

Sustainability and Financial Performance: Examining ESG Disclosure And Carbon Intensity In Indonesia's High-Polluting Industries

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Abstract. The study investigates the impact of Environmental, Social, and Governance (ESG) disclosure and Carbon performance on financial performance of high-polluting industries in Indonesia. Using panel data regression analysis and a comprehensive set of control variables, the authors find that ESG disclosure and carbon performance have significant impacts on financial performance, as measured by Return on Assets (ROA). Specifically, higher levels of ESG disclosure are associated with better financial performance, while higher carbon intensity is associated with lower financial performance. The study highlights the importance of considering both ESG disclosure and carbon performance in assessing the financial implications of corporate sustainability practices. The findings have important implications for companies, investors, and policymakers in Indonesia and other emerging economies, particularly in the context of addressing climate change and promoting sustainable development.

Keywords: ESG Disclosure, Carbon Performance, Corporate Sustainability, Product innovations, Process innovations, Financial performance

1. Introduction

Climate Change is one of the greatest and most complex challenges the world is currently facing, attracting increasing interest from both academics and policymakers (Jiang et al., 2021; S. Wang & Kim, 2023). The important implications of climate change have been widely acknowledged. They are the primary concern in various countries because of the serious consequences, such as rising global average temperatures, extreme weather changes, and rising sea levels (IPCC, 2007). Greenhouse gas emissions are the primary cause of climate change (Giannarakis et al., 2017). The world's temperature rose significantly in 2019, making it the second-hottest year after 2010 and the hottest decade (United Nations, 2021). Additionally, rising temperatures have increased the frequency and intensity of natural disasters worldwide, such as droughts and forest fires (Tjenggoro & Prasetyo, 2018). In Indonesia, there is a yearly trend of increasing occurrences of natural disasters. In 2019, there were 3,814 disaster cases, while in 2021, there was an increase to 5,402 disaster cases (BNPB, 2023).

According to Carbon Brief, (2021), humans have emitted around 2,504 GtCO₂ into the atmosphere from 1850 to 2021. Indonesia is the fifth most significant greenhouse gas emitter in the world, with total emissions of about 103 GtCO₂, which accounts for about 4.1% of total global greenhouse gas emissions. This ranking puts Indonesia behind the United States with 509 GtCO₂ (20.3%), China with 284 GtCO₂ (11.4%), Russia with 173 GtCO₂ (6.9%) and Brazil with 113 GtCO₂ (4.5%). Over the last few decades, Indonesia's greenhouse gas (GHG) emissions have increased. Indonesia's GHG emissions increased by 313.47% in 2018 compared to 1990 (Climate Scorecard, 2020). Most carbon emissions resulted from fossil fuels, which are still predominantly produced by the transportation industry (Sudjoko et al., 2021) and the coal mining industry (Setiawan et al., 2021). The high carbon emissions have led to various issues in Indonesia, including air pollution. According to the Air Quality Life Index AQLI, (2021), in 2021, the average Indonesian is estimated to lose 2.5 years of life expectancy due to air quality exceeding the safe threshold set by the World Health Organization (WHO). Furthermore, in August 2023, CNN Indonesia, (2023) highlighted that Jakarta, the capital of Indonesia, ranked first as the city with the worst air quality in the world, surpassing Dubai and Johannesburg.

Because the issue of climate change is crucial, Indonesia has committed to addressing it by implementing Law No. 17 of 2004, which includes support for the Kyoto Protocol to reduce global greenhouse gas emissions. Indonesia signed the Paris Agreement in 2016 to restrict world average temperature rise to less than two degrees Celsius (Kementrian Lingkungan Hidup dan Kehutanan, 2023). Climate change has become a significant concern for corporations, governments, and stakeholders (Downar et al., 2021). Consequently, companies are under significant pressure from stakeholders to respond to climate change and express their commitment to environmental preservation through sustainability reports.

According to a KPMG survey, in recent years, many countries worldwide have experienced significant changes in the number of sustainability reports (KPMG, 2020). This increase is not only driven by new laws. However, it is also motivated by a growing understanding of the impact of environmental, social, and governance issues on the performance and value of companies (KPMG, 2020). The first survey was conducted in 1993, revealing that only 12% of companies published sustainability reports. By 2020, this number had significantly risen to 80%, reaching even as high as 90% for the world's largest companies.

A Sustainability Report is a document published by a company that outlines the economic, environmental, and social impacts of its operational activities (GRI, 2016). The regulations for sustainability reporting in Indonesia are outlined in Otoritas Jasa Keuangan (OJK) Regulation No. 51/POJK.03/2017, which requires Financial Services Institutions, Issuers, and Public Companies to implement sustainable financing by April 30 of the following year (Otoritas Jasa Keuangan, 2017). However, due to the spread of the coronavirus, the preparation that was supposed to be completed in 2020 has been pushed back to 2021 and must be submitted to OJK no later than 2022, according to the OJK Authority Circular Letter No. 4/SEOJK.04/2022 (Otoritas Jasa Keuangan, 2022). According to

Deegan, (2002), Sustainability Reports are expected to alleviate public worries about the implications of a company's operations. Furthermore, sustainability reports indicate a change in investment behavior (Chiu et al., 2020; Zafirah Ishak & Asmawi, 2022). Investors view sustainability reports as marketing tools that help form a positive image and encourage organizational legitimacy (Jonsdottir et al., 2022), ultimately contributing to financial performance. Financial performance is the visibility of financial aspects or the extent to which a company achieves its economic goals (Orlitzky et al., 2011). According to Buallay, (2020), a Sustainability Report can be proxied by ESG. ESG includes three major components of a sustainability report. Environmental relates to a company's contribution to the ecosystem and natural environment. Social relates to a company's ability to maintain positive relationships with stakeholders. Governance relates to corporate governance practices implemented to maintain relationships with stakeholders.

Despite many studies investigating the relationship between ESG disclosure and financial performance (Deng & Cheng, 2019; Velte, 2017; Zhao et al., 2018), previous research is still considered ambiguous and contradictory (Brooks & Oikonomou, 2018). Research by Alareeni & Hamdan, (2020); Semenova & Hassel, (2016) show a positive relationship between ESG and financial performance. The argument depends on the value creation perspective, where ESG serves as a tool for communicating non-financial information to generate competitive advantages (Buallay, 2019; Istan, 2024). These competitive advantages eventually benefit the company's reputation and performance. In contrast, investigations by Duque-Grisales & Aguilera-Caracuel, (2021); Landi & Sciarelli, (2019), show a negative connection. The argument is based on the concept that sustainable practices can incur significantly higher costs and potentially reduce the return on profit (Husada & Handayani, 2021). According to Friedman, (2007), the primary purpose of a corporation is to increase financial profitability, and any non-financial disclosure reduces profitability. Meanwhile, (Atan et al., 2018; Elsayed & Paton, 2005) found no significant connection.

Furthermore, the reduction of carbon emissions has garnered attention and raised questions regarding its impact on financial performance. According to Dereli, (2015), companies that effectively develop innovative techniques of production, distribution, or manufacturing will produce environmentally friendly products, may gain a competitive advantage. Sustainability innovation is considered as an environmental strategy to minimize energy usage, reduce materials, and prevent pollution (Li et al., 2020). Sustainability innovation includes product and process innovations (Zameer et al., 2021). Product innovation involves the development of new environmentally friendly products by utilizing eco-friendly, recyclable materials and durable use products with nearly zero waste. Meanwhile, process innovation involves using environmentally friendly technologies in the production process to minimize environmental impact. This sustainable innovation is as a means to carbon emissions reduction and related to carbon performance. Carbon emissions is the biggest portion of greenhouse gas produced by an organization within a given period (Heizer, 2014). Carbon performance is a quantifiable assessment of a company's efficacy in controlling and reducing carbon released by operational and business operations (Velte et al., 2020) In the context of carbon performance, companies are not only focused on reducing carbon emissions but also seeking ways to enhance the effectiveness of carbon reduction management. The more carbon reduction, the better carbon performance will be. Therefore, carbon emission reduction becomes an essential aspect of sustainability innovation strategies contributing to improving corporate performance.

According to Emous et al., (2021) reduced carbon emissions may increase short-term profitability. Consistent with Fernández-Cuesta et al., (2019); Galama & Scholtens, (2021), who showed that higher carbon performance allows businesses to access more long-term financial loans to fund their environmental initiatives. In contrast, according to Busch & Lewandowski, (2018), polluting companies have more effective financial performance, arguing that being environmentally friendly demands investment, and there is no guarantee that these investments will be recovered.

The sustainability phenomena has changed the new paradigm in investment behaviour (Chiu et al.,

2020). Global investors consider environmental issues, carbon emissions and governance as crucial factors. Public companies in Indonesia, especially those that operate across borders, realize that focuses on sustainability is not only added value but also a strategy to attract foreign investors. This research uses ESG disclosure and carbon performance as methods for measuring financial performance, given the significant global interest in these aspects. A focus on ESG disclosure and carbon performance can provide an effective response to global business dynamics and support efforts to attract the interest of foreign investors, whose play a crucial role in the capital and growth of companies in Indonesia.

Although there have been many studies on the relationship between ESG disclosure, carbon performance, and financial performance, the findings often vary and contradict (Brooks & Oikonomou, 2018). Some studies indicate that sustainable practices have a positive relationship with financial performance (Al Hawaj & Buallay, 2022; Alareeni & Hamdan, 2020; Semenova & Hassel, 2016; Gholami et al., 2022; Velte, 2017; Deng & Cheng, 2019; Zhao et al., 2018; Ahmad et al., 2021; Wu & Li, 2023), while others find no significant (Atan et al., 2018; Elsayed & Paton, 2005; Husada & Handayani, 2021) Other studies find a negative correlation between sustainable practices and financial performance (Duque-Grisales & Aguilera-Caracuel, 2021; Landi & Sciarelli, 2019; Nguyen et al., 2022). This study provides new evidence on the relationship between ESG disclosure and financial performance, particularly in the context of high-polluting industries in Indonesia, where the pressure to reduce environmental impact is increasing. Second, by integrating carbon performance as a crucial measure of carbon emissions in highly polluting industries, the research offers better insights into the crucial environmental aspect. Third, previous studies on ESG and financial performance have mainly concentrated on developed countries, with data from emerging economies remaining few (Malarvizhi & Matta, 2016). This research addresses gaps in developing countries, particularly Indonesia, which has unique characteristics as the 16th largest economic contributor globally and the largest in Southeast Asia, ranking as the fifth-largest carbon emitter globally (Carbon Brief, 2021).

This study provides potential solutions to environmental and business challenges faced by companies in Indonesia, particularly in industries with significant environmental impacts. With an in-depth understanding of the relationship between ESG disclosure, carbon performance, and financial performance, this study may provide an evidence in defining sustainable strategies that suitable in the Indonesian context. In addition, this study can potentially contribute significantly to sustainable development in Indonesia. By providing empirical evidence on the effectiveness of ESG disclosures and carbon emission reduction efforts, this research can assist governments, companies, and stakeholders in formulating effective policies for facing the challenges of climate change and advancing the sustainable development agenda.

2. Literature Review and Development of Hypothesis

2.1. Environmental, Social, and Governance Disclosure and Financial Performance

Stakeholder theory, Signaling theory, and Agency theory are fundamental concepts used to develop hypotheses on how ESG (Environmental, Social, and Governance) Disclosure influences financial performance. Stakeholder theory explains that companies' operating activities are not only for the company's benefit but also to contribute to interested parties, including shareholders, creditors, consumers, vendors, government, society, and other parties (Ghozali & Chariri, 2007). According to Deegan & Blomquist, (2006), certain information reporting can be used to attract and maintain support from certain groups of stakeholders. Support from these stakeholders, in turn, provides the company with several advantages in carrying out its operating activities, such as obtaining capital funds from investors, obtaining loans from creditors, and other support in the form of increased sales turnover of the company's products which will ultimately increase the company's revenue, so that the company's financial performance will also increase.

Previous research conducted by Habib & Mourad, (2023) showed that ESG disclosure positively influences company performance. These results are in line with stakeholder theory, which asserts that

corporate social responsibility practices can help companies improve their relationships with stakeholders and ultimately improve financial performance (Al Hawaj & Buallay, 2022; Bitektine & Haack, 2015; Habib & Mourad, 2023; Tu & Huang, 2015).

Signaling theory explains the reasons why companies need to provide information to external parties. This impulse is caused by the existence of information asymmetry between company and external parties. This information asymmetry occurs because company possesses more information than external parties. According to signalling theory, managers can reduce information asymmetry by voluntarily providing information to external stakeholders (Pulino et al., 2022). In other words, information asymmetry can be reduced if management possessing the information sends signals to the intended party (Ulum et al., 2022). ESG Disclosure can signal additional information to stakeholders (Su et al., 2016). For example, companies using ISO 14001 certification to show they have managed environmental issues well. This may gain investors' and stakeholders' trust and eventually may reduce the concerns about declining financial performance. As a result, the company's reputation improved, and may positively impacting its financial performance. Several studies show that high environmental performance can improve a company's reputation, increase revenue, and reduce cost. Research conducted by Habib & Mourad, (2023); Wu & Li (2023); Wu & Li, (2023) found positive results in the relationship between environmental performance and financial performance.

Financial performance is the ability of a company to manage and control its resources (IAI, 2016). Financial performance provides an overview of a company's financial health and quality during a specific period. One measure of financial performance is profitability. According to Kasmir, (2019), profitability ratios assess a company's potential to earn profits or income over a specified period. Return on Assets is one of the profitability ratios that evaluates the percentage of net profit relative to the company's assets. This ratio assesses how much profit is generated for each unit of the company's assets.

According to agency theory, the relationship between shareholders as principals and management as agents often causes conflicts of interest. The conflict of interest is caused by information asymmetry between the two, wherein the principal, namely the shareholder, faces limitations in monitoring and overseeing the agent's actions, which is the company management. Asymmetric information can lead to agent behavior not aligned with the principal's interests, damaging shareholders. Effective corporate governance practices become crucial to solving this challenge. and good governance can help companies improve their operations (Merza Radhi & Sarea, 2019).

Watts et al., (1990) state that agency costs, including transaction and information costs. Transaction costs arise from contract negotiations between shareholders and management, involving monitoring expenses, while information costs result from information asymmetry. In the context of sustainability, sustainable practices can reduce information asymmetry between shareholders and management. Therefore, continuous reporting helps reduce agency costs and improve the financial performance of the company. The results of previous research Alareeni & Hamdan, (2020); Gholami et al., (2022); Velte, (2017) state that there is a positive influence between governance disclosure on financial performance. Based on these explanations, the following hypothesis is formulated:

H1: Environmental, Social, and Governance (ESG) disclosure has a positive impact on financial performance

H1a: Environmental disclosure has a positive impact on financial performance

H1b: Social disclosure has a positive impact on financial performance

H1c: Governance disclosure has a positive impact on financial performance

2.2. Carbon Performance and Financial Performance

According to stakeholder theory, companies, in achieving their goals, should not conflict with the interests of various stakeholder groups, including the government and environmental observers. One way to enhance alignment with these stakeholders' goals is through carbon performance. Carbon performance is a quantitative measure of a company's management effectiveness in reducing carbon emissions generated from operational activities (Velte et al., 2020). The concept of carbon performance

provides an overview of the extent to which a company is reducing carbon emissions generated during its operational activities. Low carbon emissions and sustainable business practices can mitigate the impact of climate change and reduce a company's contribution to environmental pollution. This is expected to foster more positive relationships with stakeholders, especially regulators, consumers, and environmentalists. Therefore, a commitment to reducing carbon emissions serves as a way to reassure stakeholders that the company is mindful of the impact of its business activities (Yunus et al., 2016). With stakeholder confidence, it is anticipated that they will provide support to companies with good carbon performance. This support may manifest in increased consumer trust, substantial investments from investors, and regulatory backing. With this support, companies can reap benefits such as an excellent reputation, increased sales growth, and ultimately improved profitability.

This study aligns with Choi et al., (2021); Choi & Luo, (2021), who found that carbon intensity has a negative impact on financial performance. Based on this explanation, the hypothesis is formulated as follows:

H2: Carbon Performance measured by carbon intensity, has a negative impact on financial performance.

3. Research Methodology

3.1. Sample and Analysis Method

The quantitative method used in this research model is expressed as numbers or values that can be measured. This study uses a panel data linear regression analysis model. Secondary data between 2019 and 2022 in this study was taken from the Indonesia Stock Exchange website, company's websites, Osiris database, and Bloomberg database.

The focus of this research is on five industry sectors which are high polluters. Clarkson et al., (2013) identified the five most polluting sectors as pulp and paper, chemicals, oil and gas, metals and mining, and utilities, infrastructure, and transportation. These sectors are selected based on their significant environmental pollution levels and high expenditure on environmental matters. According to Clarkson et al., (2013), activities in these sectors potentially impact corporate value and investor returns due to their negative environmental impact. In addition, these sectors regularly report toxic release data to the Environmental Protection Agency (EPA). Therefore, ESG and financial performance research is highly relevant to these sectors.

This study's population includes all the companies listed on the Indonesia Stock Exchange (IDX) between 2019 and 2022. Purposive sampling was used for sample selection, which is a sampling technique that uses specified criteria such as the following:

- (1) Companies that include in high-pollution sectors, based on Clarkson et al., (2013)
- (2) Companies that published annual reports and sustainability reports during 2019 to 2022
- (3) Data availability related to variables used in the study.

The data processing technique in this research involves descriptive statistical analysis and classical assumption testing, which includes normality, multicollinearity, heteroskedasticity, autocorrelation tests, and multiple regression analysis tests.

The sample selection process can be observed in Table 1.

Table 1. Sample selection process

Description	Total
Total companies in high-polluting sectors on IDX during the period of 2019-2022	159
Total companies without ESG data in Bloomberg	(131)
Total companies	28
Total observations (28 x 4 years)	112
Total incomplete observations	(19)
Total observations	93

There are 159 companies in high-pollution sectors, according to Clarkson et al., (2013). However, upon checking in Bloomberg, only 28 companies were found to report ESG data, while 131 companies did not report ESG data on Bloomberg. The research period covers from 2019 to 2022 (4 years), resulting in a total of 112 observations. During the data collection process, 19 observations were found to be incomplete, bringing the total number of observations in this study to 93.

3.2. Variable measurement

In this study, the dependent variable is financial performance as measured by Return on Assets. Several previous studies have used Return on Assets to measure financial performance, such as the research by Al Hawaj & Buallay, (2022); Alareeni & Hamdan, (2020); Wedari et al., (2023) and Nguyen et al., (2022). Meanwhile, the independent variable in this study is ESG, as conducted in the research by Al Hawaj & Buallay, (2022); Alareeni & Hamdan, (2020).

The selection of ESG scores is based on Alareeni and Hamdan's (2020), that ESG score is more accessible, standardized and effective in identification. As a result, many studies use ESG scores in their research (Al Hawaj & Buallay, (2022); Alareeni & Hamdan, (2020). (Atan et al., 2018). In addition, the ESG data provided by Bloomberg is graded based on importance, giving higher weights to more relevant disclosures (Atan et al., 2018).

Bloomberg ESG scores were used in this study. The Bloomberg database assesses ESG disclosure scores using four disclosure scores, including Environmental, Social, and Governance (ESG) disclosure (a combination of environmental, social, and governance), environmental disclosure, social disclosure, and governance disclosure. ESG scores within the range of 0-100 are calculated based on quantitative and qualitative indicators covering environmental, social, and corporate governance aspects.

Another independent variable in this study is Carbon performance, measured by the sum of scope one and scope two emissions divided by total sales, according to Lewandowski, (2017); Trumpp & Guenther, (2017). The selection of carbon performance measures was based on Misani and Pogutz's (2015) argument that the use of scope one and two emissions makes it possible to consider all significant operational changes, investments, and innovations that affect greenhouse gas emissions, including the switch to electricity suppliers using renewable energy sources. This study includes several control variables, such as CEO Power proxied by CEO tenure and CEO Ownership. CEO tenure is determined by the number of years a CEO has served in a company. This is in line with the findings of Sheikh, (2019) CEO tenure was chosen because it is considered to play a positive role in the correlation between ESG-financial performance. This is because a longer CEO tenure leads to have more understanding of the company (Velte, 2020). Meanwhile, CEO ownership is calculated by dividing the percentage of CEO ownership by the total number of outstanding shares (Saidu, 2019); Velte, (2020). CEO Ownership is one of the sources of power both theoretically and practically (Onali et al., 2016); CEOs with significant stock ownership tend to have a greater influence on corporate policies and long-term strategies, which may relate to decisions related to sustainability aspects. This study also uses control variable Growth. Growth is measured as total sales this year minus total sales the previous year divided by total sales last year. Growth shows whether a particular company has experienced sales growth compared to the previous year. The Growth control variable is assumed to be positive for financial performance. (Velte., 2020). Control variables Property, plant, and equipment, as defined by the total value of property, plant, and equipment divided by total sales. This ratio was chosen with the assumption that when the PPE ratio is high, it indicates that the company has problems managing adequate working capital, which may result in a negative impact on financial performance (Li et al., 2018). Meanwhile, the control variable BIG 4, as an indicator of audits conducted by large audit firms as a company's effort to increase shareholder confidence and corporate reputation, has positive impact on financial performance (Velte., 2020). BIG 4, as measured by a dummy variable with a value of 1 for companies that use BIG 4 audit services and a value of 0 for those that do not.

Table 2. Variables Definition and Measurement

Variable	Definition	Description
Dependent Variable		
ROA	Financial performance	Measured by Return on Assets (ROA). ROA is calculated by dividing total net income by total assets.
Independent Variable		
ESG Score	ESG Disclosure	The Bloomberg ESG Index includes all disclosures related to environmental, social, and governance disclosures.
E Score	Environmental Disclosure	The E Disc Index measurements disclosures about energy usage, waste, pollution, natural resource conservation, and behavior toward flora and animals.
S Score	Social Disclosure	The S Disc Index measures disclosures related to the company's relationships with external parties such as vendors, consumers, the community, and the public.
G Score	Governance Disclosure	The G Disc Index measures disclosures related to good and sustainable governance within the company's internal operations.
CP	Carbon performance	Carbon performance is measured by the sum of scope one and scope two emissions divided by total sales.
Control Variable		
CEO power	CEO Tenure	CEO Tenure (CEOT) is measured by the number of years a CEO has served in the company.
	CEO Ownership	CEO Ownership is measured by the number of CEO shares divided by the total outstanding shares, expressed as a percentage.
Growth	Growth	The growth control variable is measured by subtracting the total sales of the current year from the total sales of the previous year, divided by the total sales of the previous year, and expressed as a percentage.
PPE	Property, plant & equipment	The PPE control variable is measured by the sum of the value of property, plant, and equipment divided by total sales.
BIG4	BIG4	The BIG4 control variable is measured by a dummy variable, where 1 represents companies audited by BIG4 audit firms, and 0 represents companies not audited by BIG4 audit firms.

The multiple linear regression is used in the analysis with the model as follows:

$$FIN_{it} = \alpha + \beta_1 ESGscore_{it} + \beta_2 Escore_{it} + \beta_3 Sscore_{it} + \beta_4 Gscore_{it} + \beta_5 CP_{it} + \beta_6 CEOO_{it} + \beta_7 CEOT_{it} + \beta_8 Growth_{it} + \beta_9 PPE_{it} + \beta_{10} BIG4_{it} + \epsilon_{it} \dots\dots\dots$$

(1)

Where:

- α = Beta coefficient of the constant (Intercept)
- β = Beta coefficient of the independent variable
- FIN = Financial performance
- ESGSCORE = Environmental social governance disclosure
- ESCORE = Environmental disclosure
- SSCORE = Social disclosure
- GSCORE = Governance disclosure

CP	= Carbon performance
CEOO	= CEO ownership
CEOT	= CEO tenure
Growth	= Growth
PPE	= Property, plant & equipment
BIG4	= BIG4 (Audit variable)
ε	= Regression error
i	= Cross-section indicator
t	= Time indicator

4. Result and Discussion

4.1. Descriptive statistics and correlation

Table 3 shows the descriptive statistical results for this study's independent, dependent, and control variables with 93 observations. The average ROA is 4.79 which indicates that high-pollution industry companies in Indonesia have achieved a profit of 4.79% of the total assets they manage.

The average ESG score in Indonesia is 48.12, below the median of 50 on the Bloomberg Scale from 0-100, indicating a relatively low level. The average E score and S score are 34.12 and 34.27, respectively. The scores are below the median of 50, indicating that sample companies from high-pollution sectors have limited environmental disclosure. It implies that sample companies need a significant improvement to meet requirements.

Table 3. Descriptive Statistics

Variable	Obs. (n)	Min	Max	Mean	Std. Deviation
ROA	93	-0.65	13.07	4.79	4.53
ESG score	93	31.76	64.25	48.12	10.61
E score	93	6.1	61.04	34.12	19.14
S score	93	18.12	50.85	34.27	11.06
G score	93	60.9	92.35	75.81	10.10
CP	93	0.00000017	0.0000093	0.0000036	0.0000031
CEOT	93	0.66	10.08	4.59	3.17
CEOO	93	0	0.09	0.019	0.032
Growth	93	-0.23	0.77	0.16	0.30
PPE	93	0.32	5.00	2.32	1.61

Meanwhile the G score is 75.81, above the median value of 50 on the Bloomberg scale, which ranges from 0-100. These results indicate that the average G score is relatively high. Overall, polluting companies in Indonesia demonstrate relatively good corporate governance.

The average carbon performance, measured by carbon intensity, is 0.0000036, indicating that for every 1 Indonesian Rupiah in company sales, carbon emissions from Scope 1 and Scope 2 amount to 0.0000036. This means that each sales activity contributes to scope 1 and 2 carbon emissions. Carbon emissions scope 1 are emissions from sources owned or controlled by the organization from production, physical or chemical processing activities (GRI, 2016). Meanwhile, scope 2 is indirect carbon emissions

such as heating, cooling, steam power and electricity use (GRI, 2016)

The average CEOT score is 4.59, indicating that the average CEO tenure in Indonesia's high-pollution industry is 4.5 years. The findings of Meiryani et al., (2023), study in the LQ45 sector show that the average CEO tenure is 4.8 years. This shows that CEO tenure in Indonesian companies in the high-pollution sector is shorter than in LQ45 companies. It indicates there is a dynamic change happening place in CEO tenure.

The average CEO ownership (CEO) value is 0.019, indicating that, on the whole, stock ownership by CEOs in high-polluting companies in Indonesia is minimal, specifically at 0.019% of the total outstanding shares. This means that the average CEO stock ownership in Indonesia is relatively insignificant compared to the total shares held by the public or other entities. This figure suggests that the small proportion of stock ownership can create challenges for management in aligning interests between management and shareholders. As a result, there is a potential for a mismatch in objectives between management and shareholder expectations, ultimately not impacting financial performance.

The average Growth value of 0.16 indicates that overall, high-pollution companies in Indonesia experience a sales growth of 16% each year. This result shows that the majority of companies demonstrate improved sales performance compared to the previous periods. The average PPE value of 2.32 indicates that, overall, high-pollution companies in Indonesia rely on physical assets such as property, plants, and equipment to achieve sales. The value of 2.32 illustrates the effectiveness of companies in generating revenue from investments in physical assets. This result highlights the crucial role of physical assets in the company's income structure, serving as a strategic foundation for improving performance and achieving profits.

Table 4. Descriptive Statistics Dummy variable – Frequency Distribution

BIG 4			
		Frequency	Percent
Valid	0	28	30.1
	1	65	69.9
Total		93	100

Table 4 shows the frequency distribution of the BIG4 control variable. where the majority of high-pollution companies in Indonesia choose to be audited by BIG4 Public Accounting Firms.

Table 5. Correlation matrix

	ROA	ESG score	E score	S score	G score	CP	CEOT	CEO O	Growth	PPE	BIG 4
ROA	1										
ESG score	0.240**	1									
E score	0.324***	0.808***	1								
S score	0.112	0.776***	0.477***	1							
G score	-0.034	0.707***	0.372***	0.670***	1						
CP	-0.237**	0.218**	0.260**	0.029	0.274***	1					
CEOT	-0.205**	-0.315**	-0.145	-0.339***	-0.377**	0.150	1				
CEO	-0.131	-0.051	0.047	-0.001	-0.130	1.112	0.500	1			
Growth	0.326***	0.049	0.054	0.004	0.059	-0.179	0.088	0.029	1		
PPE	-0.328***	-0.114	-0.180*	-0.123	0.016	0.091	0.255**	0.125	0.071	1	
BIG4	0.018	-0.010	0.103	0.234	-0.103	-0.156	-0.034	0.307	-0.111	-0.312***	1

Note: ***, **, * Significance correlation at the level of 0.01, 0.05 and 0.10

Table 5 shows the Pearson Correlation for the dependent, independent, and control variables. ESG Score has a high positive and significant correlation with E Score, S Score, and G Score, however these variables are not in the same regression models, therefore, this will not be an issue.

4.2. Regression results

Table 6 shows the regression results from this study. The R-squared value is 0.403, meaning that the

independent variables can explain 40.3% of the dependent variable (financial performance) in this study: Environmental, Social, and Governance (ESG) disclosure, Environmental disclosure, Social disclosure, Governance disclosure, Carbon performance, CEO power, Growth, Property, Plant and Equipment (PPE), and BIG4. The remaining 59.7% can be attributed to variables outside the independent variables.

Table 6. Regression Results

Variable	Model 1 ESG score & ROA	Model 2 E score & ROA	Model 3 S score & ROA	Model 4 G score (ROA)
ESG score	0.106 (0.041)**			
E score		0.0979 (0.002)***		
S score			0.36806 (0.322)	
G score				-0.0211 (0.718)
Carbon performance	-524160.5 (0.003)***	-574083.5 (0.001)***	-444388.1 (0.012)**	-428395 (0.016)**
CEOT	-0.102 (0.532)	-0.104 (0.507)	-0.119 (0.481)	-0.174 (0.297)
CEO	13.721 (0.554)	8.243 (0.716)	11.442 (0.629)	11.652 (0.619)
Growth	3.146 (0.003)***	3.105 (0.002)***	3.255 (0.002)***	3.448 (0.001)***
PPE	-1.056 (0.017)**	-0.852 (0.052)*	-1.083 (0.016)**	-1.067 (0.016)**
BIG4	-1.440 (0.423)	-0.657 (0.712)	-1.641 (0.375)	-1.455 (0.420)
Observation				93
Adjusted R2				0.403

The regression results of the Environmental, Social, and Governance (ESG) disclosure variable indicate p-value of 0.041 which is lower than the significance level α (0.05), and coefficient value of 0.106, This means there is a positive and significant relationship between ESG disclosure and financial performance. This shows that **H1 is accepted**. These results demonstrate that companies that enhance their ESG disclosure will experience positive consequences on their financial performance. This finding is consistent with Alareeni & Hamdan (2020), Zhao et al. (2018), Deng & Cheng (2019), and Al Hawaj & Buallay (2022), who found that Environmental, Social, and Governance disclosure has a significant positive impact on financial performance.

The regression results of the Environmental disclosure variable show p-value of 0.002, which is lower than the significance level α (0.05), and coefficient value of 0.0979, indicates there is a positive

and significant relationship between Environmental disclosure and financial performance. This shows that **H1a is accepted**. These results demonstrate that companies that enhance their environmental disclosure will experience a positive increase in financial performance. This research finding aligns with the studies conducted by Habib & Mourad (2023), Wu & Li (2023), and Velte (2017), which found that Environmental disclosure has a positive impact on financial performance. Meanwhile, for the social disclosure variable, the significance value is 0.322, which is higher than the significance level (0.05), **shows that H1b is rejected**. The findings of this study are inconsistent with the research conducted by Franco et al., (2020); Pham & Tran, (2020); Rhou & Singal, (2020), which states that social disclosure significantly positively influences financial performance. The Governance disclosure variable has a significance value of 0.718, which is higher than the significance level (0.05). As a result, **H1c is rejected**. This finding is inconsistent with studies conducted by Alareeni & Hamdan, (2020); Gholami et al., (2022); Velte, (2017), which state that there is a positive influence between governance disclosure and financial performance.

The regression results of Carbon performance in models 1, 2, 3, and 4 show significance values of 0.003, 0.001, 0.012, and 0.016, respectively, which are lower than the significance level α (0.05), indicating a significant relationship between Carbon performance and financial performance. **This means that H2 is accepted**. The regression coefficients $\beta_1 = -52416.5, -574083.5, -44438.1, \text{ and } -428395$ indicate that for each increase of one unit in Carbon Intensity, there is a corresponding decrease in financial performance by -52416.5, -574083.5, -44438.1, and -428395. These amounts are significant, indicating that high-polluting companies in Indonesia must consistently monitor the carbon intensity levels of their activities, as each increase in carbon intensity has a major impact on the company's financial performance.

The control variables in this study consist of CEO Power, Growth, Property, Plant & Equipment (PPE), and BIG4. Table 6 shows that the Growth and Property, Plant & Equipment (PPE) as control variables have a significance value lower than α (0.05). This indicates that the control variables Growth and Property, Plant, and Equipment (PPE) significantly influence financial performance. Meanwhile, the CEO Power control variable proxied by CEOT and CEOO and the BIG4 control variable have a significance value higher α (0.05). This indicates that CEO Power and BIG4 control variables do not significantly influence financial performance.

4.3. Discussion

This study found that Environmental, Social, and Governance (ESG) disclosure has a significant positive impact on financial performance. According to Stakeholder theory, companies operate not only for their benefit but also for the benefit of stakeholders. ESG disclosure can be used as an effective tool to attract and maintain support from specific stakeholders, and this support results in various benefits in conducting operational activities, such as obtaining capital from investors and securing loans from creditors. With this support, companies can allocate their capital to invest in assets that enhance production capacity, ultimately increasing revenue and profitability. Therefore, ESG disclosure is crucial for companies, especially in Indonesia. ESG disclosure not only strengthens relationships with stakeholders but also significantly contributes to improving the company's financial performance. However, improving ESG disclosure is not easy, especially for highly polluting companies; it requires awareness and the role of all parties in realizing this, awareness from stakeholders, business people, investors, and the government as the party that has regulations.

The findings of this study show that environmental disclosure has a significant positive effect on financial performance. Consistent with Signaling theory, companies are motivated to provide information to external parties to address information asymmetry between the company and external stakeholders. Environmental disclosure can serve as a signal of additional information for stakeholders (Su et al., 2016). Environmental certifications show a company has effectively addressed environmental challenges. As a result, stakeholders are more motivated to trust and have less concerns about future losses, which causes a better company reputation and, eventually, an impact on revenue and financial

performance.

The study's findings show that social disclosure does not affect financial performance. In Indonesia, regulations for sustainability reporting are outlined in Financial Services Authority Regulation No. 51/POJK.03/2017, which requires Financial Institutions, Issuers, and Public Companies to implement sustainable financing and report on it in the Sustainability Report. It became effective in April of the following year, but due to the COVID-19 events, the regulation took full effect in 2022. This study covers the observation period from 2019 to 2022. As a result, a few companies disclose social information. The lack of social disclosure suggests that many companies have not integrated social aspects into their financial reports. As a result, stakeholders, such as investors, the public, regulators, and others, may be unsatisfied and question the company's commitment to social responsibility and sustainability. Consequently, the company loses support from stakeholders, impacting its ability to maximize revenue and, ultimately, not influencing financial performance.

The study's findings show that the governance disclosure variable does not affect financial performance. In signaling theory, managers' disclosure of reports reflects their confidence in the quality of the reports; they are more willing to provide information (signals) about the company if they believe it has good quality. Although this theory has the potential to improve governance disclosure practices, the majority of companies in Indonesia are still family-owned, which tends to avoid governance disclosure as a way to maintain control by major shareholders (Wirawan & Diyanty, 2014). Therefore, the number of companies reporting governance disclosure is limited. Limitations in reporting create information asymmetry, making it difficult for investors to evaluate management quality and lowering the effectiveness of positive signals created by good corporate governance procedures. Thus, the importance of disclosing corporate governance to enhance financial performance is still impeded by structural constraints in share ownership. Furthermore, according to agency theory, the relationship between shareholders as principals and management as agents often leads to conflicts of interest. The conflict of interest is caused by information asymmetry between the two (Jensen & Meckling, 1976). The results show that structural constraints in share ownership, especially family dominance, can significantly hinder the effectiveness of corporate governance practices. The imbalance of power and these constraints cause management to lack the initiative to disclose adequate governance information, creating agency problems between managers and shareholders. As a result, corporate governance does not influence financial performance.

The study's findings show that Carbon performance through carbon intensity, has a significant negative impact on financial performance. In stakeholder theory, companies should align their goals with the interests of stakeholders. Carbon performance is one way to align these objectives. Carbon performance provides an overview of how much a company is reducing carbon emissions generated by its operational activities. Low carbon emissions can mitigate the impact of climate change and reduce a company's contribution to environmental pollution. Reducing carbon emissions is a way to reassure stakeholders that the company is mindful of the impact of its business activities. With this confidence, stakeholders may provide support in the form of increased customer trust, large investments from investors, and other forms of support. With this support, the company will achieve a good reputation, increased sales growth, and increased profitability. Furthermore, carbon mitigation can reduce the potential costs arising from the company's environmental impact, such as environmental sanctions (Kim et al., 2015). Therefore, carbon reduction practices not only aid in minimizing a company's negative impact but also directly contribute to operational efficiency and financial burden reduction. Consequently, the company's financial performance will improve as carbon performance becomes more effective.

The results of this study indicate the control variable CEO Power, proxied by Tenure does not affect financial performance. This result occurs because CEOs who have served for a long time in a company tend to feel comfortable (Ahmad et al., 2022). Meanwhile, business conditions tend to be unstable, and change is unavoidable. Therefore, companies need fresh thinking to remain competitive. CEOs who

have served for a long time tend to maintain the status quo rather than try something new that is risky; hence, the CEO's tenure does not influence financial performance.

The control variable CEO Power, which is proxied by CEO ownership, the variable CEO ownership shows no influence on financial performance. This result occurs because CEO ownership in Indonesia is relatively small, and some companies may not have CEO ownership at all. As a result, CEOs may not work optimally. Moreover, small-scale share ownership prevents management from influencing decisions made during RUPS. This situation prevents managers from aligning the interests of management and shareholders, ultimately not motivating managers to improve financial performance. The control variable Growth has a significant positive impact on financial performance. This result suggests that higher Growth each year can enhance the company's ability to generate profits. If a company can increase its sales, it has established itself in its business operations (Sari, 2018). Effective management of the company can lead to achieving the expected returns, and high consumer trust in the product can result in increased sales, ultimately contributing positively to financial performance. The results show that the control variable Property, Plant, and Equipment (PPE) has a significant negative impact on financial performance. This suggests that the higher the ownership of physical assets by the company, including Property, Plant, and equipment, the lower the company's ability to generate profits. It indicates that the company may not be efficiently managing its physical assets, ultimately hindering profit growth (Li et al., 2018). Large asset ownership can signal constraints in operational management or inefficient investments in those assets, leading to an impact on the company's financial performance.

This study finds that the control variable BIG4 does not have an impact on financial performance. This shows that other factors beyond the use of BIG4 or non-BIG4 audits are more dominant in influencing financial performance. Other factors are the competence and independence of auditors. Although large public accounting firms (KAP), such as BIG4, can provide significant resources in the audit process, this alone is not sufficient without the support of competent auditors. Incompetent auditors may result in an inability to identify issues in financial statements, ultimately not influencing the financial performance of the company.

5. Conclusion

This study provides new evidence on the relationship between ESG disclosure, carbon performance, and financial performance in the context of high-polluting industries in Indonesia. The findings suggest that companies gain financial benefit from improving their ESG disclosure practices and reducing their carbon emissions, even in industries that are traditionally associated with high environmental impacts. These results have important implications for companies, investors, and policymakers in Indonesia and other emerging economies. Companies should prioritize ESG disclosure and carbon performance as key components of their sustainability strategies, not only to address stakeholder concerns but also to improve their financial performance. Investors should consider ESG and carbon performance as important factors in their investment decisions, as they can have significant impacts on a company's long-term financial viability. Policymakers should provide clear guidelines and incentives for companies to improve their ESG disclosure and carbon performance, as these practices can contribute to broader sustainable development goals. Future research could explore the specific mechanisms through which ESG disclosure and carbon performance influence financial performance, as well as the potential moderating factors that may influence these relationships in different industry or country contexts.

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