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The Harmony of Carbon Emission, Environmental Performance, Social Performance, and Leverage

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ABSTRACT

This study explores the relationship between gas emissions, environmental performance, social performance, and the moderating role of leverage in the relationship. This study was conducted in one of the developing countries, namely Indonesia. This study uses a sample of companies listed on the Indonesia Stock Exchange (IDX) from 2019 to 2023. The sample used in this study was 165 samples. This study uses Stata software to process data, with random effect models. The study results indicate that the relationship between gas emissions and the environment has a positive and significant effect. The moderation variable in this study cannot have an impact on environmental performance and social performance. This study contributes to the literature on how companies can invest in gas emissions and influence environmental performance.

Keywords: *Carbon emission, Environmental Performance, Social Performance, Leverage, Indonesia*

1. Introduction

Since the Kyoto Protocol agreement, climate change and sustainable development have become a global focus, causing regulators, policymakers, investors, and the public to be highly protective of carbon emission behaviour. As risks to the climate and environment, public health, and social justice have intensified globally, the concept of sustainable development has garnered widespread public attention and significant interest from nations worldwide (Chen & Wang, 2024).

In recent years, the world has faced complex and diverse environmental, social and economic challenges. Companies focus heavily on sustainability issues by bringing new ideas to the market and generating economic performance through business activities. These sustainability activities also build a better corporate image towards the company's stakeholders. Previously, the need for environmental protection, pollution reduction, and sustainable innovations was ignored.

The issue of sustainability is a pressing issue that has attracted the attention of practitioners and researchers around the world. The increasing threat of climate change has made corporate carbon emissions a significant environmental and social problem. Carbon emissions are an environmental issue that contributes to global climate change. Stakeholders demand greater transparency and accountability by understanding the complexity of carbon emissions. Extreme climate change is fueled by high gas emissions. Large business operations present an opportunity to address climate change through effective management of carbon emissions.

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Investors are also increasingly focusing on environmental issues in their business activities (U.S. Trust, 2017). As three out of four investors confirmed that before making an investment decision, they consider the environmental and social impact of their business activities. Community and corporate relationships in business are also in focus, which must conform to socially constructed norms, values, beliefs, and definitions, so companies must demonstrate a commitment to environmental and social sustainability so that public perceptions are correct.

The poor environment and higher gas emissions indicate that the social contract is in jeopardy because companies are not fulfilling their responsibilities to minimize the negative impacts of the company's business activities. (Zandi et al., 2022). The severe social impact of carbon emission recognizes the urgency of adopting sustainable practices so as to shift to better energy sources by implementing more comprehensive strategies so as to mitigate climate change (Hasan et al., 2024).

The performance of ESG is a key indicator in assessing a company's non-financial performance, managerial excellence, and risk mitigation capabilities. So, companies should comprehensively improve ESG performance to optimize resource allocation, enhance transparency, and strengthen investor attractiveness. However, social and environmental impacts are still unclear and a small minority (Halme et al., 2020) given that the main reason for the ESG focus is to respond to concerns over the negative environmental and social impacts of business.

Stakeholders recognize the urgency of reducing the risks posed by global warming and ensuring that the financial sector supports the transition to a global market for carbon reduction and its relationship with the climate. Financial investors are becoming more aware of climate change as a significant threat, various international and national initiatives have been created to fight global warming and encourage economic actors to accelerate the transition to a low-carbon economy (Tanthanongsakkun et al., 2023). As a result, carbon risks associated with climate change and global warming can disrupt a company's operations and thus reduce shareholder value. Climate change caused by carbon emissions also leads to increased costs for adaptation, infrastructure damage, and industrial losses associated with climate disruption. The influence on the financial sector is also increasingly visible; therefore, it is expected to reduce gas emissions and disclose this information to the public as a commitment to sustainable development. (Al-Fakir Al Rabab'a et al., 2023).

Climate policies are important in reducing carbon emissions to achieve zero carbon and cash flows should also be aligned with pathways to reduce carbon emissions to achieve climate-resilient sustainable development (Owolabi et al., 2024) and knowledge of the extent to which governance mechanisms have influenced carbon emission reductions at the organizational and country levels. (Oyewo, 2023).

Indonesia, as a research country, also has regulations governing sustainability activities. Financial Services Authority Regulation (POJK) No. 51 of 2017 on the Implementation of Sustainable Finance for Financial Services Institutions, Issuers, and Public Companies. However, disclosure of carbon emissions is only disclosed in the annual report and sustainability reporting is moving from voluntary to mandatory. Reporting in Indonesia is also still uneven, inconsistent and biased. (Wahyuningrum et al., 2024). The sale of carbon emissions in Indonesia is also regulated through the Financial Services Authority Regulation (POJK) No. 14 of 2023 on carbon

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trading through carbon exchanges. This is in line with the SDG targets in 2030, especially on SDG 13, namely climate management that integrates climate change anticipation actions in national policies, strategies and planning.

This research contributes to adding literature on the determinants of carbon emissions in developing countries, this research also expands the literature by using gas emissions as a proxy for climate change whose data is obtained from Thomson Reuters. Second, this research focuses on all companies listed on the Indonesian stock exchange.

Research focusing on performance outcomes in terms of social and environmental impacts is still unclear (Halme et al., 2020). Previous research (Chen & Wang, 2024) studied the relationship of carbon emissions to ESG performance in local companies in China, where the results explained that carbon emissions can significantly improve ESG performance in local companies. This study tries to separate the functions of ESG, and focus on the components of environmental performance and social performance in companies in developing countries. This study also uses leverage as a moderating variable, because such research is still rare (Al-Fakir Al Rabab'a et al., 2023) and focuses more on the cost of debt (Cumming et al., 2024; Owolabi et al., 2024)..

2. Literature Review

Stakeholder Theory

Environmental protection is a shared responsibility for organizations and stakeholders. Stakeholder theory has an influence on a company's environmental strategy and responsiveness but has an uncertain impact. (Fosu et al., 2024). The success of a company depends not only on the needs of shareholders, but also on managing the needs and expectations of stakeholders, which is expected to reduce conflicts, improve reputation, and strengthen competitiveness. (Li et al., 2024).

The reporting of sustainability reports by companies on a regular basis is an effort to demonstrate efforts and achievements in environmental, social and governance aspects. Responsible and responsive stakeholders must also be proactive in addressing community problems because they will have an impact on the company and illustrate that the company is able to direct complex stakeholder relationships (Gali et al., 2020). ESG awareness in the company will have a maximum impact because it is an investment in the environment and increases investment efficiency.

Companies are also pressured by stakeholders to inform the latest issues, one of which is gas emission. (Wahyuningrum et al., 2024)The reporting of gas emissions is one of the authentic evidence of the company's decisions and actions that are easily accessible to external parties, which means that it is practical and easy to see the disclosure of carbon emissions. Stakeholder theory also shows a normative nature that encourages behaviour based on ethical, moral, and relational considerations and is instrumental because of strategic considerations that are oriented towards results and personal considerations to meet the demands of stakeholders. (Chliova et al., 2025)..

Carbon Emission

Policymakers must find ways to address climate change, promote sustainable development, and adopt appropriate initiatives to safeguard the environment. Efforts to reduce pollution and economic development have their challenges. It is still unclear whether or not achieving a better environment, particularly gas emission reduction and sustainable

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development are compatible goals. (Raihan et al., 2024).

The impact of corporate carbon emissions on performance has two interrelated perspectives: Corporate carbon emissions involve increased compliance, litigation, and cleanup costs that can reduce performance because companies that have high carbon emissions will be increasingly responsible for bearing the costs for these impacts, while companies that fail to commit will have adverse social consequences. (Miah et al., 2021).

Carbon emissions are an important issue for companies that have the potential to disrupt company operations and negatively impact shareholder wealth (Tanthanongsakkun et al., 2023). Through Law No. 17 of 2024 concerning the ratification of the Kyoto Protocol on climate change and Indonesia's desire to be zero carbon by 2060, the Indonesian government is very aware of carbon emissions. This is also clarified by regulations made by the government agency, the Financial Services Authority (OJK), which recently issued Financial Services Regulation No. 14 of 2023 which regulates carbon trading and/or carbon ownership records of companies in Indonesia. Regulations can help managers to comply with regulations and have a better impact on company operations. (Mohammad Nasih, Astri Puspitasari, 2024) because gas emission reporting contains information about the strategies, conditions, and challenges faced by companies in managing carbon emissions from various disciplines. (Nasih et al., 2019).

Environmental Performance

Environmental performance has become an important indicator and concern for companies. Executives tend to release environmental information when the company has good environmental performance to reduce information asymmetry and promote the company's image, and vice versa (Wahyuningrum et al., 2024). Reducing carbon emissions and improving environmental quality are global imperatives that must be met to achieve sustainable development and reduce the negative impacts of climate change.

The way to tackle climate for policymakers is to boost sustainable development and adopt initiatives to safeguard the environment, However, efforts to reduce pollution and economic development simultaneously present conflicting challenges (Raihan et al., 2024). Disclosure of carbon emissions has become an attractive disclosure trend due to the increasing awareness of many parties regarding carbon footprints. Stakeholder theory provides an alternative theoretical perspective to explain voluntary environmental disclosures, such as carbon emissions disclosures.

Stakeholders and companies have a mutually influential relationship. Furthermore, under this paradigm, stakeholder theory suggests that carbon emissions disclosure is a helpful instrument to meet stakeholders' information demands about climate change.

H1: Environmental Performance has a positive effect on carbon emissions.

Social Performance

Environmental practices, images, and products provide confidence for corporate identification, customers, and loyalty for corporate image building and social performance. The substantial influence of social engagement creates a positive corporate image when activities are reputation-oriented and supported by society because of the company's initiative to build society (Fosu et al., 2024). However, social performance is often viewed as a secondary or optional function rather than a business imperative (Esteves, 2024). Social performance has an important role as it acts as a vital intermediary between companies and society, navigating

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complex relationships and decisions that significantly impact lives and livelihoods.

Environmental and social issues are often complex and require thinking about long-term investments that result in changing corporate actions. Companies prefer to be able to redevelop business models to include social goals, reassess hiring policies, promotions, and design new systems to improve the overall health of the workforce and external stakeholders. (DesJardine & Durand, 2020) as these actions can result in future profits for shareholders due to safer and healthier employee engagement and satisfaction. These activities can also provide reputational benefits to governments and external stakeholders.

Foreign investors strongly consider corporate social behaviour as a material investment decision that can increase the likelihood of long-term corporate viability. (Al-Gamrh et al., 2020) Because foreign investors are more familiar with social and environmental issues due to the foreign markets they explore.

However, in Islamic banking companies, social performance is still very weak due to the lack of social responsibility and the perceived absence of the expected positive effects of Islamic financial institutions in society (Meskovic et al., 2024). They should be aware of social performance because Islamic law's ultimate goal is to promote the welfare of individuals and society as a whole.

Positive social performance encompasses a wide range of outcomes that can involve reducing carbon emissions, increasing transparency of reporting mechanisms, fostering better relationships with labor unions, reducing the number of product recalls, and generating other benefits for stakeholders. (Chliova et al., 2025)

H2: Social Performance has a positive effect on carbon emissions.

Leverage

Companies engage in voluntary disclosure based on financial performance. When finances are stable, the desire to implement carbon emission reduction and disclosure activities is higher. When the company's leverage is high, this indicates that the company is experiencing a decline in financial condition, which results in the company having difficulty implementing voluntary activities such as carbon emissions (Wahyuningrum et al., 2024)**.** This also aligns with the stakeholder theory that companies must be careful when using funds to minimize their carbon emissions.

Environmental activities are closely linked to costs and subsequent benefits. Increasing a company's environmental activities requires additional funds and resources for investment in technology, expertise, and implementation of environmental protection. However, due to poor financial conditions, companies often consider increasing their funds and resource capacity for social and environmental activities. In contrast, environmental and social protection companies usually have favorable financial circumstances and industrial policies that can reduce their business risks.

Indonesia has active carbon trading, and companies seek to engage in environmental activities because they can obtain funds by selling carbon credits. Highly leveraged companies will use environmental activities and performance to improve their carbon emissions disclosure. If environmental and social performance is improved, the negative effect of the debt ratio can be reduced. Reputation, trust, stakeholder engagement, and environmental performance may also improve.

H3: Leverage can strengthen the relationship between environmental performance and carbon emission.

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H4: Leverage can strengthen the relationship between social performance and carbon emission.

3. Methodology/ Materials

Data Source

The data used in this study is data on companies listed on the Indonesia Stock Exchange (IDX) from 2019-2023. The research data was obtained from Thomson Reuters. We get carbon emission data from Refinitv ESG, which provides emission data from 2002. The following is the distribution of company sectors used in this study:

No.	TRBC Economic Sectors	Total	Percentage
1	Energy	5	15,15%
2	Basic Materials	3	9,09%
3	Consumer Non-Cyclicals	7	21,21%
4	Financials	6	18,18%
5	Real Estate	3	9,09%
6	Technology	4	12,12%
7	Industrials	2	6,06%
8	Healthcare	1	3,03%
9	Utilities	1	3,03%
10	Consumer Cyclicals	1	3,03%

TRBC Economic Sectors is a Tribeca Resource Corp that identifies, monitors, and analyzes companies and industries across global markets. The table explains that companies from the consumer non-cyclicals sector are the most widely used sample following the financials and technology sectors. The consumer non-cyclical sector includes companies that produce packaged food and cigarettes.

Variable Measurement

This study uses data from Refinitiv Eikon. The independent variables are environmental performance and social performance, using environmental and social performance scores. The dependent variable is carbon emission, which comes from the carbon emission score. Finally, the moderating variable is leverage, following Wahyuningrum's research (2024), where total debt is divided by total equity.

Model Settings

This research is divided into two models. Model 1 explains the relationship between the independent and dependent variables, while Model 2 explains that there are moderating variables that can affect Model 1.

Model 1

$$CarEm_{i,t} = \pi r^2 = EnPer_{i,t} + SocPer_{i,t} + \varepsilon_{i,t}$$

Model 2

$$CarEm_{i,t} = EnPer_{i,t} + SocPer_{i,t} + Lev_{i,t} + EnPer * Lev_{i,t} + SocPer * Lev_{i,t} + \varepsilon_{i,t}$$

Framework of the Study

Description:

CarEm :Carbon Emission, Carbon Emission Score

EnPer : Environmental Performance, Environmental Performance Score

SocPer : Social Performance, Social Performance Score

Lev : Leverage, total debt divided by equity

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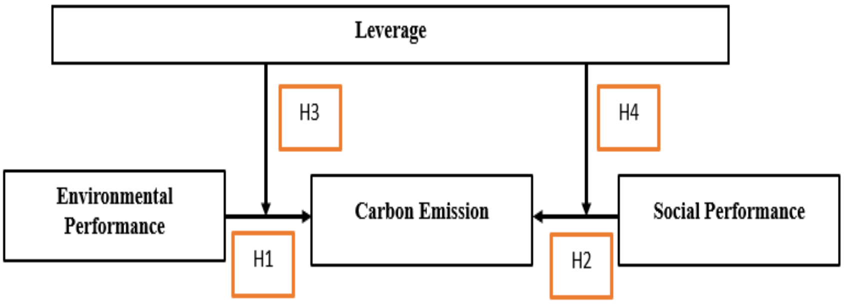

Results and Findings

Descriptive Analysis

Model 1

Variable	Prediction	Coefficient	P>|t|	Sign
EnPer	+	0,899	0,000	***
SocPer	+	-0,182	0,0295	**
Constant		24.854	0,000	
Number of Observation	180			
R-Squared	0,562			
Prob>F	0,000			

*p<0.1 (10%); **p<0.05 (5%); ***p<0.01 (1%)
(one-tailed test)

Model 1 explains the effect of environmental performance and social performance on carbon emissions in companies in Indonesia. H1 explains that environmental performance significantly and positively affects carbon emissions (H1 accepted). Disclosure of carbon emissions has become an interesting trend due to the increasing awareness of many parties regarding carbon footprints. Stakeholder theory provides an alternative theoretical perspective to explain voluntary environmental disclosures, such as carbon emission disclosures. The second hypothesis (H2 rejected) in this study explains the relationship from social performance to gas emissions choosing a negative but significant influence. This is not in line with the hypothesis of this study. Similar to research conducted by Meskovis

Model 2

(2024) awareness of social performance is still not formed in the company. The thinking factor that social performance is often seen as a secondary or optional function rather than as a business imperative (Esteves, 2024). (Esteves, 2024) is also a factor. The lack of foreign investors who can consider the company's social performance a long-term investment decision can also be one of the factors of awareness of the company's social performance. (Al-Gamrh et al., 2020)In Indonesia, foreign investors are still very limited and the activities of existing stakeholders sometimes undermine social performance (DesJardine & Durand, 2020).

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(DesJardine & Durand, 2020) because awareness is still limited.

Variable	Prediction	Coefficient	P>|t|	Sign
EnPer	+	0,873	0,000	***
SocPer	+	-0,174	0,036	**
Constant	+	0,206	0,039	**
EnPer*Lev	+	-0,002	0,0915	*
SocPer*Lev	+	-0,001	0,3355	
Constant		24.984	0,000	***
Number of Observation	180			
R-Squared	0,579			
Prob>F	0,000			

*p<0.1 (10%); **p<0.05 (5%); ***p<0.01 (1%)
(one tailed test)

Model 2 explains the moderating effect of leverage on the effect of environmental performance and social performance on carbon emissions. The results in this model are H3 and H3 rejected by the regression results. This is also in line with Wahyuningrum's research (2024), . When the company's leverage is high, this indicates that the company is experiencing a decline in financial condition which results in the company having difficulty in implementing voluntary activities such as carbon emissions. (Wahyuningrum et al., 2024)This is also in line with stakeholder theory that companies should be careful when using funds to cap their carbon emissions.

4. Conclusion

This study considers the limited exploration of research on carbon emission disclosure in Indonesia influenced by environmental and social performance. Secondly, this study is expected to make stakeholders aware and increase knowledge about carbon emission information, which is an important part that companies should focus on. Because, Regulation No. 51/POJK.03/2017 mandates that Financial Institutions, Issuers, and Public Companies implicitly implement sustainable financing, including carbon emissions. However, the data used in this study is still very limited to only one country, Indonesia. Future research is expected to expand the research to developing countries in ASEAN. The supporting factors of the research are also minimal, it is expected that future studies will add other variables that can support the research.

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