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04002 Does carbon emission disclosure and environmental performance increase firm value? Evidence from highly emitted industry in Indonesia

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Abstract. Whether investors take into account the company's information related to carbon emission mitigation and the company's environmental ranking in their investment decisions is an interesting research avenue. The objective of this study is twofold. First, it tests whether the level of carbon emissions disclosure differs by industry sector. Second, it examines whether carbon emission disclosures as reported by companies and their environmental performance affect the value of the firm. This study utilizes 102 companies in 2022 that are included in highly polluting industries as a sample, which is divided into 4 different sectors: consumer goods, energy, basic industry, and miscellaneous industry. The results of the analysis of variance (ANOVA) test reveal that the extent of carbon emissions reporting is different across industry sectors. Mean while, the multivariate regression results reveal that carbon emission disclosures positively influence the value of the firm. Environmental performance, however, does not impact firm value. This study informs the company's management that promoting higher levels of carbon emission mitigation and reporting would boost the company's reputation, which would in turn increase its value.

1 Introduction

The issue of climate change and carbon emissions by corporations has received widespread attention in recent years. Over the past few years, a sizable number of businesses throughout the world have implemented programs to track, manage, and ultimately cut their carbon footprints [1]. However, companies may incur additional expenses as a result of their efforts to report and reduce their carbon footprint. An increased likelihood of costly environmental liabilities is associated with higher levels of carbon emissions [2]. A company's value will be affected by its emission level to the degree that the market adjusts stock prices to account for the costs associated with carbon emissions both presently and in the future [3]. In this

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research, we investigate if a company's stock price changes as a result of the disclosure of its carbon emission levels. This research also investigates whether environmental performance achieved by a company affects its value as reflected in its stock pri ce. Besides, this study examines first whether the level of carbon emission disclosures differs by industry sector. Numerous studies have explored the company-value effect of greenhouse gas emissions and greenhouse gas emission disclosures in single-country settings and cross -country settings. Using a cross-country dataset, Hassan and Romilly [4] and Choi and Luo [3] find that an increase in carbon emissions would decrease firm value. The repercussions are more pronounced for companies operating in nations that have implemented a domestic carbon emission trading system and have strict environmental rules in place [3]. Similarly, a study in the Shanghai and Senzhen Stock Exchanges [5], in the US [1] , and in Japan [6] confirms that a reduction in carbon emission volume would enhance firm value. Studies of the relationship between the amount of carbon emission reporting and the value of a company show that in China, the amount of carbon emission reporting tend to enhance firm value [2], and this relationship is stronger in non-state-owned companies [7]. In Indonesia, some studies find a favorable association between greenhouse gas emission disclosures and firm value using different industry samples. These studies cover the observation of manufacturing companies [8,9], firms receiving awards in the Indonesian Sustainability Reporting Award [10] , companies in Sharia Stock Index [11] and non-financial companies [12,13]. A study that took all companies listed on the country's stock exchange as a sample, however, exhibits contradictory results, indicating carbon emission disclosure has an adverse effect on firm value [14] . The present study will test whether carbon emission reporting affects firm

value in highly polluted industries in Indonesia. The industry includes four different sectors: consumer goods, energy, basic industry, and miscellaneous industry. The observed sample is different from previous studies done in the country. This study also examines whether different industry sectors produce different levels of carbon emission disclosures. Using the most recent data, i.e., the year 2022, to avoid the COVID -19 effect, this study contributes to the extant literature by providing a comparison test of greenhouse gas emission disclosure among the four industry samples in the post-COVID-19 period. Since there will always be an inherent asymmetry of information between companies and investors, signaling theory is often discussed in relation to the stock market [15] . However, management signals to investors may help reduce the impact of information asymmetry. Some examples of signals are carbon disclosure and carbon performance reporting and financial performance, both of which inform investors about management's environmental vision for the company's future [16]. Hence, it is expected that investors will value more companies that obtain ISO 14001 certification and a high PROPER (Company Performance Rating Assessment Program in Environmental Management rating by Ministry of Environment). Previous studies confirm the value and relevance of greenhouse gas emission disclosures [2,7,10–13] and environmental performance [17,18] . Thus, this study posits that the extent of carbon emission disclosures and environmental performance are likely to increase firm value. 2 Material and methods 2.1 Sampling and Data The research population consists of companies listed on the Indonesia Stock Exchange (IDX) in highly emitting industries, namely in the energy, manufacturing, and transportation sectors. The classification of the industry follows previous studies [19–21]. As of December 31, 2022, there were 112 companies listed in this sector. The sample selection was based on the following criteria: (1) The company discloses carbon emissions reporting and policies to reduce carbon emissions in both the annual report and sustainability report; (2) the company follows PROPER or ISO 14001; and (3) complete research data is available. The data is taken from the company's annual report and sustainability report on the IDX website and company website. At the time this

research began (June 2033), 10 company annual reports were not yet available, includ ing seven in the transportation sector. Therefore, the research sample did not include the transportation sector. The final research sample consisted of 102 companies. 2.2 Variables and data analysis The dependent variable in the research is firm value (FV). FV is identified as the monetary amount that potential purchasers are willing to offer in the event of the company's sale. The valuation of a firm reflects the degree of investor confidence and the impression of the management's ability to effectively oversee the company [13]. This study employs Tobin's Q formula from Chung and Pruitt [22] to measure firm value, as presented in Equitation (1

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TT (1) Where, MVE = Multiplying the stock's closing price on the last day of the fiscal year by the number of shares outstanding DEBT = Total Debt TA = Total Assets The independent 1 variables in the study are carbon emissions disclosures (CAED) and environmental performance (EP). In line with previous researches [10,11,13,20], to measure the extent to which information about carbon emissions is disclosed, this study adapts an indicator developed by Choi et al. [19]. The index's 18 components address the following areas of interest related to CAED: climate change (threats and opportunities), carbon dioxide emissions (accounting), use of energy (accounting), greenhouse gas reduction (costs), and carbon emission accountability. 1 The scoring of the index is unweighted; hence, a statement about the company's carbon emission reporting receives a score of one if it directly pertains to an item in the index and a score of zero otherwise. A c ompany's CAED level is calculated by dividing its index score by 18, the maximum achievable index score. EP was evaluated using the ISO 14001 and/or PROPER environmental performance ratings for businesses published by the Ministry of the Environment. Proper ratings are color coded, from "black" (the least) to "gold" (the utmost). Black and red are indicators of subpar quality. The color blue indicates compliance with applicable environmental management laws and regulations by the company. Green and gold stars are above -average rating indications. In contrast to

"green," which in dicates mere compliance, "gold" indicates environmental excellence in both manufacturing and service, as well as an ethical and socially responsible approach to business. There are no "black" or "red" ratings given to any of our samples in this study. Therefore, we use blue as our standa rd indicator color. In this study, a nominal variable is used to assess environmental performance. A "blue" rating is equivalent to a zero score. A score of one is given to the corporation depicted in green. A corporation earns a 2 if it has ISO 14001 cert ification and a 3 if it earns the highest possible gold rating. Some businesses have both ISO 14001 and a "green" grade. Whichever is higher will be used for scoring. Profitability (Profit) and firm size (SIZE) are the control variables of the study. Profit is the ratio of net income to total assets, while SIZE is the natural logarithm of a company's total assets. To test whether different industries produce different levels of CAED, this study 2 2 E3S Web of Conferences 467, 04002 (2023) https://doi.org/10.1051/e3sconf/202346704002 9th ICCC 2023

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utilizes the Anova test. Meanwhile, to analyze whether CAED, EP, Profit, and SIZE affect FV, the following regression model is formulated , as depicted in Equitation (2). $FV = \alpha + \beta 1CAED + \beta 2EP + \beta 3Profit + \beta 4SIZE + \varepsilon$ (2) Where, FV is the firm value, CAED is the corporation’s carbon emission disclosure, EP is the environmental performance, profit is the profitability of a company, and SIZE is the firm's size. The measurement of each

variable has already been explained in the above paragraphs. 3 Results and discussion 3.1 Descriptive statistics of CAED and the anova test Table 1 exhibits the descriptive statistics of the CAED score that are categorized into four different industries. Table 1 also displays 2 the results of the comparison test among industries using the Anova test. Table 1. Descriptive statistics of CAED per industry sector and results of Anova test. Industry N Mean Min Max SD F Sig Consumer goods 26 64.5 38.8 94.4 17.31 3.573 0.009 Energy 24 75.4 44.4 100 17.63 Basic industry 30 65.5 38.8 94.4 15.53 Miscellaneous industry 13 56.8 33.3 94.4 18.86 All sample 102 67.4 33.3 100 17.31 Table 2. Descriptive statistics of the research variables. Variables Mean Min Max SD FV 1.555 0.358 8.996 1.306 CAED 67.4 33.3 100 17.31 SIZE 29.90 26.36 33.54 1.573 Profit 0.044 -0.447 0.520 0.135 EP 1.29 0 3 1.001 Frequency of EP 0=33 32.4% 1=13 12.7% 2=49 48.0% 3=7 6.9% N 102 100.0 As depicted in the table, the average score of CAED for highly emitting industries is 67.4%. The number is higher than those in nonfinancial companies [12,13], 17.8%, and in the Sharia Stock Index [11] . The score, however, is lower than those in the same industry in previous studies [20,23], at 72%. The highest average score of CAED is in the energy industry (75.4%), while the lowest is in miscellaneous industries (56.8%). The CAED mean score in the consumer goods industry is 64.5%, ranking third after the basic industry (65.5%). For the consumer good s industry, the figure is higher than that of the same industry as reported in a previous study (47.6%) [24].The table shows 2 the results of the Anova test: the F value is 3.573 and the sig value is 0.009, far above 0.05, indicating the extent of carbon emissions reporting is different across industry sectors. Table 2 shows the descriptive statistics of the variables used for the regression analysis. The table displays the EP category range from 0 to 3 based on the color of the PROPER rating and ISO certification. The blue PROPER rating (32.4%) comes in second p lace to the ISO certification category (48%), which has the highest percentage of EP. The lowest percentage is in the gold PROPER rating (6.9%). 2.2 Results of the linier regression analysis Table 3 presents 2 the results of the multiple regression test. As shown in the table, CAED is positively associated with firm value at the 5% level. It

indicates that CAED tends to enhance a firm's reputation in the eyes of investors, which in turn increases its v alue. The results are in line with signaling theory, where CAED is good news from the management to the shareholder, and shareholders react to the news with an increase in share price. The results are consistent with previous studies in China [2,7] and Indonesia [8], [10–13] . EP does not influence firm value. It implies that investors ignore the environmental management rating and certification achieved by the company. The results are consistent with previous studies in Indonesia, which used ISO certification only as a proxy for EP [8,10]. Table 3. Results of multiple regression analysis. B t Sig TOL FIV Constant 6.473 2.554 0.012 CAED 0.110 2.392 0.019 0.750 1.334 EP 0.006 0.044 0.965 0.874 1.145 Size -0.213 -2.338 0.021 0.755 1.324 Profit 2.409 2.502 0.014 0.913 1.096 F value & sig 3.177 0.017 Adjusted R2 0.116 Kolmogorov Smirnov sig 0.082 For the control variables, profitability positively affects firm value, while firm size negatively affects firm value. The negative relationship between firm size and firm value indicates investors perceive that firms with high assets possess high risk, which in turn reduces 2 the value of the firm. The findings are consistent with a previous s tudy that took companies receiving sustainability reporting awards as a sample [10]. The adjusted R2 value of 0.116 indicates that CAED, EP, Profit, and SIZE may predict only 11.6% of the variance that affects firm value, while the other 88.4% are affected by other variables that were not captured in the research model. The F sig suggests that the regression model is fit to the research data. 4 Conclusion This research aims to test 2 whether the level of carbon emissions disclosure differs by industry sector and to examine whether carbon emission disclosures as reported by companies in highly emitting industries and their environmental performance affect the value of the firm. Data analysis reveals that different industries produce different levels of greenhouse gas emission reporting. Carbon emission disclosures and profitability are good news for investors because they increase firm value. Meanwhile, environ mental performance does not affect firm value. Since the adjusted R2 is relatively low (11.6%), future studies may add variables 4 2 E3S Web of Conferences 467, 04002 (2023) https://doi.org/10.1051/e3sconf/202346704002 9th ICCC 2023

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to examine factors that impact on firm value. This article may provide insight to the management of a company that reporting policies and activities related to carbon emissions may increase the firm's reputation, which in turn increases its value. References

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