Carbon Performance and Information Disclosure on Market-Based and Accounting-Based Performance

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ABSTRACT

This paper aims to give empirical evidence on whether carbon performance and carbon information disclosure affect market-based performance and accounting-based performance. Market-based performance was proxied by Tobin's Q, whereas accounting-based performance was divided into two groups: financial performance was proxied by return on equity (ROE), and operating performance was proxied by return on assets (ROA) and return on sales (ROS). In this paper, data were collected from archival data: both primary and secondary data. Primary data were sustainability reports used to measure carbon performance and carbon information disclosure. Secondary data were the financial report and closing price at the capital market to measure Tobin's Q, ROE, ROA, and ROS. The sample was collected using the purposive sampling method, with a total of 154 companies during 2016–2021. The results of this research showed that carbon performance does not influence both economic performance and operating performance. However, carbon performance positively and significantly influences financial performance. Conversely, carbon index disclosure can positively and significantly influence economic performance and operating performance, but carbon index performance does not influence financial performance.

Keywords: carbon performance, carbon information disclosure, market-based performance, accounting-based performance.

1. INTRODUCTION

On the basis of the analyses of the Carbon Brief cited by Kompas.com on April 3, 2022, Indonesia is number 5 after the US, China, Russia, and Brazil. There has been air pollution due to mining dust arising from industrial activities in East Halmahera, North Maluku Province. This pollution causes respiratory problems in residents in East Halmahera (Lumbanrau, 2021).

Greenhouse gas emissions are a global concern because these emissions are the cause of climate change in both developing and developed countries. Indonesia has participated in signing the Paris Agreement in 2016 and the policy issued by the Financial Services

Authorization obliging companies or the industrial sector to report sustainability reports on an annual basis. It is hoped that with this policy, industrial awareness in making sustainable decisions is based on the concern for the sustainability of the natural and social environment. However, average companies report that carbon emission is below 50% (Setiany *et al*., 2022). It indicates that the Indonesian industrial sector does not recognize the significance of carbon emission and climate change challenges. It is also showing that Indonesian businesses and their governing bodies are not currently concerned with tackling sustainability.

Many stakeholders consider environmental aspects in the operational activities of a company. According to BNP Paribas Global Survey, investor interest in ESG-based products has increased by 20% since the Covid-19 pandemic. Moreover, 79% of respondents agreed that the social aspect would positively affect the long-term investment of its risk management fund (Sari, 2021). Mostinvestors, especially the younger generation, are interested in sustainable investment (Nurmutia, 2022). Indonesian citizens are also aware of environmental issues based on a survey conducted by Katadata Insight Center in 2021, stating that customers are willing to pay more for eco-friendly products (Alika, 2021). On the basis of the Bloomberg data reported by the Indonesian Business Daily, the SRI KEHATI index hasincreased by 59.25% from its lowest point in 2020 due to the pandemic until the end of the year. The increase was higher than that of IHSG, which increased by 51.84% in the same period (Noviani & Tari, 2021). It shows that investors are more interested in investing and value companies that pay attention to the ESG aspects of corporate governance in their business activities.

President Jokowi ratified Presidential Regulation No. 98 of 2021 regarding the Implementation of Carbon Economic Value for Achieving Nationally Determined Contribution Targets and Control of Greenhouse Gas Emissions in National Development (PR 98/2021) on October 29, 2021. For Indonesia's climate change policies, PR 98/2021 has become a game-changer, especially in the government's effort to regulate the carbon trading system and develop a sustainable green economy. PR 98/2021 becomes an important legal basis for the government's efforts to meet Indonesia's Nationally Determined Contribution, which is 29% independently and 41% with international collaboration by 2030. Indonesia's efforts in reducing carbon emissions can also be observed from the implementation of the carbon tax on July 1, 2022 (Kementrian Keuangan, 2022).

A lower carbon emission will increase carbon performance (Yan *et al*., 2020). Carbon performance describes the activities of companies to reduce their carbon emission when running their managerial activities. Carbon performance is positively correlated with market value (Ziping & Genzhu, 2018). Therefore, the government, companies, and public in Indonesia must make eco-design, laws and regulations, and waste management that are the most important criteria to achieve sustainable development.

A company's responsibility for the environment is closely related to the company's business sustainability. Companies that disclose carbon emissions and have a green strategy tend to increase public trust in the company and increase intangible assets and firm value. Carbon emission disclosure is voluntary. A lot of countries state that this disclosure is voluntary, such as the US (Adhikari & Zhou, 2022; Beauchamp & Cormier, 2022; Datt

et al., 2019; Matsumura *et al*., 2014; Luo & Tang, 2014), Canada (Beauchamp & Cormier, 2022), UK (Luo & Tang, 2014; Alsaifi *et al*., 2019; 2020), Australia (Luo & Tang, 2014), France (Mardini & Lahyani, 2022), Italy (Jaggi *et al*., 2018), Indonesia (Setiany *et al*., 2022), Japan (Saka & Oshika, 2014), and South Africa (Cordova *et al.*, 2021; Ganda, 2018; Ganda & Milondzo, 2018).

The active disclosure of carbon information by companies signals their active fulfillment of social responsibility in the eyes of investors. In China, there is China's decoupling index. Cao *et al.* (2023) showed that carbon intensity ranks number 2 of the factors that influence China's decoupling index, such as scoring economic growth, carbon intensity, industrialization, energy consumption structure, and consumer price index.

The impacts of carbon performance and carbon information disclosure on firm value are already researched by some authors. Yan *et al.* (2020) documented that carbon performance and carbon information disclosure have a significant positive impact on corporate value. Ziping & Genzhu (2018) found that carbon performance positively correlates to the value of the firm in the capital market. Meanwhile, Sun *et al.* (2022) documented that carbon dioxide emission can negatively affect firm value but voluntary carbon information positively affects firm value. Choi *et al.* (2021) documented that carbon emissions and carbon information disclosure are negatively correlated with market value. The research conducted in Indonesia by some researchers, such as Alfayerds & Setiawan (2021), found that carbon emission disclosure positively affects firm value. Meanwhile, Rachmawati (2021) showed that carbon emission disclosure does not affect firm value. Asyifa & Burhany (2022) documented that carbon emission disclosure negatively affects firm value.

This study has some motivations. First, the results of the last studies are still inconsistent. Second, no studies combine the effect of carbon performance and carbon emission disclosure on market and accounting performance. On the basis of the study by Kuo *et al.* (2022), operating performance as a part of accounting performance is affected by sustainable development, such as waste management. Third, there is a phenomenon that both the international and Indonesian communities want to reduce carbon emissions. Fourth, Setiany *et al.* (2022) suggested that applicable government measures regarding climate change are not yet effective.

This study has some contributing theories regarding the influence of carbon performance and carbon emission disclosure on market and accounting companies. Some studies are more focused on manufacturing companies. This study focuses on both manufacturing and nonmanufacturing companies. This research is expected to encourage companies to improve carbon performance and disclose carbon emission. In addition, the results of this study are expected to be additional information for investors to consider carbon performance and carbon emission disclosure in making investment decisions. The results of this study are expected to support the Financial Services Authority Regulation in Indonesia (POJK) No 51/POJK.03/2017, which requires financial service institutions, issuers, and public companies to implement sustainable financing.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1. Grand Theories

Rankin *et al.* (2023) suggested that the stakeholder theory states that organizations must consider how their operations affect stakeholders and should not only focus on maximizing profit for the benefit of owners. According to the stakeholder theory, companies create corporate policy and carry out strategic decisions in response to the needs of both their internal and external partners (Ganda, 2018). The stakeholder theory emphasizes how the corporation responds to internal and external partners' interests to survive.

According to Soobaroyen & Ntim (2013), the legitimacy theory attempts to describe the interaction between an organization and society. To preserve and improve organizational legitimacy as well as to address societal concerns carbon performance (CP) and CD and their connection to climate change, disclosure is a necessary step in the process of expressing this alignment (Soobaroyen & Ntim, 2013; Patten, 2015). According to scholars studying the legitimacy theory, social and environmental disclosures are a valid instrument that a company can employ to increase its credibility to the public (Patten, 2015). According to the legitimacy theory, a firm's exposure to stakeholder pressure in the social, political, and regulatory settings determines the level of disclosure (Datt *et al.*, 2019). Legitimacy is a broad perspective in which corporate activities are identified as acceptable and compatible with society's beliefs, values, meanings, and norms (Ganda, 2018).

The organizational aspect of economic governance is where the institutional theory traces the connections between a corporation and society (Brammer *et al.*, 2012). The institutional theory emphasizes corporate consciousness in accepting socially acceptable values, norms, and meanings. The theory posits that organizations are affected by broader societal frameworks, including governmental policies, industry standards, and nonprofit groups that keep on monitoring corporate behavior.

The signaling theory suggests that the CP perceived by investors and stakeholders is value added. According to Datt *et al.* (2019), investors and stakeholders only learn regarding a company's CP through its voluntary disclosure. They then reward or penalize companies with good or poor CP, which has an impact on the value of the company and management compensation. The findings are in line with those of Clarkson *et al.* (2008), who suggested that firms are likely to provide more voluntary environmental information such as carbon emission disclosure to investors and other decision-makers to signal their superior type.

2.2. Carbon Emission

Carbon emissions are the total greenhouse gas emissions caused directly and indirectly by people, organizations, events, or products. Greenhouse gases contribute to the greenhouse effect that has caused global climate change. Emissions of CO_2e are based on the some GHGs identified by the Kyoto Protocol, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). Company emission intensity is usually reported in mass units of CO_2 equivalent (CO_2e), for example, tons of CO_2e or kg of CO_2e (Funk, 2020). Companies usually generate emissions from their supply chain, through their operations, to the products/services that they manufacture and distribute.

2.3. Carbon Performance and Information Disclosure

CP describes quantitative emissions from managerial activity that deals with carbon emissions (Velte *et al.*, 2020). One of the methods to measure CP is carbon intensity. According to Funk (2020), carbon intensity can then be calculated by dividing emissions by a relevant measure of activity. These activities can be calculated from either using revenue as a common economic denominator or using sector-specific physical production units. Thomas & Onodi (2023) suggested that carbon intensity using the economic perspective is more suitable for cross-sectoral analysis and more reflects the carbon efficiency of individual companies.

Carbon emission disclosure is a collection of information of a quantitative and qualitative nature on the past and predictions of the company regarding the level of the company's carbon emissions (Anggraeni, 2015). There was a demand from the environment, business, and politics for companies to respond to the threats caused by extreme global warming (Choi *et al.*, 2013). The information can be a positive signal for the stakeholders as the companies have voluntarily disclosed the information needed by the stakeholders.

2.4. Market-Based and Accounting-Based Performance

ROE, ROA, and ROS were the accounting-based measures, and Tobin's Q represents the market-based performance. ROE reveals a company's profitability. ROA serves as a gauge for a company's profitability to evaluate the effectiveness of the business to operate its assets. ROS is a ratio used to evaluate the operational effectiveness of businesses. Tobin's Q shows how much the company is worth in the market.

2.5. Past Research

Saka & Oshika (2014) found that corporate carbon emissions have a negative correlation with stock market value and carbon management disclosure has a positive correlation with equity market value in Japanese. The positive correlation between carbon management disclosure and equity market value is stronger with higher levels of corporate carbon emissions. On the basis of a sample of 474 American, British, and Australian companies, Luo & Tang (2014) documented a positive relationship between carbon disclosure and performance. Carbon Disclosure Project (CDP) is a reliable indicator for CP. Anggraeni (2015) showed that carbon information disclosure has a positive impact on firm value in Indonesia. Ziping & Genzhu (2018) showed that CP is not only significantly positively correlated with market value in the capital market but also significantly correlated with financial performance in the product market.

Alfayerds & Setiawan (2021) showed that carbon emission disclosure has a positive influence on firm value. Rachmawati (2021) showed that carbon emission disclosure has no effect on firm value. Setiany *et al.* (2022) documented that only media exposure and company size can positively influence carbon disclosure in Indonesia in the manufacturing industry. Yan *et al.* (2020) showed that CP and carbon information disclosure have a positive effect on firm value. Cordova *et al.* (2020) studied CO_2 and CSR in Asia, the US, and Africa, documenting that direct and indirect emissions are significantly positively influenced by CSR, the CSR committee, board size, and policy. CSR also positively affects the overall CO_2 emissions. Busch *et al.* (2022) showed that CP negatively affects short-

term and long-term financial performances.

Adhikari & Zhou (2022) found that the market responds to the first publication of carbon emission levels by narrowing the relative bid-ask spread. The highest reduction in bid-ask spreads is only experienced by firms that participate and supply comprehensive information. Beauchamp & Cormier (2022) conducted research in US and Canadian firms. They provided evidence that embedded CO_2 significantly lowers stock market value and confirm reserves companies improve the firm's value.

Alsaifi *et al.* (2019) documented that voluntary carbon disclosure is positively correlated with firms' financial success for the top FTSE 350 firms. Pitrakkos & Maroun (2020) documented that high-carbon firms are potentially more likely to disclose environmental information regarding greenhouse gas emissions and climate change in terms of quantity and quality than low-carbon firms in South African companies. According to Ganda (2018), CP has a favorable impact on both return on equity (ROE) and return on sales (ROS) in the Republic of South Africa. However, CP has a negative impact on both return on investment (ROI) and market value added. Ghose *et al.* (2023) documented that in India, carbon productivity positively effect on businesses' financial performance (market-based measure). but carbon productivity does not influence on financial performance (accounting-based measure). It suggests that cutting back on carbon emissions and boosting carbon productivity give a competitive advantage for companies, which enhance their financial performance. Carbon productivity has a higher positive impact on high-carbon-intensive industry firms than low-carbon-intensive sectors. Ganda & Milondzo (2018) documented a negative correlation between carbon emission intensity and accounting-based firm performance (ROE, ROI, and ROS) in South African companies.

According to Jaggi *et al.* (2018), greenhouse gas disclosure had a positive effect on the stock price of Italian companies and a positive correlation between greenhouse gas emissions and Tobin Q. Datt *et al.* (2019) demonstrated that high-carbon performers advertise their real type by disclosing more significant carbon items reducing greenhouse gas emissions, external verification, and carbon accounting on the biggest US firms. Alsaifi *et al.* (2020) documented that the market reacts negatively to carbon disclosure announcements in the UK. Das (2023) documented that a low-carbon product design positively influences a firm's competitiveness and economic performance in Indian manufacturing companies. For 49 Turkish companies, Kalash (2021) showed that CDP significantly affected leverage, ROA, operating profitability, and ROE but CDP did not affect stock market performance. Makan & Kabra (2021) documented a positive correlation between carbon emission reduction measures and financial performance in India. Wang *et al.* (2021) documented that carbon efficiency has a positive impact on short- and long-term financial performances but a negative impact on total the sum of systemic and non-systemic risks in Chinese companies. de Lima *et al.* (2022) documented no differences in the financial performance of carbon-efficient enterprises using cluster analysis in the Brazilian Stock Exchange Index.

Cormier & Beauchampp (2021) found that the market value of a company is negatively affected by the disclosure of embedded CO_2, which reflects long-term environmental problems. The value of the stock market is also negatively correlated with the disclosure of annual CO_2 emissions, which indicate short-term environmental threats. Desai *et al.*

(2022) documented the negative impact of carbon emissions on Indian enterprises' accounting-based financial performance (ROA) and market-based financial performance (Tobin's Q). Alkurdi *et al.* (2023) documented that carbon emission performance is negatively correlated with board gender diversity, audit committee independence, expertise, and attendance in European companies. Board size has a positive correlation with carbon emission performance. Siddique *et al.* (2023) found that market-based policies positively affect corporate CP. Rahman *et al.* (2023) documented that corporate carbon emissions are negatively correlated with power distance and the uncertainty avoidance, but individualism and masculinity are positively correlated in 39 different nations.

2.6. Hypothesis Development

2.6.1. Effect of CP on Market-Based Performance (economic) and Accounting-Based Performance (operating and financial)

CP describes quantitative emissions from managerial activities that deal with carbon emissions (Velte *et al*., 2020). A lower carbon emission will increase CP (Yan *et al*., 2020). A good CP will be a competitive advantage, such as increasing enterprise value.

Companies can legitimize their actions by improving CP, which shows that the company cares regarding reducing emissions in its operational activities. When a company focuses on reducing carbon emissions, it will minimize the impact of environmental damage. The signaling theory focuses on the importance of the information produced by a company with investment decision parties outside the company. This theory is in line with the results of the studies conducted by Yan *et al.* (2020), Ziping & Genzhu (2018), and Ganda (2018) which stated that CP has a positive influence on firm value. Therefore, the hypothesis is as follows:

H_{a1}: *Carbon performance has a positive effect on economic performance.*
H_{a2}: *Carbon performance has a positive effect on financial performance.*
H_{a3}: *Carbon performance has a positive effect on operating performance.*

2.6.2. Effect of carbon information disclosure on market-based and accounting-based performance (economic, operating, and financial performance)

Carbon emission disclosure is a collection of information of a quantitative and qualitative nature on the past and predictions of the company regarding the level of the company's carbon emissions, as well as disclosures, explanations, and implications (Anggraeni, 2015). Companies that disclose carbon emissions and have a green strategy tend to increase public trust in the company and increase intangible assets and firm value.

On the basis of the stakeholder theory, organizational management is expected to carry out activities considered important by their stakeholders and report to stakeholders. Because climate change is becoming an important issue in society, society has pushed (directly and indirectly) firms to disclose environmental information. Because investors evaluate related information, firms are motivated to disclose information voluntarily to access high-quality resources. Carbon emission disclosure is a form of accountability carried out by the company to all stakeholders. Therefore, disclosing carbon emissions will add a competitive advantage to obtain stakeholder support that could increase enterprise value.

Companies can legitimize their actions by disclosing carbon emissions that provide information related to the company's operating activities that affect its environment. Companies that gain legitimacy are likely to improve their image and reputation in the eyes of the stakeholders, which will affect the company's value.

In addition, the signaling theory focuses on the importance of the information produced by a company with investment decision parties outside the company. Disclosing carbon emissions can signal investors because it shows a company's seriousness in solving existing environmental issues. This positive signal will certainly get a positive response from the stakeholders, especially shareholders, which will improve the trust of shareholders and prospective shareholders in the company to increase stock prices and company value.

This theory is in line with the results of the studies conducted by Yan *et al.* (2020), Hardiyansah *et al.* (2021), Alfayerds & Setiawan (2021), and Anggraeni (2015), which stated that carbon information disclosure has a positive influence on firm value. Therefore, the hypothesis is as follows:

H_{a4}: *Carbon information disclosure has a positive effect on economic performance.*
H_{a5}: *Carbon information disclosure has a positive effect on financial performance.*
H_{a6}: *Carbon information disclosure has a positive effect on operating performance.*

3. RESEARCH METHODOLOGY

The sample was selected using criteria based on certain judgmentsor quotas (Hartono, 2017) including companies that are listed on the Indonesian Stock Exchange, issue financial statements and sustainability report, and disclose the amount of carbon/greenhouse gas emissions and carbon emissions (at least one item in carbon emission disclosure) issued in their sustainability report in 2016–2021.

Table 1. Total Research Samples

Information	2016	2017	2018	2019	2020	2021
Listed firms	541	570	622	671	716	770
Not inform carbon emissions	(525)	(549)	(584)	(611)	(656)	(709)
	16	21	38	60	60	61
Outlier	(6)	(8)	(17)	(19)	(22)	(25)
Sample	10	13	21	41	38	36
Total observations			**159**			

The dependent variable used in this study was firm performance, such as market performance (economic (Tobin's Q)), accounting performance (financial (ROE)), and operating performance (ROA and ROS).

$$Tobin's\ Q = \frac{(number\ of\ outstanding\ shares\ x\ price\ of\ shares) + total\ liability}{total\ liability + total\ equity} \tag{1}$$

$$ROE = \frac{Net\ Income}{Total\ Equity} \tag{2}$$

$$ROA = \frac{Net\ Income}{Total\ Assets} \tag{3}$$

$$ROS = \frac{Net\ Income}{Total\ Sales} \tag{4}$$

The independent variables in this study were CP and carbon information disclosure (CID). One of the methods used to measure CP is carbon intensity. According to Funk (2020), carbon intensity can then be calculated by dividing emissions by a relevant measure of activity. CP measured by carbon intensity. This study follows Yan *et al.* (2020) to measure CP.

$$Carbon\ Performance = \frac{1}{\left(\frac{Corporate\ carbon\ emissions}{Business\ income}\right)} \tag{5}$$

Carbon emission disclosure was measured using a content analysis method. This method used a carbon emission checklist adopted from the studies conducted by Choi *et al.* (2013) and Setiany *et al.* (2022). The checklist was developed based on a questionnaire sent by the CID consisting of five major disclosure groups: climate change, greenhouse gas emission, energy consumption, greenhouse gas emission reduction and cost, and carbon emission accountability. Each disclosure group was further broken down into 18 acquisition items. The weighting formula of this index is as follows:

$$CID = \frac{Number\ of\ scores\ of\ entity\ i\ in\ period\ t}{Maximum\ total\ number\ of\ scores}\ x\ 100\% \tag{6}$$

According to Hartono (2017), a control variable is a variable that is used to supplement or control causal relationships to obtain a more complete and better empirical model. Revenue growth shows the company's performance in the current year compared to that in the previous year (Sukamulja, 2019).

Sales growth is used by many parties, such as company owners, investors, creditors, or other parties, to see a company's prospects. By looking at sales data from the past, the company can optimize existing resources to develop the value of the company. Investors can also use sales growth data to project the company's profits in the future (Khoeriyah, 2020).

$$Revenue\ Growth\ Rate = \frac{Revenue\ year\ n - Revenue\ year\ (n-1)}{Revenue\ year\ (n-1)} \tag{7}$$

According to Atiningsih & Wahyuni (2020), the size of an enterprise is the scale for measuring the company's size, total assets, stock market value, number of employees, and others. Investors pay great attention to the size of companies because large companies can guarantee more returns than those of small companies. That is why a larger size of the company will closely relate to funding decisions to be implemented by the company to optimize the enterprise's value (Suwardika & Mustanda, 2017). The size of a company can be measured by the following:

$$Company's\ Size = Ln\ (Total\ Assets) \tag{8}$$

The leverage ratio is a type of ratio that measures a company's financial risk in the long term (Sukamulja, 2019). Leverage can increase yield profit when such debts are used for asset financing. If the assets of the company increase, the company will produce greater

profit from the sale of assets (Yulimtinan & Atiningsih, 2021). This will increase the attractiveness of the company to investors to buy company shares by looking at the effectiveness of company funding so that it will affect the increase in the company's value.

$$Debt\ to\ Assets\ Ratio = \frac{Total\ Liability}{Total\ Assets} \qquad (9)$$

Multiple regression analysis tools are used to test the hypothesis. The regression equation is as follow:

$$Tobin's\ Q_{it} = \alpha + \beta_1 CP_{it} + \beta_2 CID_{it} + \beta_3 GROWTH_{it} + \beta_4 SIZE_{it} + \beta_5 Lev_{it} + e_{it} \qquad (10)$$
$$ROE_{it} = \alpha + \beta_1 CP_{it} + \beta_2 CID_{it} + \beta_3 GROWTH_{it} + \beta_4 SIZE_{it} + \beta_5 Lev_{it} + e_{it} \qquad (11)$$
$$ROA_{it} = \alpha + \beta_1 CP_{it} + \beta_2 CID_{it} + \beta_3 GROWTH_{it} + \beta_4 SIZE_{it} + \beta_5 Lev_{it} + e_{it} \qquad (12)$$
$$ROS_{it} = \alpha + \beta_1 CP_{it} + \beta_2 CID_{it} + \beta_3 GROWTH_{it} + \beta_4 SIZE_{it} + \beta_5 Lev_{it} + e_{it} \qquad (13)$$

4. RESULTS AND ANALYSIS

The results of the descriptive statistics, correlation, and regressions of the study with a total of 159 observations are presented in the following tables.

Table 2. Descriptive Statistics

Variable	Observations	Mean	SD	Min	Max
CP	159	7.617	0.940	4.450	9.970
CID	159	0.583	0.302	0.00	1.00
Growth	159	0.081	0.308	-0.49	1.88
Size	159	30.934	1.341	28.24	35.06
Lev	159	0.573	0.231	0.11	1.90
Tobin's Q	159	0.908	0.288	0.22	2.11
ROE	159	0.069	0.075	-0.12	0.29
ROA	159	0.029	0.033	-0.40	0.14
ROS	159	0.138	0.121	-0.23	0.49

Table 3. Correlation Results

	CP	CID	Growth	Size	Lev	Tobin's Q	ROE	ROA	ROS
CP		-0.105	-0.079	0.151*	-0.009	-0.070	0.173**	0.035	0.060
CID	-0.105		-0.061	0.209***	-0.021	0.212***	-0.029	0.029	0.181**
Growth	-0.079	-0.061		0.120	0.014	0.027	0.305***	0.224***	0.199**
Size	0.151*	0.209***	0.120		0.449***	0.138*	0.118	-0.143*	0.344***
Lev	-0.009	-0.021	0.014	0.449***		0.420***	0.067	-0.223***	-0.058
Tobin's Q	-0.070	0.212***	0.027	0.138*	0.420***		0.225***	0.196*	0.069
ROE	0.173**	-0.029	0.305***	0.118	0.067	0.225***		0.821***	0.597***
ROA	0.035	0.029	0.224***	-0.143*	-0.223***	0.196*	0.821***		0.488***
ROS	0.060	0.181**	0.199**	0.344***	-0.058	0.069	0.597***	0.488***	

Note: The level of stat*** significant at alpha 1%, ** significant at alpha 5%, and * significant at alpha 10%.

Table 4. Tobin's $Q_{it} = \alpha + \beta_1 CP_{it} + \beta_2 CID_{it} + \beta_3 GROWTH_{it} + \beta_4 SIZE_{it} + \beta_5 Lev_{it} + e_{it}$

Variables	Column 1	Column 2	Column 3	Column 4	Column 5	
Constant	1.072***	0.789***	1.093**	1.351***	0.811*	
CP	-0.022		-0.017		0.015	Ha1 no supported
CID		0.203***		0.244***	0.219***	Ha4 supported
Growth			0.555***	0.610***	0.041	
Size			0.022	0.049	-0.028	
Leverage			-0.012	-0.030*	0.608***	
Adj. R^2	-0.001	0.039	0.162	0.221	0.186	
F-Test	0.782	7.389***	8.629***	12.205***	8.195***	

Note: The level of stat*** significant at alpha 1%, ** significant at alpha 5%, and * significant at alpha 10%.

Table 5. $ROE_{it} = \alpha + \beta_1 CP_{it} + \beta_2 CID_{it} + \beta_3 GROWTH_{it} + \beta_4 SIZE_{it} + \beta_5 Lev_{it} + e_{it}$

Variables	Column 1	Column 2	Column 3	Column 4	Column 5	
Constant	-0.037	0.073	-0.114	-0.070	-0.075	
CP	0.014**		0.016**		0.019***	Ha2 supported
CID		-0.007		-0.007	0.019	Ha5 no supported
Growth			0.017***	0.009	0.082***	
Size			0.077	0.072***	-0.001	
Leverage			0.002	0.004	0.022	
Adj. R^2	0.024	-0.006	0.114	0.078	0.108	
F-Test	4.836**	0.132	6.088***	4.329***	4.841***	

Note: The level of stat*** significant at alpha 1%, ** significant at alpha 5%, and * significant at alpha 10%.

Table 6. $ROA_{it} = \alpha + \beta_1 CP_{it} + \beta_2 CID_{it} + \beta_3 GROWTH_{it} + \beta_4 SIZE_{it} + \beta_5 Lev_{it} + e_{it}$

Variables	Column 1	Column 2	Column 3	Column 4	Column 5	
Constant	0.019	0.027***	0.102	0.119*	0.122*	
CP	0.001		0.002		0.004	Ha3 no supported
CID		0.003		0.007	0.014	Ha6 no supported
Growth			-0.026	-0.026**	0.029***	
Size			0.027	0.026***	-0.004*	
Leverage			-0.003	-0.003	-0.020	
Adj. R^2	-0.005	-0.006	0.089	0.088	0.221	
F-Test	0.189	0.134	4.853***	4.816***	12.205***	

Note: The level of stat*** significant at alpha 1%, ** significant at alpha 5%, and * significant at alpha 10%.

The results in Table 4 show that in both univariate (columns 1 and 2) and multivariate (columns 3, 4, and 5) analyses, CP does not affect Tobin's Q. Meanwhile, carbon disclosure has a positive effect on Tobin's Q. The results in Table 5 show that in both univariate (columns 1 and 2) and multivariate (columns 3, 4, and 5) analyses, CP has a positive effect on ROE. Meanwhile, carbon disclosure has no effect on ROE. The results in Table 6 show that in both univariate (columns 1 and 2) and multivariate (columns 3, 4, and 5) analyses, neither CP nor carbon disclosure has any effect on ROA. The results in Table 7 show that

in both univariate (columns 1 and 2) and multivariate (columns 3, 4, and 5) analyses, CP has no effect on ROS. Meanwhile, carbon disclosure has a positive effect on ROS.

Table 7. $ROS_{it} = \alpha + \beta_1 CP_{it} + \beta_2 CID_{it} + \beta_3 GROWTH_{it} + \beta_4 SIZE_{it} + \beta_5 Lev_{it} + e_{it}$

Variables	Column 1	Column 2	Column 3	Column 4	Column 5	
Constant	0.079	0.096***	-1.026***	-0.973***	-0.955***	
CP	0.008		0.001		0.009	Ha3 no supported
CID		0.072**		0.040	0.067**	Ha6 supported
Growth			-0.136***	-0.128***	0.065**	
Size			0.059**	0.063**	0.034***	
Leverage			0.040***	0.037***	-0.130***	
Adj. R^2	-0.003	0.026	0.176	0.186	0.181	
F-Test	0.574	5.288**	9.461***	10.006***	7.971***	

Note: The level of stat*** significant at alpha 1%, ** significant at alpha 5%, and * significant at alpha 10%.

Based on analysis data between 2016–2021, adjusted R^2 is 18.6% and F-test 8.195 significant at alpha 1% for model 5 in Table 4. Adjusted R^2 is 10.8% and F-test 4.841 significant at alpha 1% for model 5 in Table 5. Adjusted R^2 is 22.1% and F-test 12.205 significant at alpha 1% for model 5 in Table 6. Adjusted R^2 is 18.1% and F-test 7.971 significant at alpha 1% for model 5 in Table 7. These results indicate models of this study are fit.

This shows that the variable capabilities of CP, CID, and control variables in explaining the variation in company value change by 18.6%. F-test is significant at alpha 1%. It indicates that the empirical model is fit to be used to predict dependent variables (Tobin's Q, ROE, ROA, and ROS).

On the basis of the results in this study, CID positively significant influenced Tobin's Q. CP positively influenced ROE. CP and CID did not significantly influence ROA, but CID positively influenced ROS. The results of this study confirmed that Ha1 was not supported, Ha2 was supported, and Ha3 was not supported. It means that CP has no effect on economic performance. However, CP affects financial performance. Lastly, CP does not affect operational performance. The argument built on CP does not have a good effect on economic performance and operational performance because there is no standard for the results of carbon emissions that can be tolerated. It means that the minimum limit of CP has not been set by the regulator. No party has validated this CP. Is the size valid or invalid? The listed firms in Indonesian Stock Exchange report CP only based on their measurement. Until now, there is not guidance from regulator to measure CP. It does not elicit a good response from the short-term investors in the capital market or in other markets. In other markets, consumers are not yet sure of the CP produced by the company because no party has confirmed that this measure is a valid one.

The results of the economic and operational performance are different from those of previous researchers. Ziping & Genzhu (2018), Yan *et al.* (2020), Makan & Kabra (2021), Wang *et al.* (2021), Adhikari & Zhou (2022), Beauchamp & Cormier (2022), Ghose *et al.* (2023), and Das (2023) stated that CP has a positive effect on economic performance. But Saka & Oshika (2014), Busch *et al.* (2022), and Desai *et al.* (2022) found that CP has a

negative effect on economic performance. Ganda (2018) and Ghose *et al.* (2023) documented that CP has a positive effect on operational performance. But Ganda & Milondzo (2018) and Desai *et al.* (2022) stated that CP has a negative effect on operational performance. The result of financial performance is in line with Ganda (2018) but is different from Ganda & Milondzo (2018) found that CP has negative effect on financial performance.

However, shareholders who aim to have a long-term share investment appreciate company management. This achievement will clearly show the company's efforts to reduce carbon emissions. Good CP will meet social expectations and norms, thus gaining stakeholder support because investors are more interested in investing and valuing companies that pay attention to the environmental, social, and environmental (ESG) aspects. Improving CP will reduce energy consumption and waste discharge, will reduce product and environmental treatment costs, will help companies obtain sustained economic benefits, and will establish the image of green enterprises. This image gives consumers the impression of green environmental protection, and consumers are willing to spend more money on green products (Ziping & Genzhu, 2018).

The results in Table 5 confirmed that Ha4 was supported, Ha5 was not supported, and Ha6 was supported. These results are reversed by CP. These results explain that carbon emission disclosure can affect economic performance. Investors in capital market have more confidence in disclosing carbon emissions. The public believes more in carbon emission disclosure than carbon emission performance. This belief encourages the public to buy products produced by companies that are open regarding things related to carbon.

CID is good news for investors because CID indicates that companies commit to reducing carbon emissions. Therefore, investors positively react to the disclose. Environmental awareness is key to creating company sustainability. It will increase the company's image (Hardiyansah *et al.*, 2021). The results are in line with the previous studies conducted by Saka & Oshika (2014), Luo & Tang (2014), Anggraeni (2015), Yan *et al.* (2020), and Alfayerds & Setiawan (2021), which found that CID positively affects economic performance. However, the results are different from the previous studies conducted by Alsaifi *et al.* (2020) and Cormier & Beauchampp (2021), which documented that CID negatively influence on economic performance. Rachmawati (2021) and Kalash (2021) found that CID does not influence economic performance. This study found that CID does not influence financial performance. It is different from Jaggi *et al.* (2018) and Kalash (2021), which documented that CID has a positive effect on financial performance.

5. CONCLUSION

The results of the analysis showed that CP does not influence both economic performance and operational performance, but CP positively significantly influences financial performance. This conclusion contributes to literature such as Ganda (2018) documenting empirical evidence that CP positively influences financial performance in Republic of South Africa.

Conversely, carbon index disclosure can positively significantly influence economic performance and operational performance. This conclusion supports literature such as Saka & Oshika (2014), Luo & Tang (2014), Anggraeni (2015), Alfayerds & Setiawan (2021),

Yan *et al.* (2020).

This conclusion also supports grand theories such as stakeholder theory, legitimate theory, and signaling theory. It indicates that   the corporation has responded to internal and external partners' interests to survive. It also indicates corporate activities are acceptable and compatible with society's beliefs, values, and norms. The corporations also provide voluntary environmental information such as CP and CID to signal their concern to sustainability.

The limitation of this study is the subjectivity of the content analysis in CID measurement. The researcher also provides suggestions to future researchers for using multinational data to improve generalizability. Using the multinational data, researchers can compare carbon emission reduction in one country to that in other countries.

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REFERENCES

[1] Adhikari, A., Zhou, H. (2022), "Voluntary disclosure and information asymmetry: do investors in US capital markets care about carbon emission?", *Sustainability Accounting, Management and Policy Journal*, 13, 195-220.

[2] Alfayerds, W. D., Setiawan, M. A. (2021), "Pengaruh Pengungkapan Emisi Karbon dan Annual Report Readability terhadap Nilai Perusahaan", *Jurnal Eksplorasi Akuntansi*, 3, 349–363.

[3] Alika, R. (2021), "Survei KIC: Konsumen Bersedia Bayar Mahal untuk Produk berkelanjutan", *katadata.co.id.* https://katadata.co.id/yuliawati/ekonomi-hijau/612499e309ba9/survei-kic-konsumen-bersedia-bayar-mahal-untuk-produk-berkelanjutan.

[4] Alkurdi, A., Al Amosh, H. Khatib, S.F.A. (2023), "The mediating role of carbon emissions in the relationship between the board attributes and ESG performance: European evidence", *EuroMed Journal of Business*, Vol. ahead-of-print No. ahead-of-print.

[5] Alsaifi, K., Elnahass, M., Salama, A. (2019), "Carbon disclosure and financial performance: UK environmental policy", *Business Strategy and the Environment*, 29, 711-726.

[6] Alsaifi, K., Elnahass, M., Salama, A. (2020), "Market responses to firms' voluntary carbon disclosure: empirical evidence from the United Kingdom", *Journal of Cleaner Production*, 262, 1-11.

[7] Anggraeni, D. Y. (2015), "Pengungkapan Emisi Gas Rumah Kaca, Kinerja Lingkungan, Dan Nilai Perusahaan", *Jurnal Akuntansi dan Keuangan Indonesia*, 12, 188–209.

[8] Asyifa, D. A., Burhany, D. I. (2022), "Carbon Emission Disclosure and Environmental Performance Effect on Firm Value", *International Journal of Arts and Social Science*, 5, 193-203.

[9] Atiningsih, S., Wahyuni, A. N. (2020), "Pengaruh Firm Size, Sales Growth, Struktur Aset dan Profitabilitas Terhadap Nilai Perusahaan dengan Struktur Modal

sebagai Variabel Intervening", *Jurnal STIE Semarang*, 12, 47–68.

[10] Beauchamp, C., Cormier, D. (2022), "Corporate disclosure of CO2 embedded in oil and gas reserves: stock market assessment in a context of global warming", *Managerial Finance*, 48, 1689-1706.

[11] Brammer, S., Jackson, G., Matten, D. (2012), "Corporate social responsibility and institutional theory: new perspectives on private governance", *Socio-Economic Review*, 10, 3-28.

[12] Busch, T., Bassen, A., Lewandowski, S., Sump, F. (2022), "Corporate Carbon and Financial Performance Revisited. *Organization & Environment*, 35, 154–171.

[13] Cao, Y., Chaiwan, A., Chaiboonsri, C. (2023), "The Effects of Industrialization and Economic Growth on Sustainable Development Decoupling in China", *Review of Integrative Business and Economics Research*, 12, 103-118.

[14] Choi, B., Luo, L., Shrestha, P. (2021), "The value relevance of carbon emissions information from Australian-listed companies", *Australian Journal of Management*, 46, 3-23.

[15] Choi, B.B, Lee, D. and Psaros, J. (2013), "An analysis of Australian company carbon emission disclosures", *Pacific Accounting Review*, 25, 58-79.

[16] Clarkson, P., Li, Y., Richardson, G., Vasvari, F. (2008), "Revisiting the relation between environmental performance and environmental disclosure: an empirical analysis", *Accounting, Organizations and Society*, 33, 303-327.

[17] Cordova, C., Grima, A.Z., and Merello. P. (2021), "Contextual and corporate governance effects on carbon accounting and carbon performance in emerging economies", *Corporate Governance*, 21, 536-550.

[18] Cormier, D., Beauchamp, C. (2021), "Market incidence of carbon information disclosure in the oil and gas industry: the mediating role of financial analysts and governance", *Journal of Financial Reporting and Accounting*, 19, 901-920.

[19] Das, C. (2023), "Analyzing the effect of low carbon product design on firm performance", *International Journal of Productivity and Performance Management*, 72, 180-199.

[20] Datt, R.R., Luo, L., Tang, Q. (2019), "Corporate voluntary carbon disclosure strategy and carbon performance in the USA", *Accounting Research Journal*, 32 No. 3, 417-435.

[21] de Lima, C.R.M., Barbosa, S.B., de Castro, S. N. R., Bazil, D.G., de Andrade G. J.B.S.O. (2022), "Corporate financial performance: a study based on the Carbon Efficient Index (ICO2) of Brazil stock exchange", *Environment, Development and Sustainability*, 24, 4323-4354.

[22] Desai, R., Raval, A., Baser, N., Desai, J. (2022), "Impact of carbon emission on financial performance: empirical evidence from India", *South Asian Journal of Business Studies*, 11, 450-470.

[23] Funk, C. M. (2020), "Carbon Footprinting: An Investor Toolkit", *State Street Global Advisors*, 1-12.

[24] Ganda, F. (2018), "The effect of carbon performance on corporate financial performance in a growing economy", *Social Responsibility Journal*, 14, 895-916.

[25] Ganda, F., Milondzo, K.S. (2018), "The impact of carbon emissions on corporate financial performance: evidence from the South African Firms", *Sustainability*, 10, 1-22.

[26] Ghose, B., Makan, L.T., Kabra, K.C. (2023), "Impact of carbon productivity on firm performance: moderating role of industry type and firm size", *Managerial*

Finance, 49, 866-883.

[27] Hardiyansah, M., Agustini, A.T., Purnamawati, I. (2021), "The Effect of Carbon Emission Disclosure on Firm Value: Environmental Performance and Industrial Type", *Journal of Asian Finance, Economics and Business*, 8, 123-133.

[28] Hartono, J. (2017), "*Metode Penelitian Bisnis: Salah Kaprah dan Pengalaman-Pengalaman*", (Edisi 6). Yogyakarta: BPFE UGM.

[29] Jaggi, B., Allini, A., Macchioni, R., Zampella, A. (2018), "Do investors find carbon information useful? Evidence from Italian firms", *Review of Quantitative Finance and Accounting*, 50, 1031-1056.

[30] Kalash, I. (2021), "The impact of environmental performance on capital structure and firm performance: the case of Turkey", *Society and Business Review*, 16, 255-277.

[31] Kementrian Keuangan. (2022), "Terapkan Pajak Karbon 1 Juli 2022, Pemerintah Siapkan Aturan Teknis Pelaksanaan", https://www.kemenkeu.go.id/informasi-publik/publikasi/berita-utama/terapkan-pajak-karbon-1-juli-2022-pemerintah.

[32] Khoeriyah, A. (2020), "Pengaruh Ukuran Perusahaan, Leverage, Sales Growth Dan Investment Opportunity Set Terhadap Nilai Perusahaan", *Profita: Komunikasi Ilmiah Akuntansi dan Perpajakan*, 13, 96-111.

[33] Kuo, Y.C., Wu,Y.M., Liu, Y. X. (2022), "Identifying Key Factors for Sustainable Manufacturing and Development", *Review of Integrative Business and Economics Research*, 11, 30-50.

[34] Lumbanrau, R.E. (2021), "Di mana ada tambang di situ ada penderitaan dan kerusakaan lingkungan, nelangsa warga dan alam lingkar tambang", *BBC News Indonesia*. https://www.bbc.com/indonesia/indonesia-57346840

[35] Luo, L., Tang, Q. (2014), "Does carbon disclosure reflect underlying carbon performance?", *Journal of Contemporary Accounting and Economics*, 10, 191-205.

[36] Makan, L.T., Kabra, K.C. (2021), "Carbon emission reduction and financial performance in an emerging market: empirical study of Indian Firms", *Indonesian Journal of Sustainability Accounting and Management*, 5, 23-32.

[37] Mardini, G.H., Lahyani, F.E. (2022), "Impact of foreign directors on carbon emissions performance and disclosure: empirical evidence from France", *Sustainability Accounting, Management and Policy Journal*, 13, 221-246.

[38] Matsumura, E.M., Prakash, R., Vera-Munoz, S.C. (2014), "Firm-value effects of carbon emissions and carbon disclosures", *The Accounting Review*, 89, 695-724.

[39] Noviani, A., Tari, D. N. (2021), "Investor Makin Tertarik Investasi di Saham Berbasis ESG", *Bisnis Indonesia*. https://bisnisindonesia.id/article/investor-makin-tertarik-investasi-di-saham-berbasis-esg.

[40] Nurmutia, E. (2022), "BNP Paribas Sebut Minat Generasi Muda Investasi Berkelanjutan Tumbuh Pesat", *Liputan6.com*. https://www.liputan6.com/saham/read/4985768/bnp-paribas-sebut-minat-generasi-muda-investasi-berkelanjutan-tumbuh-pesat.

[41] Patten, D. (2015), "An insider's reflection on quantitative research in the social and environmental disclosure domain", *Critical Perspectives on Accounting*, 32, 45-50.

[42] Pitrakkos, P., Maroun, W. (2020), "Evaluating the quality of carbon Disclosures", *Sustainability Accounting, Management and Policy Journal*, 11, 553-589.

[43] Rachmawati, S. (2021), "Green Strategy Moderate The Effect Of Carbon Emission Disclosure And Environmental Performance On Firm Value", *International Journal of Contemporary Accounting*, 3, 133–152.

[44] Rahman, S., Kabir, M.N., Talukdar, K.H., Anwar, M. (2023), "National culture and firm-level carbon emissions: a global perspective", *Sustainability Accounting, Management and Policy Journal*, 14, 154-183.

[45] Rankin, M., Stanton, P., McGowan, S., Ferlauto, K. (2023), "*Contemporary Issues in Accounting*", (3rd Edition). John Wiley & Sons.

[46] Saka, C., Oshika, T. (2014), "Disclosure effects, carbon emissions and corporate value", *Sustainability Accounting, Management and Policy Journal*, 5, 22-45.

[47] Sari, I. N. (2021), "Minat Investasi Berkelanjutan (ESG) Naik, OJK Siapkan Roadmap", *katadata.co.id*. https://katadata.co.id/intannirmala/finansial/60ffceab9cf14/minat-investasi-berkelanjutan-esg-naik-ojk-siapkan-roadmap.

[48] Setiany, E., Hidayah, N., Zamzami, A. H., Ahmad, Z. (2022), "Government Ownership, Media Exposure and Firm Characteristics on Carbon Emission Disclosure: The Case of Indonesia Manufacturing Industry", *Review of Integrative Business and Economics Research*, 11, 193-203.

[49] Siddique, M.A., Aljifri, K., Hossain, S., Choudhury, T. (2023), "Effect of market-based regulations on corporate carbon disclosure and carbon performance: global evidence", *Journal of Applied Accounting Research*, Vol. ahead-of-print No. ahead-of-print.

[50] Soobaroyen, T., Ntim, C.G. (2013), "Social and environmental accounting as symbolic and substantive means of legitimation: the case of HIV/AIDS reporting in South Africa", *Accounting Forum*, 37, 92-109.

[51] Sukamulja, S. (2019), "*Analisa Laporan Keuangan sebagai Dasar Pengambilan Keputusan Investasi*", Andi Offset.

[52] Sun, Z.Y., Wang, S.N., Li, D. (2022), "Carbon Emission, Voluntary Carbon Disclosure and Firm Value", *Springer Nature 2021 LATEX template*, 1-16.

[53] Suwardika, I. N. A., & Mustanda, I. K. (2017), "Pengaruh Leverage, Ukuran Perusahaan, Pertumbuhan Perusahaan, Dan Profitabilitas Terhadap Nilai Perusahaan Pada Perusahaan Properti", *E-Jurnal Manajemen Unud*, 6, 1248-1277.

[54] Thomas, R., Onodi, G. (2023), "Understanding carbon exposure metrics", *J.P. Morgan Asset Management*, June, 1-10.

[55] Velte, P., Stawinoga, M., Lueg, R. (2020), "Carbon performance and disclosure: A systematic review of governance-related determinants and financial consequences", *Journal of Cleaner Production*, 254, 120063.

[56] Wang, J., Li, J., Zhang, Q. (2021), "Does carbon efficiency improve financial performance? Evidence from Chinese firms", *Energy Econ*. 104, 105658.

[57] Yan, H., Li, X., Huang, Y., Li, Y. (2020), "The impact of the consistency of carbon performance and carbon information disclosure on enterprise value," *Finance Research Letters*, 37, 101680.

[58] Yulimtinan, Z., Atiningsih, S. (2021), "Leverage Ukuran Perusahaan Pertumbuhan Penjualan Terhadap Nilai Perusahaan Dengan Profitabilitas Sebagai Variabel Mediasi", *Balance: Jurnal Akuntansi dan Bisnis*, 6, 69-82.

[59] Ziping, D., Genzhu, L. (2018), "Research on the Correlation Between Carbon Performance and Enterprise Performance", *Proceedings* of the 2018 International Conference on Economy, Management and Entrepreneurship (ICOEME 2018), Boao, China.