JURNAL AKUNTANSI BISNIS
PUSAT PENGKAJIAN DAN PENGEMBANGAN AKUNTANSI
p-ISSN 1412-775X
e-ISSN 2541-5204

The Influence of Environmental Cost, Board Size, and Institutional Ownership on Carbon Emission Disclosure with Company Size as a Moderating Variable

Andini Khoirun Nisa [1*], **Indah Fajarini Sri Wahyuningrum**[2]
[1,2]*Departement of Accounting Faculty of Economics and Business, Semarang State University*
* *Corresponding author email*: andinikhoirunnisa@students.unnes.ac.id

Abstract

This study analyzes the effects of environmental cost, board size, and institutional ownership on carbon emission disclosure, with company size as a moderating variable. The research focuses on basic materials and energy companies listed on the Indonesia Stock Exchange (IDX) from 2021–2024. Data were collected from annual and sustainability reports and analyzed through multiple linear regression and moderated regression analysis (MRA). The results show that environmental cost positively influences carbon emission disclosure, while board size and institutional ownership have no significant effect. Company size is found to strengthen the relationship between environmental cost and carbon emission disclosure but does not moderate the effects of board size and institutional ownership. These findings highlight the importance of company resources in supporting environmental transparency.

Keywords: Carbon Emission, Environmental Cost, Board Size, Institutional Ownership, Company Size.

Abstrak

Studi ini menganalisis pengaruh biaya lingkungan, ukuran dewan direksi, dan kepemilikan institusional terhadap pengungkapan emisi karbon, dengan ukuran perusahaan sebagai variabel moderasi. Penelitian ini berfokus pada perusahaan bahan baku dan energi yang terdaftar di Bursa Efek Indonesia (IDX) dari tahun 2021–2024. Data dikumpulkan dari laporan tahunan dan laporan keberlanjutan dan dianalisis melalui regresi linier berganda dan analisis regresi moderasi (MRA). Hasil menunjukkan bahwa biaya lingkungan berpengaruh positif terhadap pengungkapan emisi karbon, sedangkan ukuran dewan direksi dan kepemilikan institusional tidak berpengaruh signifikan. Ukuran perusahaan ditemukan memperkuat hubungan antara biaya lingkungan dan pengungkapan emisi karbon tetapi tidak memoderasi pengaruh ukuran dewan direksi dan kepemilikan institusional. Temuan ini menyoroti pentingnya sumber daya perusahaan dalam mendukung transparansi lingkungan.

Kata Kunci: Emisi Karbon, Biaya Lingkungan, Ukuran Dewan Direksi, Kepemilikan Institusional, Ukuran Perusahaan.

1. INTRODUCTION

Climate change has become a global phenomenon that has received increasing international attention. Rising global temperatures have led to substantial impacts on climate conditions across various regions (Intergovernmental Panel on Climate Change, (2021). According to the Intergovernmental Panel on Climate Change (IPCC) (2023), greenhouse

gases are the primary drivers of global warming. Global temperatures increased by approximately 1.1°C during the 2011–2020. Such emissions, particularly carbon dioxide (CO_2), negatively affect ecosystem stability and the socio-economic well-being of communities Gavurova et al (2021). The evidence suggests that climate change constitutes a significant global threat, thereby necessitating comprehensive and coordinated mitigation strategies. Carbon emission disclosure (CED) has emerged as an essential component of corporate environmental accountability, reflecting the growing demand for transparent reporting on firms' environmental impacts. In this context, CED refers to a company's practice of reporting its direct and indirect greenhouse gas emissions as part of its corporate social responsibility to support sustainability efforts and meet stakeholder information needs Adrati & Augustine (2022). Carbon emission disclosure reflects a company's transparency in reporting its carbon emissions and the mitigation actions taken to reduce them (Wahyuningrum et al., 2025). In Indonesia, carbon emission disclosure (CED) continues to be voluntary. While the Company Law No. 40 of 2007 requires companies to report on social and environmental responsibility, it does not clearly define the specific categories of environmental information that need to be disclosed Budiharta & Kacaribu (2020).

According to Ritchie et al. (2021) the land-use change and forestry sector was the largest contributor to carbon emissions in Indonesia in 2021, generating approximately 473.38 million tons of CO_2. This was followed by the electricity and heat sector with 259.21 million tons of CO_2, and the transportation sector with 135.67 million tons of CO_2. The manufacturing and construction sector has produced a significant contribution of 130.76 million tons of CO_2. In contrast, other sectors such as buildings, industry, other fuel combustion, fugitive emissions, aviation, and shipping contributed relatively smaller shares to the national emissions profile. Overall, these data indicate that land-use activities and the energy sector remain the primary sources of carbon emissions in Indonesia.

The basic materials and energy sectors in Indonesia require particular attention due to their substantial contribution to national carbon emissions. According to data reported by Ritchie et al. (2021) through Our World in Data, the electricity and heat sector produced approximately 259.21 million tons of CO_2 in 2021, making it the second-largest emitter after the land-use change and forestry sector. Ritchie et al. (2021) also noted that basic material industries including cement, steel, and chemical manufacturing contributed substantially to total emissions due to their energy-intensive production processes.

An important case related to emission issues in Indonesia involved the suspension of multiple companies by the Ministry of Environment and Forestry (KLHK) in the Greater Jakarta region for alleged air pollution. According to Poynting (2024), four firms such as PT Pindo Deli 3 and PT Wahana Sumber Rezeki were identified as violators of environmental regulations in 2023. The pollution was largely attributed to poorly managed coal stockpiles and production activities that were not aligned with approved environmental management plans. A similar issue occurred with PT Medco E&P Malaka, an oil and gas company suspected of causing health problems among residents in East Aceh due to inadequately disclosed air pollution. Maruf & Rudianto (2019) stated that the case has remained unresolved and has not received transparent clarification. These cases illustrate that air pollution and carbon emissions in Indonesia remain significant because of inadequate environmental control measures and suboptimal corporate social responsibility practices.

Several major environmental issues, including climate change and air pollution, have prompted many countries to intensify efforts to reduce greenhouse gas emissions Al-Qahtani & Elgharbawy (2020). Indonesia has demonstrated a strong commitment to emission reduction by ratifying the Kyoto Protocol through Law No. 17 of 2004 (Government of Indonesia, 2004), issuing Presidential Regulation No. 98 of 2021 on the implementation of carbon economic value (Government of Indonesia, 2021), and participating in the 2015 Paris Agreement, which aims to limit global temperature increases to no more than 1.5°C (UNFCCC, 2015). Through these commitments, Indonesia has set a national target to reduce greenhouse gas emissions by 29% through domestic efforts and up to 41% with international support by 2030 Amaliyah & Solikhah (2019).

Prior studies investigating the determinants of carbon emission disclosure (CED) have generated mixed empirical evidence. Several scholars have documented a positive association between environmental cost and CED, arguing that firms allocating greater resources to environmental activities tend to disclose more extensively as a form of accountability and legitimacy reinforcement Diyanti & Sa'diyah (2024), Putri & Paramita (2025). Similarly, research on board size has indicated that larger boards may enhance monitoring effectiveness and strategic oversight, thereby promoting higher levels of CED (Abbas et al., 2023; Karim et al., 2021; Simamora et al., 2022). In contrast, other studies have reported insignificant effects of environmental cost Sutomo & Ridhawati (2023) and board size Budiharta & Kacaribu (2020), Amaliyah & Solikhah (2019), suggesting that disclosure practices may be shaped more strongly by regulatory compliance than internal governance attributes. Institutional ownership has also produced inconsistent findings. Some studies reported that institutional investors exert pressure for higher transparency, thereby increasing CED levels Bedi & Singh (2025), Amanda et al (2024), while others found no meaningful influence Wahyuningrum et al (2024). These inconsistencies may stem from heterogeneity in sample characteristics, sectoral differences in carbon-intensive activities, variations in measurement of CED, and differing regulatory environments across study periods, which collectively contribute to divergent empirical outcomes.

Company size is a factor strongly associated with corporate transparency, as larger firms generally experience greater public scrutiny, stronger regulatory oversight, and have more resources to support extensive disclosure practices Ratmono et al (2021), Primary (2021), Widagdo et al (2022), Hidayat et al (2022), Harits & Mutasowifin (2024). These characteristics help explain why prior studies have reported conflicting results regarding the determinants of CED. For instance, while some researchers found a positive relationship between environmental cost and CED, others observed no significant effect. Larger firms typically possess more developed reporting systems and higher incentives to communicate environmental initiatives, allowing environmental expenditures to translate into substantive disclosures, whereas smaller firms may incur similar costs but lack the capacity or motivation to disclose them.

The same logic applies to board size and institutional ownership, where inconsistent findings may stem from size-related differences in organizational structure and stakeholder pressure. Larger firms often have more complex governance mechanisms, enabling larger boards to exert stronger oversight and influence disclosure quality compared with smaller firms. Likewise, institutional investors tend to impose greater monitoring pressure in large

firms due to higher reputational stakes and better information accessibility. Consequently, company size is theoretically justified as a moderating variable because it shapes the extent to which environmental cost, board size, and institutional ownership affect CED, thereby offering a plausible explanation for the divergent empirical results observed in previous studies, particularly within high-emission industries.

Profitability and leverage are included in this study as control variables because their primary role is to account for firm-specific financial conditions that may influence disclosure behavior, rather than to serve as the core determinants of CED. Profitability reflects a firm's capacity to generate earnings, which may enhance its ability and willingness to disclose environmental information, whereas leverage captures the extent of dependence on debt financing and the resulting pressure from creditors. Prior studies Widagdo et al (2022), Amanda et al (2024), Al-Qahtani & Elgharbawy (2020) show that these financial characteristics can influence disclosure practices and firm performance.

However, the theoretical focus of this research lies in examining environmental cost, board size, and institutional ownership as the main predictors of CED, because these variables directly represent environmental investment, governance mechanisms, and ownership structure factors that are conceptually grounded in stakeholder theory and legitimacy theory. Profitability and leverage, while relevant, function as background conditions that may confound the relationships between the main variables and CED. Therefore, they are treated as control variables to isolate the true effect of the primary determinants and ensure the robustness of the empirical analysis.

The novelty of this study lies in its specific focus on carbon-intensive industries namely basic materials and energy companies which remain understudied in the context of carbon emission disclosure. Moreover, this study contributes new empirical evidence from Indonesia by examining the determinants of carbon emission disclosure within sectors that play a critical role in national emission levels and the introduction of company size as a moderating variable. This approach by examining environmental cost, board size, and institutional ownership together within high-emission sectors offers a more comprehensive understanding of carbon emission disclosure because it allows the combined and individual effects of these determinants to be observed more clearly. The findings are expected to enrich the literature on environmental disclosure and provide targeted insights for key stakeholders. For policymakers, the results may inform the formulation of more effective national strategies for emission reduction. For regulators, the evidence can support the development of clearer and more enforceable disclosure guidelines. For corporate management, the findings offer practical direction in allocating resources and strengthening governance practices to improve environmental transparency and accountability.

2. LITERATURE REVIEW AND HYPOTHESES FORMULATION

Stakeholders Theory

Stakeholder theory, introduced by Freeman (1984), explains that the sustainability of a company is not only determined by its ability to generate profits, but also by its ability to meet the expectations and interests of its stakeholders. These stakeholders include parties who are directly or indirectly affected by the company's activities, such as shareholders, employees,

customers, suppliers, the community, and the government. According to Valentinov & Chia (2022), stakeholder theory is an approach that views a company as having stakeholders, namely groups or individuals who have an interest in the company's success or failure. This theory essentially argues that a company is not an independent entity; rather, its existence depends heavily on the support and recognition of various parties known as stakeholders Ghozali & Chariri (2007).

Stakeholder theory provides a fundamental theoretical basis for examining carbon emission disclosure because it posits that firms must address the information needs and expectations of various stakeholder groups to maintain legitimacy and secure continued support. In the context of high-emission industries, stakeholders including regulators, investors, communities, and environmental advocates demand greater transparency regarding carbon-related activities and mitigation efforts. This theoretical perspective suggests that firms with higher environmental costs, stronger governance structures, and more influential ownership patterns are more likely to enhance their disclosure practices as a response to external pressure and accountability expectations. Accordingly, stakeholder theory underpins the development of the study's hypotheses by explaining why these organizational characteristics are expected to influence the extent of carbon emission disclosure.

Legitimacy Theory

Legitimacy theory was introduced by Dowling and Pfeffer (1975), stating that legitimacy is a condition in which the values upheld by a company are aligned with the value system embraced by the society or social environment in which the company operates Wahyuningrum et al (2022). This social contract strengthens the incentives for top management to internalize and comply with the values, norms, and constraints that apply within the society surrounding the company, particularly those related to the implementation and reporting of environmental activities Velte (2023). Consequently, companies strive to maintain their social legitimacy through various actions that demonstrate environmental responsibility and adherence to public expectations, such as disclosing information related to environmental performance and efforts to reduce the negative impacts of operational activities on the community.

Legitimacy theory is also central to this study because it argues that firms disclose information to align their actions with societal norms and to maintain organizational legitimacy. Companies operating in high-emission sectors face greater public scrutiny due to their substantial environmental impact, creating stronger incentives to disclose carbon-related information as a means of demonstrating compliance with societal and regulatory expectations. From this perspective, firms with higher environmental costs, larger boards, or significant institutional ownership may engage in broader carbon emission disclosure to signal responsible environmental behavior and reduce legitimacy gaps. Thus, legitimacy theory supports the development of the study's hypotheses by explaining why these firm characteristics are expected to drive variations in disclosure practices.

Carbon Emission Disclosure

According to Jinsun Carbon (2025), carbon emissions refer to the release of carbon dioxide (CO_2) and other greenhouse gases such as methane (CH_4) and nitrous oxide (N_2O) into the atmosphere through human activities and natural processes. In managing and reporting these emissions, Carbon Emission Disclosure represents a key component of Carbon

Accounting, requiring companies to measure, recognize, record, present, and disclose the carbon emissions they generate Rini et al (2021).

CED is reported annually as a form of corporate responsibility and as a strategy to fulfill disclosure obligations, with emission data commonly presented in sustainability reports Najah (2012). Under PSAK No. 1 revised in 2009, environmental disclosure including carbon disclosure is part of corporate transparency regarding environmental impacts Ikatan Akuntan Indonesia (2009). Carbon Emission Disclosure enables companies to openly report carbon-related information to enhance corporate integrity and contribute to environmental conservation efforts Utami & Achyani (2023).

Environmental Cost and Carbon Emission Disclosure

According to Hansen and Mowen (2017), environmental costs reflect liabilities that arise due to poor environmental quality or the potential for environmental damage. In line with this view, Clarkson et al (2011) explains that companies that have a high environmental awareness tend to allocate more resources to environmental activities as part of a sustainability strategy.

Environmental cost expenditure is a form of corporate responsibility in meeting *stakeholder* expectations of sustainable business practices. Environmental cost expenditure is one of the legitimacy strategies used by companies to demonstrate compliance with applicable social and ethical standards. Companies that allocate more funds to environmental management tend to be more open about disclosing information about carbon emissions as a form of accountability and transparency. Prior empirical studies have shown that environmental cost is positively associated with carbon emission disclosure, including findings by Diyanti and Sa'diyah (2024), Putri and Paramita (2025), and Ratmono et al. (2021), all of which report that higher environmental expenditure encourages firms to provide more extensive environmental and carbon-related disclosures.

Based on this explanation, the relationship between environmental cost and carbon emission disclosure can be stated as follows:

H1: Environmental cost has a significant positive effect on carbon emission disclosure

Board Size and Carbon Emission Disclosure

Abbas et al (2023) define board as the the number of individuals serving on a company's board of directors, representing the overall managerial capacity involved in overseeing corporate decision-making. Companies with large numbers of directors generally show a higher level of transparency in the delivery of information because larger boards typically bring greater expertise and stronger oversight mechanisms, which encourage firms to disclose more comprehensive environmental information, including in terms of carbon emissions disclosures.

Stakeholder theory and legitimacy theory suggest that a larger board of directors may increase the level of carbon emission disclosure because a greater number of board members enhances the diversity of perspectives and strengthens oversight, leading to stronger internal pressure to respond to stakeholder information demands. From the standpoint of legitimacy theory, larger boards also encourage firms to disclose more carbon-related information as a strategic effort to demonstrate conformity with societal and regulatory expectations, thereby maintaining organizational legitimacy. Karim et al (2021) show a positive relationship between board size and carbon emission disclosure. Similar findings were also reported by Abbas et al.

(2023) and Simamora et al. (2022), who demonstrated that companies with larger boards tend to disclose more extensive carbon-related information. These results indicate that an increase in the number of board members is associated with a higher level of carbon emission disclosure. Based on this explanation, the relationship between board size and carbon emission disclosure can be stated as follows:

H2: Board size has a significant positive effect on carbon emission disclosure

Institutional Ownership and Carbon Emission Disclosure

Institutional ownership is the proportion of shares of a company owned by a financial institution or institutional investor Setiawan & Syarif (2016). High institutional ownership encourages companies to act more cautiously and openly, including in disclosing environmental information such as Carbon Emission Disclosure (CED*)*, as institutional investors exert strong monitoring pressure and demand higher accountability from management Bedi & Singh (2025), Amanda et al (2024).

Institutional ownership is one of the stakeholder groups that has a great influence on company policies because they are oriented towards long-term investment sustainability. Institutional investors have a vested interest in the long-term stability and value of the company, so they pay attention to environmental risks that could affect future financial performance. This positive association is evidenced in studies by Bedi and Singh (2025), Wahyuningrum et al. (2024), and Setiawan dan Syarif (2019), all of which conclude that institutional investors exert monitoring pressure that encourages greater transparency in carbon-related disclosures.

Based on this explanation, the relationship between institutional ownership and carbon emission disclosure can be stated as follows:

H3: Institutional ownership has a significant positive effect on carbon emission disclosure

Company Size as a Moderating Variable

Research Diyanti & Sa'diyah (2024) found that environmental costs have a positive impact on carbon emission disclosure. On the contrary, Sutomo & Ridhawati (2023) reported that *environmental cost* has a negative effect on carbon emission disclosure. On the other hand, the magnitude of the environmental costs incurred often depends on *company size* Because larger companies have higher financial capacity and social responsibility than smaller companies Ruth et al (2024). Therefore, this study uses company size as a moderation variable between environmental cost and carbon emission disclosure.

Company size is an important moderating factor because larger companies possess greater financial capacity, reporting infrastructure, and managerial resources to convert environmental expenditures into broader carbon-related disclosures. As noted by Malakwen et al (2024), larger companies face stronger social responsibility pressures and have more established mechanisms for communicating environmental performance. Therefore, company size is expected to strengthen the relationship between environmental cost and carbon emission disclosure, as larger companies are better equipped to translate environmental investments into transparent reporting.

Based on the inconsistent results of previous studies, the effect of company size moderation can be expressed in the following hypothesis:

H4: Company size can strengthen the influence of environmental cost on carbon emission disclosure

Research conducted by Badu (2017) and Abbas et al (2023) shows that board size has a positive effect on corporate social responsibility disclosure, including environmental disclosure. However, Scarlet Witch & Witch (2020) find different results, where board size has negative effects on Carbon Emission Disclosure. Company size strengthens those relationships because large companies have higher public resources and pressure to maintain legitimacy and meet stakeholder expectations through enhancement Carbon Emission Disclosure (CED).

Company size is expected to moderate the relationship between board size and carbon emission disclosure because larger companies generally possess greater financial resources, more sophisticated reporting systems, and stronger governance mechanisms. These advantages enable large firms to better leverage the expertise and oversight provided by a larger board, translating it into more comprehensive and transparent carbon-related disclosures. In contrast, smaller companies may have boards of similar size but lack the capacity or infrastructure to fully implement effective disclosure practices. Consequently, company size strengthens the positive impact of board size on CED by amplifying a firm's ability to respond to stakeholder pressures and maintain legitimacy in the public eye Badu (2017), Abbas et al (2023).

Based on the inconsistent results of previous studies, the effect of company size moderation can be expressed in the following hypothesis:

H5: Company size can strengthen the influence of board size on carbon emission disclosure.

Previous research results show that institutional ownership has a positive influence on Carbon Emission Disclosure. Amanda et al (2024) and Setiawan & Syarif (2016) found that institutional ownership plays a significant role in increasing corporate transparency on environmental issues. Meanwhile, research by Wahyuningrum et al (2024) states that institutional ownership does not affect the disclosure of carbon emissions, as the decision to voluntarily disclose information is the prerogative of management in determining company policies. Large-sized companies have greater financial capacity, better reporting systems, and high public exposure. Thus, the larger the size of the company and the higher the institutional ownership.

Company size moderates the relationship between institutional ownership and carbon emission disclosure because larger companies possess greater financial capacity, more sophisticated reporting infrastructure, and higher public exposure. These attributes enhance the ability of institutional investors to exert oversight and promote transparency, whereas smaller companies may lack the resources to translate ownership influence into comprehensive disclosure.

Based on the inconsistent results of previous studies, the effect of company size moderation can be expressed in the following hypothesis:

H6: Company size can strengthen the influence of institutional ownership on carbon emission disclosure

3. RESEARCH METHODS

Population and Sample

The research population includes all companies in the basic materials and energy sectors that are registered and publish financial statements and annual reports during the observation period. The sample is a company in the basic materials and energy sector listed on the Indonesia Stock Exchange (IDX) for the period 2021-2024. Using purposive sampling techniques to ensure the selection of companies that meet the research criteria, a final sample of 32 companies was obtained with a total of 128 analysis units.

Table 1 presents the selection process of the research sample. The initial population comprised 177 companies in the basic materials and energy sectors listed on the Indonesia Stock Exchange (IDX) during 2021–2024. Companies were progressively excluded based on specific criteria to ensure the relevance and completeness of data. First, 93 companies were excluded because they did not publish both annual reports and sustainability reports during the observation period. Next, 42 companies were removed because they did not adopt GRI 305: Emissions 2016 as their carbon emission disclosure standard. An additional 10 companies were eliminated as they did not report environmental cost information in their sustainability reports. After applying these criteria, a final sample of 32 companies was obtained, yielding 128 observations over the four-year period. This approach ensures that the analysis focuses on firms with complete and comparable data on carbon emissions and environmental costs, enhancing the reliability of the study's findings.

Table 1. Research Sample

Sample Criteria	Total
Companies in the basic materials and energy sector listed on the Indonesia Stock Exchange (IDX) for the 2021-2024 period	177
Companies that failed to publish annual reports and sustainability reports in 2021-2024	(93)
Companies that did not adopt GRI 305: Emissions 2016 as their carbon emission disclosure standards	(42)
Companies that did not report environmental cost information in sustainability reports	(10)
Final samples	32
Number of observations for four years	128

Variable Measurement

Table 2 presents the definition and measurement of the variables in detail.

Table 2. Variable Definition and Measurement

No	Variable	Definition	Measurement
1	*Carbon Emission Disclosure*	Information about the impact of the company's operations on climate change, including strategies to reduce	This study uses *the Global Reporting Initiative* (GRI) index

		emissions, and the risks and opportunities associated with such disclosures (Abbas et al., 2023)	$CED = \frac{Total\ disclosure\ score}{Maximum\ score\ (7)}$ x 100% (Wahyuningrum et al., 2022)
2	*Environmental Cost*	Environmental costs are part of environmental accounting that includes uncertain costs (*uncertain costs*) (Murti, 2022)	*ENVCOST* = Ln (Total Environmental Cost) (Ogbulafor et al., 2022)
3	*Board Size*	Number of board of directors serving in a company (Abbas et al., 2023)	$BS = \sum Dewan\ direksi\ perusahaan$ (Krisna & Suhardianto, 2016)
4	*Institutional Ownership*	Institutional ownership is the ownership of company shares held by an organization that can effectively supervise, discipline, and influence managers to force them to stay away from selfish behavior (Wahyuningrum et al., 2024)	$KI = \frac{Number\ of\ share\ owned\ by\ the\ institution}{Number\ of\ outstanding\ shares}$ x 100% (Wahyuningrum et al., 2024)
5	*Company Size*	*Company size* is a reflection of the size of the operational activities and economic capacity of a company (Melja et al., 2022)	$Company\ Size = Ln(Total\ Aset)$ (Saraswati et al., 2021)
6	Profitability	Profitability is a company's ability to generate profits from the assets it owns over a certain period. (Wahyuningrum et al., 2024)	$ROA = \frac{Net\ Income}{Total\ Asset}$ (Widagdo et al., 2022)
7	*Leverage*	Leverage is the level of a company's reliance on debt to finance its assets. (Jannah & Muid, 2020)	$DER = \frac{Total\ Liabilities}{Total\ Equity}$ (Wardiman et al., 2023)

Research Model

This study applied multiple regression with Moderation Regression Analysis (MRA) with the following equations:

$$CED_{it} = \alpha + \beta_1 \text{ENVCOST}_{it} + \beta_2 \text{BS}_{it} + \beta_3 \text{KI}_{it} + \beta_4 \text{SIZE}_{it} + \beta_5 (\text{ENVCOST} * \text{SIZE})_{it} + \beta_6 (\text{BS} * \text{SIZE})_{it} + \beta_7 (\text{KI} * \text{SIZE})_{it} + \beta_8 \text{ROA}_{it} + \beta_9 \text{DER}_{it} + \varepsilon_{it}$$

Description: CED= Carbon Emission Disclosure; ENVCOST= Environmental Cost; BS= Board Size; KI= Institutional Ownership; SIZE= Company Size; ROA= Profitability; DER= Leverage.

4. RESULTS AND DISCUSSION

Descriptive Statistics

This study utilizes secondary data obtained from the official IDX website (www.idx.ac.id) and the respective companies' websites, including annual financial statements and sustainability reports for the 2021–2024 period. The descriptive statistical summary is presented in Table 3.

Tabel 3. Descriptive Statistics

Variables	Mean	Median	Maximum	Minimum	Std. Dev
CED	0,72769	0,714428	1,000000	0,42857	0,270362
ENVCOST	23,55035	23,69659	28,22643	15,93727	2,341479
BS	6,093750	5,000000	15.00000	2,000000	2,594475
KI	0,895410	0,876473	9,992094	0,062511	0,841962
SIZE	30,51776	30,33885	32,76376	28,09096	1,129183
ROA	0,063692	0,048844	0,454267	-0,095649	0,081541
DER	1,119637	0,907869	5,533852	0,114611	0,868977

Referring to Table 3, the descriptive statistics of the sample reveal several key characteristics. Carbon emission disclosure (CED) has a mean of 0.72769 and a median of 0.71443, with a maximum of 1.0, a minimum of 0.42857, and a standard deviation of 0.27036, indicating that, on average, companies disclose around 73% of carbon emission information with moderate variability. Environmental cost (ENVCOST) exhibits a mean of 23.55035, median of 23.69659, maximum of 28.22643, minimum of 15.93727, and standard deviation of 2.34148, suggesting that firms allocate a relatively high and consistent level of environmental expenditure. Board size (BS) shows a mean of 6.09375, median of 5.0, maximum of 15, minimum of 2, and standard deviation of 2.59448, indicating that most boards consist of about six members on average, with some variation. Institutional ownership (KI) has a mean of 0.89541, median of 0.87647, maximum of 9.99209, minimum of 0.06251, and standard deviation of 0.84196, reflecting generally high ownership concentration among institutional investors but with notable outliers. Company size (SIZE), measured as the natural logarithm of total assets, presents a mean of 30.51776, median of 30.33885, maximum of 32.76376, minimum of 28.09096, and standard deviation of 1.12918, showing that the sample firms are generally large. Profitability (ROA) has a mean of 0.06369, median of 0.04884, maximum of 0.45427, minimum of -0.09565, and standard deviation of 0.08154, indicating moderate returns with some negative outliers. Finally, leverage (DER) exhibits a mean of 1.11964, median of 0.90787, maximum of 5.53385, minimum of 0.11461, and standard deviation of 0.86898, suggesting that companies operate with relatively high but variable levels of debt. These

statistics collectively provide a comprehensive overview of the sample characteristics and the variation of key variables used in the subsequent analyses.

Model Selection

Once the descriptive statistical analysis was completed, the study proceeded with a model selection test. In the context of panel data regression, researchers commonly apply three models: the Random Effect Model (REM), the Common Effect Model (CEM), and the Fixed Effect Model (FEM) (Ghozali & Ratmono, 2017).

Tabel 4. Model Selection

Model Specification	Effects Test	Statistic	Prob.
Chow Test	Cross-section F	5,527562	0,0000
Hausman Test	Cross-section random	17,169773	0,0087

According to the Chow test presented in Table 4, the Cross-section F-probability value of 0.0000, which falls below 0.05, supports the selection of the Fixed Effects Model (FEM) over the Common Effects Model (CEM). Next, the Hausman test was applied to determine whether FEM or the Random Effects Model (REM) was more appropriate. With a probability value of 0.0087, also below the 0.05 threshold, FEM emerged as the preferred model.

Hypothesis Testing

Table 5. Panel Data Regression Analysis Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-9,581756	2,684602	-3,569154	0,0006
ENVCOST	0,066728	0,026824	2,487650	0,0147
BS	-0,032568	0,021407	-1,521328	0,1317
KI	-0,014099	0,023789	-0,592670	0,5549
SIZE	0,295050	0,091289	3,232030	0,0017
ROA	-0,172584	0,429153	-0,402151	0,6885
DER	-0,039502	0,029707	-1,329697	0,1870

Tabel 6. Moderated Regression Analysis (MRA) Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-19,86244	16,54846	-1,200259	0,2333
ENVCOST	0,563261	0,676340	0,832807	0,4072
BS	-0,719690	0,585435	-1,229326	0,2223
KI	2,226887	1,571848	1,416732	0,1601
SIZE	0,636881	0,551960	1,153853	0,2517
EC_SIZE	-0,016597	0,022504	-0,733062	0,4655
BS_SIZE	0,022116	0,018923	1,168720	0,2457
KI_SIZE	-0,069550	0,048848	-1,423818	0,1581
ROA	-0,249664	0,433928	0,575358	0,5665
DER	-0,042820	0,030271	-1,414561	0,1608

Based on the regression results presented in Table 5, this study examines the influence of environmental cost, board size, institutional ownership, company size, profitability, and

leverage on carbon emission disclosure. The ENVCOST variable shows a significant positive effect on CED (p = 0.0147, coef. = 0.0667), indicating that higher environmental cost is associated with higher disclosure levels. Company size (SIZE) also demonstrates a significant positive relationship with CED (p = 0.0017, coef. = 0.2950), suggesting that larger firms tend to disclose more carbon-related information. Meanwhile, the BS, KI, ROA, and DER variables exhibit p-values above 0.05, indicating no significant influence on carbon emission disclosure. Furthermore, the moderated regression analysis (MRA) in Table 6 examines whether company size moderates the relationship between the independent variables and CED. Although the interaction terms (EC_SIZE, BS_SIZE, and KI_SIZE) show p-values above 0.05, indicating an absence of moderating effects, these findings should be interpreted cautiously because potential multicollinearity between the main variables and their interaction terms may attenuate the statistical significance of the moderation results.

Discussion

The Effect of Environmental Cost on Carbon Emission Disclosure

Referring to Table 5, the results indicate that environmental cost (ENVCOST) has a significant effect on carbon emission disclosure (CED), as shown by a probability value of 0.0147, which is below the 0.05 significance threshold. Thus, H1 is supported. The positive coefficient of 0.0667 suggests that companies allocating higher environmental costs tend to disclose more carbon emission information. This finding implies that environmental spending serves as a signal of corporate responsibility, encouraging firms to enhance transparency in environmental reporting.

This result aligns with legitimacy theory, which asserts that companies voluntarily disclose environmental information to gain stakeholder approval and maintain social legitimacy (Murti, 2022). Firms that invest more in environmental activities may feel greater pressure to justify these expenditures through broader disclosure practices.

This finding is consistent with prior studies by Diyanti & Sa'diyah (2024) and Princess & Paramita (2025), who concluded that environmental cost positively influences carbon emission disclosure. However, it contrasts with Sutomo & Ridhawati (2023) who reported that environmental cost does not significantly affect disclosure, likely due to differences in industry characteristics and reporting incentives.

The Effect of Board Size on Carbon Emission Disclosure

Referring to Table 5, the regression results show that board size (BS) has no significant effect on carbon emission disclosure (CED), as indicated by a probability value of 0.1317, which is higher than the 0.05 significance level. Thus, H2 is not supported. This result suggests that increasing the number of board members does not necessarily enhance the level of environmental disclosure. One possible explanation is that larger boards may experience coordination challenges, reducing their ability to effectively oversee sustainability-related reporting.

This finding does not align with stakeholder theory, which argues that a larger board structure should strengthen monitoring mechanisms and encourage companies to be more transparent in addressing stakeholder interests. However, the insignificance of board size may indicate that environmental disclosure decisions rely more heavily on specific board expertise rather than the number of board members. These findings are consistent with Scarlet Witch &

Witch (2020) and Amaliyah & Solikhah (2019), who also documented that board size does not significantly influence environmental or carbon disclosure. Conversely, this result contradicts studies by Abbas et al (2023), Karim et al (2021), and Simamora et al (2022), which found that a larger board enhances carbon transparency through improved oversight and decision-making capacity.

The Effect of Institutional Ownership on Carbon Emission Disclosure

Based on Table 5, institutional ownership (KI) has no significant impact on carbon emission disclosure, as reflected by a probability value of 0.5549, which exceeds the 0.05 threshold. Therefore, H3 is not supported. This suggests that institutional investors do not exert sufficient pressure to influence management to disclose more carbon-related information. This may occur because the institutional investors in the sample are more focused on financial returns rather than monitoring environmental transparency.

From the perspective of stakeholder theory, institutional investors often considered more sophisticated and demanding are expected to push companies toward greater sustainability reporting. However, the lack of significance in this study may indicate that institutional ownership in the basic materials and energy sectors is still dominated by investors with short-term orientations, reducing their emphasis on environmental disclosure. This result is consistent with findings by Wahyuningrum et al (2024), who also reported no significant relationship between institutional ownership and carbon disclosure. However, it contradicts prior studies by Bedi & Singh (2025), Amanda et al (2024), and Amaliyah & Solikhah (2019), which reported that institutional ownership positively influences environmental transparency due to stronger monitoring capabilities.

The Moderating Effect of Company Size on the Relationship Between Environmental Cost and Carbon Emission Disclosure

Referring to Table 6, the interaction variable EC_SIZE shows a probability value above 0.05, indicating that company size does not moderate the relationship between environmental cost and carbon emission disclosure. Thus, H4 is not supported. Although environmental cost has a significant direct effect on disclosure, company size does not strengthen this relationship. This implies that firms with larger asset bases do not necessarily enhance the influence of environmental spending on disclosure practices. This finding suggests that environmental cost remains a stand-alone driver of disclosure, regardless of company size. As a result, even large firms may rely on environmental cost itself rather than their scale to determine the extent of carbon emission transparency.

To ensure that the moderating results are not biased by multicollinearity, an additional correlation assessment was conducted between the main variables, the moderating variable, and the interaction terms. The results show that all correlation coefficients are low and none approach 1, indicating the absence of high multicollinearity in the MRA model. This confirms that the interaction effects are estimated reliably and are not distorted by linear dependence among variables.

The Moderating Effect of Company Size on the Relationship Between Board Size and Carbon Emission Disclosure

Based on Table 6, the interaction variable BS_SIZE has a probability value greater than 0.05, demonstrating that company size does not moderate the effect of board size on carbon

emission disclosure. Therefore, H5 is not supported. This indicates that the impact of board size on disclosure does not depend on whether the company is large or small. This result may occur because board structures focus more on governance roles and decision-making quality rather than firm scale. Accordingly, even in larger firms with more complex operations, having more board members does not strengthen the board's capacity to influence disclosure practices.

The Moderating Effect of Company Size on the Relationship Between Institutional Ownership and Carbon Emission Disclosure

The results in Table 6 also show that the interaction variable KI_SIZE has a probability value above 0.05, meaning that company size does not moderate the relationship between institutional ownership and carbon emission disclosure. Thus, H6 is not supported. This suggests that whether a firm is large or small, institutional investors do not experience a stronger influence on encouraging managers to disclose carbon emission information. This could be due to institutional investors in these sectors prioritizing financial performance rather than sustainability transparency, regardless of firm scale.

5. CONCLUSIONS AND SUGGESTIONS

This study aims to examine the effect of environmental cost, board size, and institutional ownership on carbon emission disclosure, with company size serving as a moderating variable. Using quantitative methods and hypothesis testing through multiple linear regression and moderated regression analysis (MRA), this research analyzes companies in the basic materials and energy sectors listed on the Indonesia Stock Exchange for the period 2021–2024. The findings indicate that environmental cost has a significant positive effect on carbon emission disclosure, suggesting that firms that allocate greater environmental expenditures tend to disclose more information related to carbon emissions. Board size and institutional ownership, however, show no significant effect on carbon emission disclosure. Company size is found to directly influence disclosure but does not moderate the relationships between environmental cost, board size, institutional ownership, and carbon emission disclosure.

These results provide theoretical implications by reinforcing legitimacy theory, which argues that companies disclose environmental information to maintain social approval, particularly when environmental investments are involved. From a practical perspective, the findings highlight the importance of corporate resource allocation in strengthening environmental transparency. For regulators and policymakers, the results emphasize the need to encourage more comprehensive sustainability reporting standards, especially in emission-intensive sectors.

Despite its contributions, this study has several limitations. The analysis is restricted to basic materials and energy companies, which may limit the generalizability of results to other sectors. In addition, the measurement of carbon emission disclosure relies solely on checklist-based content analysis, which may not fully capture the quality of disclosures. Future research may consider expanding the research sample to include a wider range of industries, incorporating additional variables such as environmental performance, board expertise, or carbon management strategies, as well as employing alternative research designs such as mixed methods or longitudinal analysis to deepen understanding of corporate disclosure behavior.

REFERENCE

Abbas, A., Zhang, G., Bilal, & Chengang, Y. (2023). Firm governance structures, earnings management, and carbon emission disclosures in Chinese high-polluting firms. *Business Ethics, the Environment and Responsibility*, *32*(4), 1470–1489. https://doi.org/10.1111/beer.12582

Adrati, S., & Augustine, Y. (2022). Pengaruh Volume Emisi Karbon , Pengungkapan Emisi Karbon , Pengungkapan Praktik Manajemen Emisi Karbon. *Jurnal Kontemporer Akuntansi*, *2*(1), 32–40.

Al-Qahtani, M., & Elgharbawy, A. (2020). The effect of board diversity on disclosure and management of greenhouse gas information: evidence from the United Kingdom. *Journal of Enterprise Information Management*, *33*(6), 1557–1579. https://doi.org/10.1108/JEIM-08-2019-0247

Amaliyah, I., & Solikhah, B. (2019). Pengaruh Kinerja Lingkungan dan Karakteristik Corporate Governance Terhadap Pengungkapan Emisi Karbon. *Journal of Economic, Management, Accounting and Technology*, *2*(2), 129–141. https://doi.org/10.32500/jematech.v2i2.720

Amanda, S. T., Gunawan, N. A., Putri, I. H., & Saadah, K. (2024). Carbon Emissions Disclosure in Indonesia: the Impact of Institutional Ownership. *Management of Sustainable Development*, *16*(1), 45–57. https://doi.org/10.54989/msd-2024-0005

Basuki, A. T., & Yuliadi, I. (2015). Electronic data processing (SPSS 15 dan Eviews 7). Yogyakarta: Danisa Media, 167.

Badu, E. A. (2017). The Impact of Corporate Board Size on Firm Performance : Evidence from Ghana and Nigeria. *Macrothink Institute*, *4*(2), 1–12. https://doi.org/10.5296/rbm.v4i2.11721

Bedi, A., & Singh, B. (2025). Does ownership structure affect carbon emission disclosure? *Asian Review of Accounting*, *33*(1), 72–88. https://doi.org/10.1108/ARA-11-2023-0307

Budiharta, P., & Kacaribu, H. (2020). The Influence of Board of Directors, Managerial Ownership, and Audit Committee on Carbon Emission Disclosure: A Study of Non-Financial Companies Listed on BEI. *Review of Integrative Business and Economics Research*, *9*(3), 75–87. https://sibresearch.org/uploads/3/4/0/9/34097180/riber_9-s3_06_h19-121_75-87.pdf

Carbon, J. (2025). *Jinsun Carbon*. Jinsun Carbon. https://jinsuncarbon.com/id/apa-itu-emisi-karbon/

Clarkson, P. M., Li, Y., Richardson, G. D., & Vasvari, F. P. (2011). J . Account . Public Policy Does it really pay to be green ? Determinants and consequences of proactive environmental strategies. *Journal of Accounting and Public Policy*, *30*(2), 122–144. https://doi.org/10.1016/j.jaccpubpol.2010.09.013

Diyanti, F., & Sa'diyah, N. (2024). Pengaruh Iso 14001 Certification, Ukuran Perusahaan, Dan Environmental Cost Terhadap Carbon Emission Disclosure. *Diponegoro Journal of Accounting*, *9*(204), 3195–3211. https://doi.org/10.30651/jms.v9i5.24386

Freeman, R. E. (1984). Strategic Management: A Stakeholder Approach. Pitman

Gavurova, B., Rigelsky, M., & Ivankova, V. (2021). Greenhouse Gas Emissions and Health in the Countries of the European Union. *Frontiers in Public Health*, *9*(December), 1–13. https://doi.org/10.3389/fpubh.2021.756652

Government of Indonesia. (2004). *Law No. 17/2004 on the Ratification of the Kyoto Protocol*.

Hansen, D. R., & Mowen, M. M. (2017). Managerial Accounting: Creating Value in a Dynamic

Business Environment (11th ed.). Cengage Learning

Harits, M. R., & Mutasowifin, A. (2024). Analysis of the influence of financial, carbon, and environmental performance on carbon emission disclosure. *IOP Conference Series: Earth and Environmental Science*, *1359*(1). https://doi.org/10.1088/1755-1315/1359/1/012095

Hidayat, I., Ismail, T., Taqi, M., & Yulianto, A. S. (2022). Investigating In Disclosure Of Carbon Emissions: Influencing The Elements Using Panel Data. *Jurnal Reviu Akuntansi Dan Keuangan*, *12*(3), 721–732. https://doi.org/10.22219/jrak.v12i3.23072

Hidup, K. L. (2025). *Akhir Penyusunan Second Nationally Determined Contribution, Menteri LH: Bukti Kesungguhan Indonesia Bangun Masa Depan Lindungi Bumi*. Kementrian Lingkungan Hidup. https://kemenlh.go.id/news/detail/akhir-penyusunan-second-nationally-determined-contribution-menteri-lh-bukti-kesungguhan-indonesia-bangun-masa-depan-lindungi-bumi

Intergovernmental Panel on Climate Change. (2021). Climate Change 2021: The Physical Science Basis — Contribution of Working Group I to the Sixth Assessment Report. Library of Congress.

Intergovernmental Panel on Climate Change(IPCC). (2023). Climate Change 2023: Synthesis Report Summary for Policymakers. In *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Issue studies). Intergovernmental Panel On Climate Change. https://doi.org/10.59327/IPCC/AR6-9789291691647.001

Jannah, R., & Muid, D. (2020). Analisis Faktor-Faktor Yang Mempengaruhi Carbon Emission Disclosure Pada Perusahaan Di Indonesia (Studi Empiris pada Perusahaan yang Terdaftar di Bursa Efek Indonesia Periode 2010-2012). *Diponegoro Journal of Accounting*, *3*(2013), 1–11.

Karim, A. E., Albitar, K., & Elmarzouky, M. (2021). A novel measure of corporate carbon emission disclosure, the effect of capital expenditures and corporate governance. *Journal of Environmental Management*, *290*(January), 112581. https://doi.org/10.1016/j.jenvman.2021.112581

Krisna, A. D., & Suhardianto, N. (2016). Faktor-Faktor yang Mempengaruhi Pengungkapan Tanggung Jawab Sosial. *Jurnal Akuntansi Dan Keuangan*, *18*(2), 119–127. https://doi.org/10.9744/jak.18.2.119-128

Kumparan.com. (2023). *Kumparan.com*. ACEHKINI. https://kumparan.com/acehkini/walhi-aceh-limbah-pt-medco-di-aceh-timur-bau-busuk-dan-bikin-sakit-1zbwo4Gjgu9

Malakwen, R. J., Tarus, J. K., & Otuya, R. (2024). *Relationship between environmental cost disclosure and financial performance of manufacturing and construction firms listed in Nairobi Securities Exchange: The moderating effect of firm size.* Journal of Business, Economics and Management Research Studies, 2(3), 46–57.

Maruf, M. A., & Rudianto, T. (2019). *Corporate social responsibility and environmental pollution in Indonesia*. Journal of Environmental Management and Tourism, 10(7), 1549–1557.

Melja, A., Murhaban, Mursidah, & Yusra, M. (2022). Pengaruh Profitabilitas , Ukuran Perusahaan dan Kinerja Lingkungan Terhadap Pengungkapan Emisi Karbon Pada Perusahaan Pertambangan Subsektor Batu Bara Yang Terdaftar di Bursa Efek Indonesia Tahun 2018-2021. *Jurnal Akuntansi Malikussaleh*, *1*(3), 332–346.

Murti, C. D. (2022). What Is Known About Environmental Cost Accounting? Systematic Literature Review. *Journal of Accounting and Investment*, *24*(1), 84–100.

https://doi.org/10.18196/jai.v24i1.16180

Najah, M. M. S. (2012). Carbon Risk Management, Carbon Disclosure and Stock Market Effects: An International Perspective. *Thesis*, 1–237.

Ogbulafor, L. C., Ihendinihu, J. U., & Azubike, J. U. (2022). Effect of Environmental Cost on the Financial Performance of Listed Manufacturing Firms in Nigeria Lynda et al,. *Jalingo Journal of Social and Management Sciences*, 81–93.

Our World in Data. (2021). *Our World in Data*. Our World In Data. https://ourworldindata.org/

Poynting, M. (2024). *Kenaikan suhu Bumi tembus ambang batas 1,5 Celsius untuk pertama kalinya*. BBC News Indonesia. https://www.bbc.com/indonesia/articles/cedqye0qng1o

Pratama, Y. M. (2021). Analisis Determinan Pengungkapan Emisi Karbon Di Indonesia. *Modus*, *33*(2), 120–137. https://doi.org/10.24002/modus.v33i2.4644

Putri, A. A., & Paramita, V. S. (2025). The Effect of ESG Disclosure, Green Investment, and Carbon Emission Disclosure on the Value of Energy Companies in Indonesia: Analysis for the 2019-2023 Period. *Sinergi International Journal of Accounting and Taxation*, *3*(1), 16–33. https://doi.org/10.61194/ijat.v3i1.406

Ratmono, D., Darsono, D., & Selviana, S. (2021). Effect of carbon performance, company characteristics and environmental performance on carbon emission disclosure: Evidence from Indonesia. *International Journal of Energy Economics and Policy*, *11*(1), 101–109. https://doi.org/10.32479/ijeep.10456

Rini, E. P., Febrial, P., & Muhammad, M. (2021). Pengaruh Growth, Firmsize, Profitability, Dan Environmental Performance Terhadap Carbon Emission Disclosure Perusahaan Industri High Profile Di Bursa Efek Indonesia. *Jurnal Ilmiah MEA (Manajemen, Ekonomi, Dan Akuntansi)*, *5*(3), 1101–1117.

Ritchie, H., Roser, M., & Rosado, P. (2021). *CO_2 and greenhouse gas emissions*. Our World in Data. https://ourworldindata.org/co2-and-greenhouse-gas-emissions

Ruth, M. J., John, T. K., & Robert, O. (2024). Relationship Between Environmental Cost Disclosure and Financial Performance of Manufacturing and Construction Firms Listed in Nairobi Securities Exchange ; The Moderating Effect of Firm Size. *Blueprint Academic Publishers*, *2*(3), 46–57.

Saraswati, E., Amalia, R. S., & Herawati, T. (2021). Determinants of Carbon Emission Disclosure in Indonesia Manufacturing Company. *Asian Journal of Economics, Business and Accounting*, *21*(3), 1–9. https://doi.org/10.9734/ajeba/2021/v21i330356

Setiawan, R., & Syarif, M. M. (2016). Kepemilikan Institusional , Kinerja Perusahaan , dan Efek Moderasi. *Business and Finance Journal*, *2005*, 41–48.

Simamora, R. N. H., Safrida, & Elviani, S. (2022). Carbon emission disclosure in Indonesia: Viewed from the aspect of board of directors, managerial ownership, and audit committee. *Journal of Contemporary Accounting*, *4*(1), 1–9. https://doi.org/10.20885/jca.vol4.iss1.art1

Suchman, M. C. (1995). Managing Legitimacy: Strategic and Institutional Approaches. Academy of Management Review, 20(3), 571–610

Sutomo, I., & Ridhawati, R. (2023). Efek Biaya Lingkungan Terhadap Pengungkapan Emisi Karbon Pada Perusahaan Energi Di Indonesia. *Jwm (Jurnal Wawasan Manajemen)*, *11*(3), 262–273. https://doi.org/10.20527/jwm.v11i3.280

Utami, R. A., & Achyani, F. (2023). Implikasi Media Exposure, Economic Pressure, Peringkat. *Economic and Digital Business Review*, *4*(2), 432–442.

Valentinov, V., & Chia, R. (2022). Stakeholder theory: A process-ontological perspective. *Business Ethics, Environment and Responsibility*, *31*(3), 762–776. https://doi.org/10.1111/beer.12441

Velte, P. (2023). Determinants and financial consequences of environmental performance and reporting: A literature review of European archival research. *Journal of Environmental Management*, *340*(May), 117916. https://doi.org/10.1016/j.jenvman.2023.117916

Wahyuningrum, I. F. S., Agustina, L., Ihlashul'amal, M., Jati, K. W., Sularsih, S., Anwar, S., & Sriningsih, S. (2025). Carbon Emission Disclosure and Its Impact on Developing Countries. *Jurnal Ilmu Lingkungan*, *23*(2), 472–486. https://doi.org/10.14710/jil.23.2.472-486

Wahyuningrum, I. F. S., Ihlashul'amal, M., Utami, S., Djajadikerta, H. G., & Sriningsih, S. (2024). Determinants of carbon emission disclosure and the moderating role of environmental performance. *Cogent Business and Management*, *11*(1). https://doi.org/10.1080/23311975.2023.2300518

Wahyuningrum, I. F. S., Oktavilia, S., Setyadharma, A., Hidayah, R., & Lina, M. (2022). Does carbon emissions disclosure affect Indonesian companies? *IOP Conference Series: Earth and Environmental Science*, *1108*(1). https://doi.org/10.1088/1755-1315/1108/1/012060

Wardiman, R. F., Muid, D., & Hamdani, H. (2023). The Influence of Social Pressure, Market Pressure, Shareholder Pressure and The Reputation of Public Accounting Firms on Carbon Emission Disclosure. *Jurnal Manajemen Bisnis*, *10*(1), 84–97. https://doi.org/10.33096/jmb.v10i1.482

Widagdo, A. K., Rahanyamtel, B. A., & Ika, S. R. (2022). The impact of audit committee characteristics, financial performance, and listing age on greenhouse gas emission disclosures of highly emitted industry in Indonesia. *IOP Conference Series: Earth and Environmental Science*, *1016*(1). https://doi.org/10.1088/1755-1315/1016/1/012047

Table 1 Global Reporting Initiative (GRI) index

2021 GRI Index	
Emissions	
305-1	Direct (Scope 1) GHG Emissions
305-2	Energy Indirect (Scope 2) GHG Emissions
305-3	Other Indirect (Scope 3) GHG Emissions
305-4	GHG Emissions Intensity
305-5	Reduction of GHG Emissions
305-6	Emissions of Ozone-Depleting Substances (ODS)
305-7	Nitrogen Oxides (NOx), Sulfur Oxides (SOx), and Other Significant Air Emissions