namely *carbon emission disclosure.* This research was conducted on sector companies *Basic Materials* listed on the Indonesia Stock Exchange for the 2020-2024 period. Samples are selected using the *purposive sampling* which is based on certain considerations so that 190 observation data were obtained. In this study, the disclosure of carbon emissions was measured using several items adopted Bae Choi *et al* (2013). The measurement method used is content analysis by reading the annual report of the sample company to find out how much the company reveals its carbon emissions, here is to calculate the CED:

$$\textbf{CED} = \sum \frac{\boldsymbol{di}}{\boldsymbol{M}}$$

$\sum$di = Total score described by the company
M = Amount disclosed by the company (18 items)

Profitability is measured using the following ROA *(Return on Asset)* ratio:

$$\boldsymbol{ROA} = \frac{Net\ Income}{Total\ Asset}$$

Leverage is measured using the following DER *(Debt to Equity Ratio)* ratio*:*

$$\boldsymbol{DER} = \frac{Total\ Liability}{Equity}$$

Media exposure is measured using a dummy variable where a value of 1 is for companies that disclose information related to carbon emissions through the company's website, as well as various disclosure media such as news, newspapers and various other media, while a value of 0 is for the opposite.

Environmental Performance is measured by the natural logarithm of the following environmental costs:

$$KL = Ln\ [Total\ cost\ environment]$$

Company Age is measured using:

$$\boldsymbol{Age} = Research\ Observation\ Year - Year\ the\ company\ was\ listed\ on\ the\ IDX$$

Company Size:

$$Size = Ln\ [Total\ Aset]$$

The following is the results of descriptive statistics:

Table 1. Descriptive Statistical Analysis Results

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
ROA	190	-1,050	,198	,01351	,110390
DER	190	-3,836	8,122	,84517	1,395247
MED	190	0	1	,44	,498
KL	190	16,424	27,865	22,23686	2,350191
AGE	190	1	47	21,39	11,500
SIZE	190	25,916	32,880	29,57690	1,687302
CED	190	,333	,944	,69561	,155222
Valid N (listwise)	190				

Source: SPSS Processed Data version 25 (2025)

Based on the results of the analysis, it can be seen that value *Mean* ROA of 0.013. *Leverage* (DER) Shows value mean 0.845, while *Media Exposure* (MED) shows nThe red is 0.440. Environmental Performance (KL) shows value *Mean* of 22.236 and the Carbon Emission Disclosure (CED) shows a mean value of 0.695.

Table 2. Results of Multiple Linear Regression Analysis Test

Coefficient							
		Unstandardized Coefficients		Standardized Coefficients			
Type		B	Std. Error	Beta	t	Sig.
1	(Constant)	-,636	,205		-3,101	,002
	ROA	,032	,070	,029	,465	,643
	DER	-,005	,006	-,059	-,968	,334
	MED	,040	,018	,158	2,294	,023
	KL	,021	,004	,355	4,909	,000
	AGE	-,003	,001	-,171	-2,825	,005
	SIZE	,022	,007	,217	3,179	,002
a. Variable Dependent: CED3						

Source: SPSS Processed Data version 25 (2025)

Based on Table 2, the multiple linear regression equation model is obtained as follows:

Y= -0.636+0.032ROA-0.005DER+0.040ME+0.021KL-0.003AGE+ 0.022Size+Ɛ

3.1 Effect of Profitability on *Carbon Emission Disclosure*

Hypothesis testing was carried out with the results of value research t_{hitung} t_{hitung} 0.465 < t_{tabel} t_{tabel} 1.973 with a significance value of 0.643 > 0.025 This means that profitability has no effect on *Carbon Emission Disclosure.* So that the first hypothesis (H1) in this study **rejected**. This shows that the success of a company's financial performance cannot be a consideration in disclosing carbon emissions. It can be concluded that high business profitability is not always offset by high transparency of carbon emissions and profitability cannot be used as an indicator in predicting carbon emissions disclosure (Dewayani & Ratnadi, 2021). It can be concluded that the level of profit or financial performance of a company is not a determining factor in the implementation of carbon emission disclosure. This is in line with regulatory obligations, where all companies, regardless of profitability, are still required to disclose information related to carbon emissions as part of sustainability reports. This provision is regulated in the Financial Services Authority Regulation (POJK) Number 51/POJK.03/2017.

3.2 The Effect of *Leverage* on *Carbon Emission Disclosure*

Hypothesis testing was carried out with the results of value research t_{hitung} t_{hitung} -0.968 < t_{tabel} t_{tabel} 1.973 with a significance value of 0.334 > 0.025 meaning *Leverage* has no effect on *Carbon Emission Disclosure.* So that the second hypothesis (H2) in this study **rejected**. This is because the disclosure of carbon emissions is considered to be an additional burden that can be a burden on the company's expenses (Pratiwi, 2018). Companies with *Leverage* Tinggi should be encouraged to disclose sustainability information to maintain legitimacy and meet stakeholder expectations. However, these findings suggest that the pressure from *stakeholder,* including creditors, as well as the implementation of POJK 51/POJK.03/2017 is not strong enough to encourage companies to increase transparency on real environmental issues. Therefore*Leverage* has no effect on *carbon emission disclosure.*

3.3 The Effect *of Media Exposure* on *Carbon Emission Disclosure*

Hypothesis testing was carried out with the results of value research t_{hitung} t_{hitung} 2,294 > t_{tabel} t_{tabel} 1.973 with a significance value of 0.023 < 0.025 meaning *Media Exposure* has a positive effect on *Carbon Emission Disclosure.* So that the third hypothesis (H3) in this study **Accepted**. This is because the company will be more aggressive in environmental disclosure, including carbon emission disclosure, because the disclosure made by the company will greatly affect the views of the *Squirrel* to the company's image. The company tends to disclose all its activities, including efforts to reduce carbon emissions, which are considered to make the company's financial performance increase so that it can attract the attention of investors to make investments (Hidayat et al., 2022).

3.4 Effect of Environmental Performance on *Carbon Emission Disclosure*

Hypothesis testing was carried out with the results of value research t_{hitung} t_{hitung} 4,909 > t_{tabel} t_{tabel} 1.973 with a significance value of 0.000 < 0.025 meaning Environmental Performance has a positive effect on *Carbon Emission Disclosure.* So that the fourth hypothesis (H4) in this study **Accepted**. Companies with good environmental performance tend to be more proactive in disclosing information related to carbon emissions as a form of transparency and accountability to social and environmental responsibility. Positive environmental performance is an indicator that the company is committed to environmental impact management, including in the aspect of reducing greenhouse gas emissions (Florencia et al., 2021). Thus, the better the company's environmental performance, the greater the company's tendency to publicly disclose carbon emissions.

3.4 Influence of Control Variables on *Carbon Emission Disclosure*

The company age variable as a control variable has results t_{hitung} t_{hitung} -2,825 < t_{tabel} t_{tabel} 1.973 with a significance value of 0.005 < 0.025 meaning The Company's Age Negatively Affects towards *Carbon Emission Disclosure*. This can be due to the tendency of companies that have been in existence for longer to be more conservative and less responsive to environmental issues. Established companies also tend to feel that their public legitimacy is already strong, so they don't see the urgency to increase transparency on carbon emissions (Asmeri et al., 2022).

While the Company Size as a control variable shows the results t_{hitung} t_{hitung} 3,179 > t_{tabel} t_{tabel} 1.973 with a significance value of 0.002 < 0.025 meaning Company Size Has a Positive Effect towards *Carbon Emission Disclosure*. This can be because large companies when total assets increase, companies can be more strategic in responding to risks and opportunities related to environmental issues, namely climate change that are directly related to their business operational activities such as improving energy efficiency through energy management systems, the use of renewable energy and a lower carbon footprint, renewable energy project initiatives and many more.

IV. CONCLUSIONS

Based on the results of the study, Profitability and *Leverage* have no effect on *Carbon Emission Disclosure*. Meanwhile, media exposure, environmental performance, and company size have a positive effect and the age of the company have a negative effect on *Carbon Emission Disclosure*.

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