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INVESTIGATING IN DISCLOSURE OF CARBON EMISSIONS: INFLUENCING THE ELEMENTS USING PANEL DATA

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ABSTRACT

This study aims to examine the effect of media exposure, environmental performance, profitability, company size on disclosure of carbon emissions. The research population includes all companies on the Indonesia Stock Exchange (IDX) for the 2017-2021 period. The sample in the study was determined by purposive sampling technique and 18 companies were found over a period of 5 years, resulting in 90 research samples. The analytical method used is Panel Data Regression Analysis using the eviews 9.0 program. The results of the study show that media exposure, environmental performance and company size have a positive effect on disclosure of carbon emissions, while profitability has no effect on disclosure of carbon emissions. The limitation of this research is that this research only focuses on manufacturing companies that have been listed on the Indonesia Stock Exchange (IDX), so that it cannot describe the condition of the population of all companies in Indonesia so that it can provide different results if carried out in different industries. The results of this study are expected to pay more attention to the company's environmental impact by increasing disclosure of environmental information related to greenhouse gas emissions because it can be added value to the company for stakeholders or investors.

KEYWORDS : Carbon Emission Disclosure; Company Size; Environmental Performance; Media Exposure, Profitability.

ABSTRAK

Penelitian ini bertujuan untuk menguji pengaruh media exposure, kinerja lingkungan, profitabilitas, ukuran perusahaan terhadap Pengungkapan Emisi Karbon. Populasi penelitian meliputi seluruh perusahaan di Bursa Efek Indonesia (BEI) periode 2017-2021. Sampel pada penelitian ditentukan dengan teknik purposive sampling dan ditemukan 18 perusahaan selama jangka waktu 5 tahun, sehingga menghasilkan 90 sampel penelitian. Metode analisis yang digunakan adalah Analisis Regresi Data Panel menggunakan program eviews 9.0. Hasil penelitian menunjukkan bahwa media exposure, kinerja lingkungan dan ukuran perusahaan memiliki pengaruh positif terhadap pengungkapan emisi karbon, sedangkan profitabilitas tidak berpengaruh terhadap Pengungkapan Emisi Karbon. Keterbatasan penelitian ini adalah penelitian ini hanya berfokus pada perusahaan Manufaktur yang telah terdaftar di Bursa Efek Indonesia (BEI), sehingga kurang dapat menggambarkan kondisi populasi seluruh perusahaan di Indonesia sehingga dapat memberikan hasil yang berbeda jika dilakukan pada industri yang berbeda. Hasil penelitian ini diharapkan lebih memperhatikan dampak lingkungan perusahaan dengan memperbanyak pengungkapan informasi lingkungan terkait emisi gas rumah kaca karena dapat menjadi nilai tambah perusahaan bagi para stakeholder ataupun investor.

KATA KUNCI : Pengungkapan Emisi Karbon; Ukuran Perusahaan; Kinerja Lingkungan; Media Exposure; Profitabilitas.

INTRODUCTION

Global warming is one of the problems faced by many big countries. The impact of global warming has been felt by many people around the world. According to the National Action Plan for Climate Change Adaptation (RAN-CCA) (Iklim, 2012), during the 20th century, temperature increases were estimated to reach 0.3 - 0.8°C. It is expected to rise 4°C over the next 100 years. According to the IPCC (Change, 2007), most of the increase in global average temperature is caused by an increase in greenhouse gas concentrations due to human activities through the greenhouse effect.

According to Climate Watch data released by the World Resources Institute (WRI), Indonesia is one of the 10 largest greenhouse gas emitters until early 2020. This is because disclosure of carbon emissions in Indonesia is still confidential and in practice it is still rare. This phenomenon causes environmental damage such as increasing surface temperature so that the earth is getting warmer. Forest burning and the use of fossil fuels used in industrial activities are also the cause of increasing levels of carbon dioxide emissions on earth, including in Indonesia. As a result, there has been extreme climate change, as well as rising

sea levels in recent years. In addition, this also causes air pollution which can result in a decrease in air quality which is also bad for the environment, especially health. To assess how detailed a company discloses carbon emissions, there is an index that can be assessed, namely the disclosure index disclosed by (Choi, Lee, & Psaros, 2013). Disclosure of carbon emissions is a voluntary disclosure in company reports. That is, there are some companies that disclose and some companies don't. This can be influenced by several factors such as media exposure, environmental performance, profitability and company size.

The existence of Media Exposure can make it easier for stakeholders to know environmental conditions and environmental performance, including regarding carbon emissions produced by companies in making the environment green and clean around where they operate (Amaliyah & Solikhah, 2019). In addition, companies with high profitability find it easier to respond to pressure from the public in making environmental disclosures including carbon emissions because companies have the financial ability to incorporate strategies to reduce the carbon emissions they produce (Dewi & Aldhani, 2021). Company size also shows the size of a company and describes the number of company operational activities Rini, Pratama, & Muslih (2021), so that it can meet costs related to disclosing carbon emissions because it has the availability of resources and companies will increase information disclosure to build a good social image (Mulya & Rohman, 2020).

Research Desy et al., (2021) concluded that media exposure has no influence on companies in disclosing carbon emissions, (Dewi & Aldhani, 2021) and Florencia & Handoko (2021)found that media exposure is considered a driving force for companies in disclosing carbon emissions (Ulupui, Maruhawa, & Purwohedi (2020) and Florencia & Handoko (2021)). Ulupui et al., (2020), Apriliana (2019) and Dwi et al., (2021) found that environmental performance has no effect on companies in disclosing carbon emissions. While Rini et al. (2021), Saptiwi (2019) found that environmental performance is considered a driver for companies in disclosing carbon emissions (Rini et al., 2021; Saptiwi 2019). Company size, shows the size of a company and describes the number of company operational activities (Rini et al., 2021). The bigger a company, the more likely it is that the company discloses information about its carbon emissions. Research (Saptiwi (2019); Rini et al. (2021) found that profitability is seen as a barrier for companies in disclosing carbon emissions (Saptiwi (2019); Rini et al., (2021);Ratmono & Policy (2021) , Meanwhile other streams of researchers found that profitability is considered a driver for companies in disclosing carbon emissions (Ulupui et al., (2020); Dewi & Aldhani (2021). Previous studies yielded different conclusions and did not all find conflicting relationships. So this research is important for further investigation.

Based on legitimacy theory, media exposure has a major role in encouraging companies to publicize their activities, especially those related to environmental aspects. When the media publish information related to company activities that involve the environment, the information will be one of the considerations taken by the public in putting pressure on companies to legitimize their activities by disclosing their carbon emissions. The media has an important role in providing information about the activities of a company to the public. Companies need to be aware of the media that monitors their activities because it determines the value and reputation of the company in the eyes of the public. With the media's supervising role, the company will try its best to carry out its social and environmental responsibilities. Along with the more active the media in supervising the environment of a country, companies will be increasingly motivated to disclose their activities so that they appear able to carry out their obligations properly. This is in

accordance with the research results of I (Dewi & Aldhani, 2021) which shows that media exposure has a positive effect on the disclosure of carbon emissions. The reason is based on the theory of legitimacy, namely when the media publish information related to company activities involving the environment such as disclosure of carbon emissions, this information will be one of the considerations taken by the public in putting pressure on companies to gain community legitimacy and get positive responses from stakeholders. Based on the description above, the following hypothesis can be formulated:

H_1 : Media Exposure has a positive effect on Disclosure of Carbon Emissions.

Environmental performance can be one of the influences on the disclosure of carbon emissions. Environmental performance has a positive relationship to environmental disclosure including carbon emissions. This is because companies with low environmental performance will not disclose information to avoid negative exposure, while companies with good environmental performance will encourage companies to have a proactive environmental strategy in disclosing carbon emissions. This of course will increase the company's reputation as a company that cares about the environment, so the company will tend to inform its stakeholders more through the disclosure of carbon emissions. Based on ISO 14001:2004, environmental performance is related to how well the organization manages the environmental aspects of its activities, products, services, and their impact on the environment. In line with research by Saptiwi (2019) and Rini et al., (2021) which says that environmental performance has a positive effect on the disclosure of carbon emissions. The reason is based on the theory of legitimacy, namely that companies with good environmental performance will provide information on their environmental performance in the form of environmental disclosures, in this case the disclosure of carbon emissions. The existence of good environmental performance can make the company provide assurance to the public that the company has contributed to reducing the impact of climate change and is trying to minimize global warming. This can show the company's commitment to the environment in order to get support from stakeholders and legitimacy from the community. Based on the description above, the following hypothesis can be formulated:

H_2 : Environmental Performance has a positive effect on Disclosure of Carbon Emissions.

Profitability is often used as a benchmark in carrying out environmental responsibility. Based on the legitimacy theory, society always puts pressure on companies to care about environmental problems. Companies with high profitability are easier to respond to these pressures because companies have more resources that can be used to make environmental disclosures, one of which is the disclosure of carbon emissions so that companies are easier to gain legitimacy from the community when compared to companies with low profitability. The higher the profit achieved by a company, the company is considered to have greater availability of funds, with larger funds making it easier for the company to disclose. According to Choi et al., (2013), companies with good financial conditions have more ability to use human and financial resources to report carbon emissions and this can increase the value of the company in the market. This is also in line with research conducted by Ulupui et al., (2020) and Dewi & Aldhani (2021), that profitability has a positive effect on the disclosure of carbon emissions. Companies with high profitability reflect companies with good financial conditions, so they are considered to be disclosing environmental information, in this case the disclosure of carbon emissions. Based on this description, the hypothesis can be formulated as follows:

H_3 : Profitability has a positive effect on Disclosure of Carbon Emissions.

Company size can influence companies in disclosing information related to carbon emissions. Company size can be seen from the resources owned by a company. The greater the resources owned by the company, the greater the size of the company. Large companies will have a high operational level, so that the intensity of carbon production tends to be greater. Based on the legitimacy theory, large companies are under greater pressure and demands from the public to publish their environmental performance so that large companies tend to voluntarily disclose their environment, in this case the disclosure of carbon emissions. Disclosure of carbon emissions is part of environmental disclosure that can be used by companies to respond to community pressure so that company activities still get legitimacy from the community. This is in line with the research of Rini et al., (2021) and Dwi, et al., (2021) which shows that the size of the company has a positive effect on the disclosure of carbon emissions. Large companies are assumed to be able in terms of resource availability to meet costs related to carbon emission disclosures, while smaller companies tend not to disclose carbon emissions because small companies have limited funds which are an obstacle for companies to disclose information related to carbon emissions. Based on the description above, the hypothesis can be formulated as follows:

H_4 : Company size has a positive effect on Disclosure of Carbon Emissions

METHOD

The population in this study are manufacturing companies listed on the Indonesia Stock Exchange for the period 2017-2021. The sample selection used a purposive sampling technique with sampling criteria, including manufacturing companies that disclose carbon emissions for the 2017-2021 period (covering at least one policy related to carbon/greenhouse gas emissions or disclosing at least one item of carbon emissions disclosure) and companies that follow PROPER program in 2017-2021 (PROPER is one of the government policies to improve environmental management by companies so that it complies with laws and regulations. So there is no pollution and environmental damage), so that the sample obtained in this study was 18 companies multiplied by 5 research periods so that the total observation was 90 companies. The dependent variable in this study is carbon emissions based on the 18 items checklist developed by Choi et al., (2013). Each item has a score of 1 so that to calculate it the total score of the item is divided by the total of all 18 items.

Category	Item
Climate Change: Risks and Opportunities	CC-1: Assessment/description of risks (both specific and general regulations/regulations) related to climate change and actions taken to manage these risks. CC-2: Current (and future) assessment/description of the financial, business and opportunity implications of climate change.
Greenhouse Gas Emissions (GHG/Greenhouse Gas)	GHG-1: Description of the methodology used to calculate greenhouse gas emissions (eg GHG or ISO protocol).

	GHG-2: Existence of external verification of quantity of GHG emissions by whom and on what basis.
	GHG-3: Total greenhouse gas emissions (metric tons of CO2-e) produced.
	GHG-4: Disclosures for scopes 1 and 2, or 3 of direct GHG emissions.
	GHG-5: Disclosure of GHG emissions by origin or source (eg coal, electricity, etc.).
	GHG-6: Disclosure of GHG emissions by facility or segment level.
	GHG-7: Comparison of GHG emissions with previous years .
Energy Consumption (EC/Energy Consumption)	EC-1: The amount of energy consumed (eg tera-joules or MAP-joules).
	EC-2: Quantification of energy use from renewable resources.
	EC-3: Disclosure by type, facility or segment.
Greenhouse Gas Reduction and Cost (RC/Reduction and Cost)	RC-1: Details of plans or strategies to reduce GHG emissions.
	RC-2: Specifications of the target level/level and year of GHG emission reductions.
	RC-3: Reducing emissions and costs or current savings (costs or savings) as a result of plans to reduce carbon emissions.
	RC-4: Future emission costs to be taken into account in capital expenditure planning.
	AEC-1: Indication of which board committee (or other executive body) has responsibility for action related to climate change.

AEC-2: Description of the mechanism by which the board (or other executive body) reviews company progress on climate change.	

Table 1. Disclosure of Carbon Emissions

The measurement formula is as follows:

$$\mathbf{CED = \sum di/M}$$

The independent variable is Media Exposure which is calculated using a dummy variable where a score of 1 is given to companies that have positive or negative news coverage from outside or from internal parties related to the company's efforts in dealing with carbon emissions. News coverage here refers to online media coverage. While 0 for the opposite. Furthermore, environmental performance is measured using PROPER, which is a program to assess company performance in environmental management developed by the Ministry of Environment (KLH) since 1995, to encourage companies to improve their environmental management. In PROPER, companies are categorized into 5 categories and each category is represented with a color, namely: Gold (very very good with a score of 5), Green (very good, with a score of 4), Blue (good, with a score of 3), Red (poor, with a score of 2) and Black (very bad, with a score of 2) score 1).

This study also uses a measurement of profitability, namely ROA (Return on Assets), because ROA is considered capable of measuring the company's efficiency in generating profits, which can be allocated to the future. The profitability measurement is as follows:

$$\mathbf{ROA} = \frac{laba\ Bersih}{Total\ Aset}$$

The last is the size of the company which is measured by using the natural logarithm (ln) proxy of the company's total assets. The use of natural logarithms in this study is used to reduce data fluctuations without reducing the original value. Company size variable can be formulated as follows:

$$\mathbf{Size = Ln\ Total\ Aset}$$

The analytical method used in this research is Panel Data Regression Analysis. Panel Data Regression Analysis is a combination of cross section data and time series data, where the same cross section unit is measured at different times. So, in other words, panel data is data from several individuals (samples) that are observed over a certain period of time (Eksandy, 2018:45). The Panel Data Regression Equation is:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \varepsilon_{it}$$

RESULT AND DISCUSSION

This study conducted a descriptive statistical analysis to provide an overview of the condition of the research data. The result is as follows:

Table 2. Descriptive Statistics Data

	CED	ME	PROPER	ROA	SIZE
Mean	0.431467	0.800000	3.555556	0.127200	19.55056
Median	0.444000	1.000000	4.000000	0.075500	18.11500
Maximum	0.722000	1.000000	5.000000	0.921000	28.44000
Minimum	0.056000	0.000000	3.000000	0.001000	12.60000
Std. Dev.	0.165545	0.402241	0.563120	0.142180	4.094268
Observations	90	90	90	90	90

Source: Data Processed by *Eviews* 9.0

Based on the results of data processing in Table 1, it can be seen that the dependent variable of Disclosure of Carbon Emissions and the independent variable of profitability standard deviation is higher than the average value which indicates the distribution of large data variables so that the data deviation on CED and ROA can be said to be not good. This shows that the CED and ROA data in this study contain some outliers or data that is too extreme. While the independent variables Media Exposure, Environmental Performance and Company Size have a standard deviation lower than the average value which indicates the distribution of data variables is small or there is no large enough gap from the lowest and highest ME, PROPER and SIZE ratios.

Multicollinearity test needs to be done on regressions that use more than one independent variable, this is to find out whether there is a mutually influencing relationship between the independent variables studied. The results of the multicollinearity test are as follows:

Based on the results of the multicollinearity test, it can be seen that there is no independent variable that has a value of more than 0.8, so it can be concluded that there is no multicollinearity in the regression model.

Heteroscedasticity test needs to be done to determine whether or not there is a variance inequality from the residuals of the panel data regression model. The decision whether or not heteroscedasticity occurs in the regression model is by looking at the probability value of the Breusch-Pagan Lagrange Multiplier Test.

Table 3. Results of the Multicollinearity Test

	ME	PROPER	ROA	SIZE
ME	1.000000	0.198419	0.200513	-0.376333
PROPER	0.198419	1.000000	0.033821	-0.472515
ROA	0.200513	0.033821	1.000000	-0.240984
SIZE	-0.376333	-0.472515	-0.240984	1.000000

Source: Data Processed by *Eviews* 9.0

Table 4. Result of the Heteroscedasticity Test – Glejser

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.163654	0.843200	-0.194087	0.8467
ME	0.037364	0.025858	1.444977	0.1531
PROPER	-0.018965	0.025200	-0.752570	0.4543
ROA	0.061930	0.091356	0.677893	0.5001
SIZE	0.015299	0.042707	0.358226	0.7213

Source: Data Processed by *Eviews* 9.0

Effects Specification

Cross-section fixed (dummy variables)			
R-squared	0.752311	Mean dependent var	0.431467
Adjusted R-squared	0.675819	S.D. dependent var	0.165545
S.E. of regression	0.094257	Akaike info criterion	-1.677007

Source: Data Processed by *Eviews* 9.0

Table 5. R^2 Coefficient of Determination Test Result

Based on the results obtained from the heteroscedasticity test using the glejser test, it shows that the ME, PROPER, ROA and SIZE variables have no heteroscedasticity, this is evidenced by the Prob value. ME, PROPER, ROA and SIZE are greater than 0.05 then H_0 is accepted, thus it can be concluded that H_0 is accepted, which means that the panel data regression model does not occur heteroscedasticity.

Based on the results of the calculation table above shows that the value of the coefficient of determination R^2 shows a value of 0.675819, meaning that the variation in the amount of carbon emission information disclosed (carbon emission disclosure) can be explained by Media Exposure (ME), Environmental Performance (PROPER), Profitability (ROA) and Company Size (SIZE) is 67.58% while the rest (100% - 67.58%) of 32.42% is explained by other variables not examined in this study.

Hypothesis	Coefficient	t-statistic	Prob.	Explanation
H_1	0.165329	5.155617	0.0000	**H_1 Accepted**
H_2	0.084314	2.697869	0.0088	**H_2 Accepted**
H_3	-0.103882	-0.916917	0.3624	**H_3 Rejected**
H_4	0.188142	3.552312	0.0007	**H_4 Accepted**
F-ststistic	9.835131			
Prob (F-ststistic)	0.000000			

Source: Data Processed by *Eviews* 9.0

Table 6. Result Summary

Based on the table above, it shows that the F statistic value is 9.835131 while the F table with a level of a = 5%, Df 1 (k -1) = 4 and Df 2 (n-k) = 85, the F table value is 2.479015. Thus the F statistic (9.835131) > F table (2.479015) and the statistical probability value of 0.000000 < 0.05, it can be concluded that the independent variables in this study consisting of Media Exposure, Environmental Performance, Profitability and Company Size are jointly has a positive influence on Carbon Emission Disclosure.

DISCUSSION

Media Exposure on Carbon Emission Disclosure

Media Exposure (DUMMY) in this study has a positive effect on Disclosure of Carbon Emissions. The results of this study explain that with the role of the media in supervising, the company will try its best to carry out its social and environmental responsibilities. This is supported by the theory of legitimacy, namely when the media publish information related to company activities involving the environment such as disclosure of carbon

emissions, this information will be one of the considerations taken by the public in putting pressure on companies to gain community legitimacy and get positive responses from stakeholders.

This study is in line with Ulupui et al., (2020) and Florencia & Handoko (2021) which state that media exposure has a positive effect on the disclosure of carbon emissions. Media exposure encourages companies to take necessary actions related to the environment to preserve the environment in order to help companies get support from various parties Florencia & Handoko (2021). The more active the media in monitoring the environment, the more companies will be encouraged to disclose their activities in order to get a positive response from the community and stakeholders.

Environmental Performance on Disclosure of Carbon Emissions

Environmental Performance (PROPER) in this study has a positive effect on Disclosure of Carbon Emissions. The results of this study explain that companies with good environmental performance will encourage companies to have a proactive environmental strategy in disclosing their carbon emissions. This is supported by the theory of legitimacy, namely that good environmental performance can make companies provide guarantees to the public that companies have contributed to reducing the impact of climate change and are trying to minimize global warming (Saptiwi, 2019). This can show the company's commitment to the environment in order to get support from stakeholders and legitimacy from the community.

This research is in line with Saptiwi (2019) and Rini et al., (2021) which states that environmental performance has a positive effect on the disclosure of carbon emissions. Companies with good environmental performance tend to have various active strategies in dealing with problems of carbon emissions produced by the company to improve the company's reputation as a company that cares and is responsible for the environment and maintains public trust in the company.

Profitability on Disclosure of Carbon Emissions

This shows that the Profitability (ROA) variable in this study has no effect on Disclosure of Carbon Emissions. This explains that companies that have high profitability do not affect companies in disclosing their carbon emissions. Companies with high profitability also do not always allocate their profits to social and environmental activities because apart from being voluntary, the disclosure of carbon emissions is also very dependent on the awareness of the company's management, not only from the company's ability to generate profits (Mulya & Rohman, 2020).

This study is in line with Mulya & Rohman (2020) and Florencia & Handoko (2021) which state that profitability does not affect the disclosure of carbon emissions because the level of financial performance of a good company is not always a consideration in disclosing carbon emissions.

Company Size on Carbon Emission Disclosure

This explains that the variable Firm Size (SIZE) in this study has a positive effect on Disclosure of Carbon Emissions. The results of this study explain that the size of the company measured using total assets shows the greater the total assets owned, the greater the company will be in disclosing its carbon emissions, because the larger the size of the company, the greater the environmental impact it will have (Saptiwi, 2019). This is supported by the theory of legitimacy, namely the company's motivation to be accepted by

the wider community, so that if the trust of the community has been obtained, the company will develop faster and later there will be many stakeholders who are interested in investing because the company already has good legitimacy.

This research is in line with Saptiwi (2019), Rini et al., (2021) and Dwi et al., (2021) which states that company size has a positive effect on the disclosure of carbon emissions. Large companies will disclose higher environmental information than small companies with the aim of responding to pressure from their stakeholders and assisting companies in gaining legitimacy from the community and as a form of corporate responsibility to the community.

CONCLUSION

Based on the data collected and tests that have been carried out on Manufacturing companies listed on the IDX for the 2017-2021 period, it can be concluded that this research shows that profitability has no effect on disclosure of carbon emissions. While media exposure, environmental performance and company size have a positive effect on disclosure of carbon emissions. During the research, the researcher realized that there were limitations in this study, including that there were still a few companies that published sustainability reports, so the researchers used an annual report. In addition, the checklist of criteria items used to measure disclosure of carbon emissions is subjective, where each researcher will have different perceptions and perspectives in assessing each item. This assessment does not have standard references or provisions so that conducting research requires a researcher's point of view which of course will differ from one researcher to another so that it can affect the final score. The period of this research was only carried out for 5 (five) years starting from 2017 to 2021 with a limited sample, namely manufacturing companies, so the results of this study are not necessarily reliable and do not reflect the company's condition in the future. long-term. To improve this research, it is hoped that further research can develop a checklist based on the newer Carbon Disclosure Project (CDP) questionnaire. able to add years of observation and expand the object of research so that the scope of research becomes wider.

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