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Article

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Determinants of carbon emission disclosure and the moderating role of environmental performance

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ABSTRACT

This study has three objectives: exploring carbon emissions disclosure practices in Indonesia, seeking factors that influence carbon emissions disclosure, and analyzing the moderating role of environmental performance on these factors. The novelty of this study lies in the detailed research on carbon emission practices in Indonesia and the moderation model, which refers to a combination of sociopolitical, economy-oriented, and institutional theories. The sample for this study comprises 165 firm years. This study uses a sample of nonfinancial companies with PROPER ratings listed on the Indonesian stock exchange from 2017 to 2021. The results indicate that carbon emissions disclosures in Indonesia are steadily increasing, with a slightly increasing year-to-year alignment with companies' environmental performance. Regarding how companies disclose carbon emissions, they prefer numbers or countable information, focusing on standard information for carbon emissions disclosure and not disclosing their capital expenditure planning for carbon cost. The regression findings show that foreign boards, profitability, and media exposure significantly and positively influence carbon emissions disclosure. Moreover, leverage has a negative influence, and institutional ownership has an insignificant influence on the disclosure of carbon emissions. This study confirmed the moderating role of environmental performance variables in reversing the influence of independent factors. This study contributes to the literature on how companies practice carbon emissions disclosure and the role of environmental performance as a moderating factor in carbon emissions disclosure.

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1. Introduction

In the past decade, carbon emission reduction activities have become a significant concern because of their enormous impact on climate change (An et al., 2021; Arslan et al., 2022; He et al., 2022; Herman & Shenk, 2021; Orazalin et al., 2024; Sinha & Chaturvedi, 2019). This concern has led all nations to discuss how to reduce the adverse impact of carbon emissions. A company's negligence in its operational activities leads to significant carbon emissions globally (Nasih et al., 2019); thus, companies should consider this issue. There is increasing pressure and growing concern from regulators, policymakers, investors, and the public for more information regarding companies' carbon emission behavior. Given the relevance of emission reduction activities, several previous studies have emphasized the need to disclose carbon information (Cohen et al., 2023; Safiullah et al., 2022). Carbon emission disclosures are transformed into assurance and company accountability to inform stakeholders (Liesen et al., 2017; Liu et al., 2022).

Although studies consider the crucial existence of voluntary disclosure of carbon-related information (Jaggi et al., 2018; Luo & Tang, 2014; Qian & Schaltegger, 2017), companies' motives for disclosing carbon

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emissions are still debatable. Prior studies have identified why companies want to disclose information on carbon emissions. The motivation is that companies should protect their reputation and relationships with stakeholders (Liu et al., 2022; Scholtens & Kleinsmann, 2011; Tan et al., 2022), comply with the regulator's policy (Boateng et al., 2023), and avoid suspicion from environmental NGOs. Conversely, some studies assume that companies' carbon emissions disclosures contradict sound business practices and reduce their focus on wealth creation (Ganda, 2018; Yuan et al., 2022). Reducing carbon emissions is more practical than focusing solely on administrative forms. Companies have stated that different stakeholders probably have different expectations about the existence of carbon emissions disclosures (Busch & Hoffmann, 2011). The controversy over companies' motives to disclose carbon emissions requires further research.

In this study, we believe that disclosing information on carbon emissions is evidence of a company's commitment to carbon emission reduction; therefore, we explore this issue for several reasons. First, the legitimacy theory states that one technique that an organization might use to address the needs and demands of society is social and environmental transparency (Freedman & Jaggi, 2005; Ieng Chu et al., 2012). Every company, particularly those in industries that contribute significantly to CO₂ emissions through their business processes, is expected to reduce emissions and disclose this information to the public as part of its commitment to sustainable development. In alignment with the stakeholder theory, companies are pressured by stakeholders to inform them of current issues, such as carbon emissions (Guenther et al., 2016). This disclosure, including carbon emissions reporting, is positioned as authentic evidence of company decisions and actions easily accessible to external parties (Barako & Brown, 2008). Second, regarding the practicality of carbon emissions disclosure, today, carbon emissions disclosure does not have standalone guidelines. Over the past 20 years, companies have often used the GRI template to report nonfinancial information because it is a reliable and has a standard reporting format (Fernandez-Feijoo et al., 2014; Marimon et al., 2012). Currently, carbon reporting practices are voluntary in different jurisdictions. Only a few countries, such as the United Kingdom, Australia, France, and New Zealand, have introduced carbon emissions as a mandatory requirement (Houqe & Khan, 2023; Taurigana & Chithambo, 2015). This study examines these issues in Indonesia by relating companies' perspectives on carbon emissions, practical activities, and disclosure drivers.

Indonesia, as one of the G20 countries, is actively engaged in the mission to reduce carbon emissions, as evidenced by its ratification of the Kyoto Protocol on June 28, 2004, through Law No. 17 of 2004 concerning greenhouse gas emissions reduction (Murdiyarto, 2004). Indonesia has the ambitious target of realizing net-zero emissions by 2060. The government established Presidential Regulation No. 61 of 2011 on the National Action Plan for Greenhouse Gas Emission Reduction and Presidential Regulation No. 71 of 2011 on the Implementation of the National Greenhouse Gas Inventory to achieve carbon emission reduction practices at the national level. Article 4 of this regulation emphasizes that both society and companies must contribute to efforts to reduce greenhouse-gas emissions. In alignment with the Paris Agreement ratification, Indonesia is committed to reducing greenhouse gas emissions by 31.89% through its efforts and by 43.20% with international support by 2030 (Forestry, 2021a, 2023). Ideally, carbon emissions should be reduced through the participation of various stakeholders (Prado-Lorenzo et al., 2009). Carbon emission reduction in Indonesia could be realized through a low-carbon economy, renewable energy usage, innovative technology financing, climate-smart agriculture, and sustainable forest management. All these components of carbon emission reduction implementation involve various stakeholders, with companies being the central economic players and resource users (Bocken & Allwood, 2012). Consequently, the company is expected to reduce its emissions and disclose this information to the public as a part of its commitment to sustainable development. Despite the crucial role of carbon reduction and disclosure in Indonesia, the reality-mentioned progress in carbon reporting has not led to improved practices and quality. Therefore, this study focuses on the disclosure of carbon emissions in Indonesia.

Research trends related to carbon emission disclosure in Indonesia have increased recently (Hermawan et al., 2018; Nasih et al., 2019; Solikhah & Wahyudin, 2020; I. Wahyuningrum et al., 2022; Wahyuningrum et al., 2019; Wahyuningrum et al., 2023). However, research on this topic is limited and has not produced consistent results, particularly regarding the catalysts that encourage companies to disclose carbon emissions in their reports. A previous study (Abdullah et al., 2020) found that company size, profitability, leverage, and environmental performance positively influence carbon emissions disclosures in Indonesia.

Similarly, another study (I. Wahyuningrum et al., 2022) revealed that company size affects carbon emissions disclosure, whereas PROPER rating, profitability, leverage, and audit committees do not significantly affect carbon emissions disclosure. Conversely, ISO 14001, environmental performance, environmental committees, and foreign diversity can enhance carbon emissions disclosures in companies (Jannah & Narsa, 2021). Some authors (Purwanti et al., 2022) stated that the media can negatively impact carbon emissions disclosure and that Return on Assets (ROA) does not significantly affect it. The diverse range of factors examined in previous research makes the study of carbon emissions disclosures increasingly intriguing. This study addresses this gap in the literature exploring the determinants of carbon emissions disclosure.

The novelty of the current study lies in its perspective. First, it introduces a contingency approach to explore the relationship between carbon emissions disclosure and its drivers, highlighting the role of environmental performance. This study uses the moderating model, which is based on prior studies exploring the effect of institutional ownership (Kordsachia et al., 2021; Martínez-Ferrero & Lozano, 2021), national diversity of the board (Du et al., 2020; Mardini & Elleuch Lahyani, 2022), profitability (Vinayagamoorthi et al., 2015), leverage (Benlemlih & Cai, 2020; Modi & Cantor, 2021), and media exposure (Su & Fan, 2021; Zhang et al., 2022) on environmental performance and the effect of environmental performance on carbon emissions disclosure. Combining sociopolitical, economy-oriented, and institutional theories, this study is confident in the moderation model, primarily when many existing studies on voluntary disclosure draw only on a single theory (Alatawi et al., 2023). This provides the research's theoretical and empirical motivation because it implies a connection between a few variables and environmental performance. Environmental performance has become an increasingly important indicator of a company's concerns (Bassetti et al., 2021; Searcy et al., 2016). Researchers have argued that a firm's environmental performance motivates executives to disclose environmental factors voluntarily (Dawkins & Fraas, 2011; Oates & Moradi-Motlagh, 2016; Shahab et al., 2020; Shima & Fung, 2019). Executives are more likely to release environmental information when their companies are performing well environmentally in order to lessen information asymmetry and promote a positive company image; conversely, when their companies are performing poorly environmentally, they are also more likely to release environmental information reports to enhance their company's reputation (Ma et al., 2019). In line with legitimacy theory and signaling theory, companies release information to wash away detrimental images; thus, their environmental performance becomes the company's motive. Therefore, our study uses environmental performance to strengthen the relationship between carbon emissions disclosure and its drivers. Second, this study provides a novel research perspective by comprehensively exploring the present trends, preferred forms, and sector forms of carbon emissions disclosure practices in Indonesia.

Using the lens of legitimacy and stakeholder theories as sociopolitical theories, signaling and agency theories as economy-oriented theories, and institutional theory as institutional viewpoint theories, the current study explores the practices of carbon emissions disclosure of Indonesian companies in detail and the potential factors that motivate disclosures. The following questions were addressed.

RQ-1. How do Indonesian companies disclose carbon emissions, what information is preferred, and how are they trending?

RQ-2. What factors influence companies to report carbon emission information?

RQ-3. What is the role of environmental performance in the relationship between the disclosure of carbon emissions and related factors?

Therefore, the objectives of this study were threefold. First, we aimed to develop findings on carbon emissions disclosure practices. We complement this research by providing detailed evidence on how companies disclose information on carbon emissions. Second, we observed institutional ownership, board nationality diversity, profitability, leverage, and media exposure as factors influencing companies to report carbon emissions information. Third, we investigated the role of environmental performance in the relationship between these factors and carbon emissions disclosures in Indonesia.

Using a sample of 165 firm-year observations between 2017 and 2021 from non-financial firms in Indonesia, this study focuses on non-financial firms included in the PROPER rating program. We started with non-financial sector companies in Indonesia because this sector is prone to environmental issues.

In its 2020 report on greenhouse gas emissions by industrial category, the Ministry of Energy and Mineral Resources (ESDM) revealed that the energy-producing industry (including the mining sector) contributed the most, accounting for 638,453 gigagrams (Gg) of CO₂e, or 43.83%, in 2019. Transportation, manufacturing, construction, and other sectors also contributed 24.64%, 21.46%, and 4.13%, respectively (Forestry, 2021a). These data reaffirm that companies and industries in this sector play crucial roles in increasing national carbon emissions. Additionally, this study highlights companies as members of the PROPER rank. The PROPER rating program was developed with two objectives, namely, reward companies whose performance surpasses regulatory requirements and encourage adherence to environmental laws (Afsah et al., 2010). These ratings were assigned to one of five color ratings (gold, green, blue, red, or black), which were also included in the measurements of the current study. This rating focuses on how firms, as polluters, try to control pollution, follow standards, and create innovative systems or technologies for water, hazardous waste, and air (García et al., 2007). Our measure of carbon emissions disclosure captures actual carbon emissions. This study used 18 indicators with five dimensions formulated from three perspectives. Even if we consider a group of needles developed previously (Bae Choi et al., 2013), this measurement provides evidence for the practices of carbon emissions.

A regression analysis was used to test the research hypotheses. Our study found that Indonesian firms must improve both in-house efforts and carbon emissions disclosure in many areas. Some enterprises provide minimal or subpar information about their carbon emissions, and apart from feeble endeavors, there is a disparity in knowledge regarding the disclosure of carbon emissions data. The current study also verifies that many factors, namely, the national diversity of the board, profitability, leverage, media exposure, and environmental performance, all positively influence carbon emissions disclosure, except for leverage. Conversely, we provide evidence that environmental performance produces findings that differ from theories and initial estimates. Environmental performance reverses the influence of some factors and reduces the impact of media exposure on carbon emissions disclosures. Our findings are robust because we employed additional tools to check the consistency of our results using robustness tests.

This study makes several contributions to existing literature. First, it contributes to the literature on carbon emissions disclosure. By exploring its carbon emissions disclosures, we provide empirical evidence of a company's carbon reduction commitment. Previous studies support the statement that carbon reporting aligns with carbon emissions in reality (Al-Tuwaijri et al., 2004; Clarkson et al., 2008; Luo & Tang, 2014). This study considers the limited exploration of carbon emissions disclosure research in Indonesia, especially regarding how companies practice disclosure from a specific point of view. To the best of our knowledge, our study is the first to investigate carbon disclosure practices in specific areas, such as the sector's carbon disclosure practices, the trend of level carbon disclosure, and companies' preferred carbon information, compared with earlier research conducted in Indonesia. Second, these findings will enable stakeholders to understand the highlights of carbon information. This study also provides a view of where companies should improve information on carbon emissions, which also suggests the implementation of a sustainable finance roadmap. Regulation No. 51/POJK.03/2017 mandates that Financial Institutions, Issuers, and Public Companies implicitly implement sustainable financing, including carbon emissions. Therefore, this study has implications for direct parties in developing a structured framework to increase sustainable finance practices. Third, although previous studies have provided an analysis of the factors that motivate companies to disclose carbon emissions, their findings vary; therefore, this study contributes to assuring some factors for their relationship with carbon emissions disclosure. Fourth, our findings provide an alternative perspective on the role of environmental performance.

The remainder of this article is organized as follows. The following sections outline the contextual background, and Section 3 presents a theoretical literature review. Section 4 reviews the empirical literature and develops our hypotheses. Section 5 discusses the research design, and Section 6 reports and discusses the empirical data. Finally, a summary and conclusion of the study are provided in Section 7.

2. Background

The current research focuses on Indonesia, one of the largest GDP countries among the G20 members, which is the ninth most significant emitter of carbon dioxide (CO₂), compared to other ASEAN nations. In 2022, Indonesian companies reported a total CO₂ emissions of 619 million metric tons, showing an

increase of more than 20.3% compared with 2021 (Jennifer, 2023). With these increases, Indonesia is expected to become the world's 6th-highest fossil polluter by 2022 (Jennifer, 2023). As a result, Indonesia has committed to a more aggressive reduction in carbon emissions, aiming for net-zero emissions by the 2060 ambitious target. Indonesia will join the carbon exchange market for the first time in 2023 through the Indonesian Stock Exchange for Carbon (IDXCarbon, IDX, 2023). However, although Indonesia is committed to reducing carbon emissions, and corporate activities are the most significant contributors, there is a lack of a legal structure to regulate the amount of carbon emissions and how they are disclosed (Ayostina et al., 2022). Nevertheless, information on carbon emissions is only disclosed in annual reports and sustainability reporting (Maharani et al., 2023), which are just starting to switch from voluntary to mandatory in Indonesia. Indonesia also committed to reducing greenhouse gas emissions by 31.89%–43.20% by 2030, but this appears unachievable without the effort and cooperation of business enterprises. Under current circumstances, Indonesian companies can freely reveal statistical data and information. This leads to uneven, inconsistent, and biased reporting because businesses will only do so if their performance outperforms their rivals. Likewise, in response, the Indonesian government and regulators must ponder a structured framework or legal guideline for carbon emissions reporting that ensures the disclosure of carbon emissions. The current study can support policymakers in identifying the factors that influence a firm's motives or obstruct the disclosure of information on carbon emissions. Consequently, this study will assist in drafting regulations to reinforce motivating factors and eliminate obstructive ones. Current research can be a foundation for developing regulatory standards because policies based on research findings can be unquestionably accepted and implemented (Liu et al., 2017). In summary, increasing levels of CO₂ emissions due to energy consumption, production, and business enterprise activities (Hartono et al., 2021), the lack of a regulatory framework on carbon emissions and its disclosure, and the expected role of some parties in reducing carbon footprints are the few reasons that suggest Indonesia is an acceptable country for this study.

3. Theoretical literature review

Environmental disclosure theories are the theoretical foundation of carbon emissions disclosure because carbon emissions are a part of environmental information (Desai, 2022). Based on an extensive literature review, environmental disclosure, as well as other non-financial information like social and governance, has been found to be governed by three main groups of theories (Hahn et al., 2015): sociopolitical theories (Rob et al., 1995), economic theories/information asymmetry (Desai, 2022), and institutional theories (Hahn et al., 2015).

First, according to sociopolitical theories of disclosure, voluntary disclosure aims to manage perceptions and assist companies in responding to social and political pressures from various sources, including governments, the media, non-profit organizations, and society at large (Desai, 2022). Hence, carbon emissions disclosure has become an exciting disclosure trend because of the recent increase in the awareness of many parties regarding the carbon footprint. Sociopolitical theory has two valuable pillars: legitimacy theory and stakeholder theory (Hahn et al., 2015).

The legitimacy theory explains that company activities are based on trust and social norms within a society (Chariri & Ghazali, 2007). Companies are part of an extensive social system that can influence the social system in which they operate. Thus, companies strive to align their social values with the prevailing norms in an operational environment (Dowling & Pfeffer, 1975). The relationship between companies and society creates a social contract; hence, if one sees that an offence has broken the contract of social norms, it threatens business sustainability. This scenario allows companies to consider their operational activities carefully to value society's expectations. Therefore, this concept of legitimacy theory applies to climate change issues, especially to globally intense issues such as carbon emissions, which receive plentiful attention from all parties. Legitimacy theory encourages companies to take responsibility for environmental issues to meet societal expectations (Deegan et al., 2002). This theory suggests that companies should build public perceptions through environmental legitimacy, portraying them as responsible for their carbon footprint and reduction (Kuo & Yi-Ju Chen, 2013). Owing to public demand for carbon issues, companies tend to engage in reporting practices, such as carbon emission disclosures (Kalu et al.,

2016; Kılıç & Kuzey, 2019). The use of (symbolic) process-oriented carbon reduction programs instead of a real, substantial CP (reduced greenhouse gas emissions) was recommended (Haque & Ntim, 2020). Producing carbon emissions disclosures is reasonable as a symbol of companies' concerns. Companies adopt these disclosures, presented in annual and sustainability reports, to provide information to the public (Kılıç & Kuzey, 2019). The primary purpose of a company's disclosure activities is to maintain the legitimacy of society. The legitimacy theory also considers companies' environmental awareness based on their environmental performance. As crucial as administrative forms such as environmental or carbon disclosure, the countable perspective also represents company responsibility. A firm's management encourages countable or seen performance to gain legitimacy and maintain social contracts. This scenario is one of the foundations for the role of environmental performance in this study.

Furthermore, stakeholder theory provides an alternative theoretical perspective for explaining voluntary environmental disclosures, such as carbon emissions disclosures. The main difference between this and the previous theories is that they highlight the actors they focus on. The legitimacy theory framework only focuses on society, whereas the stakeholder theory concentrates on pressure and needs (Berthelot & Robert, 2011). All forms of information companies provide are closely related to their stakeholders. Companies practice voluntary carbon disclosure due to stakeholder pressure, increasing awareness of climate change, or carbon issues. Stakeholder theory states that a company's operations impact not only the company itself but also provide effects for stakeholders (Gibson, 2000). Stakeholders and companies have a mutually influential relationship. Establishing a company requires the support of various parties, and its survival is contingent on the support obtained from its stakeholders (Rob et al., 1995). Stakeholder theory suggests that companies strive to harmonize their activities with stakeholders' expectations (Barako & Brown, 2008). Consumers, non-profit organizations, the media, and even internal stakeholders can pressure companies to address environmental issues such as carbon emissions (S.-Y. Lee et al., 2015). From this perspective, companies have begun to reveal more details about the environmental effects of their operations to demonstrate that they meet stakeholder expectations (Alfani & Diyanty, 2020). Companies disclose more environment-related information in response to stakeholder demands (Naser et al., 2006). Furthermore, under this paradigm, stakeholder theory indicates that carbon emissions disclosure is a helpful instrument for meeting stakeholders' information requests about climate change. Environmental disclosures act as tools and communicators (Nasih et al., 2019) that can garner support and ensure companies' sustainability (Akbaş & Canikli, 2018). In this context, companies voluntarily disclose carbon emissions to legitimize their actions and manage the expectations of different stakeholders according to both stakeholder theory and legitimacy.

Second, based on economic theories, the carbon emissions disclosure framework solves information asymmetry for outside stakeholders because of its potential to become a credible information source that is easy to reach. The asymmetry arises because managers and stakeholders have different privileges in obtaining information (Desai, 2022). Economic theories are anchored in signaling and agency theories to resolve this issue. Signaling theory suggests companies disclose voluntary information about their performance to solve asymmetric information and enhance their reputation (Ben-Amar et al., 2017). This scenario is suitable for carbon emissions disclosure. Companies with better environmental and carbon performance are more likely to adopt voluntary disclosure, such as carbon emissions disclosure (Akbaş & Canikli, 2018), in this regard in order to avert adverse selection and lessen information asymmetry by signaling their superior performance and setting themselves apart from underperformers (Desai, 2022). Signaling theory is the role of environmental performance in enhancing carbon emissions disclosures. In addition, agency theory provides a different approach to exploring carbon emissions disclosure. Agency theory states that voluntary disclosures are closely related to publishing costs and after-benefits; hence, managers engage in voluntary disclosures based on financial performance (Guidry & Patten, 2012). When companies possess sufficient financial resources to disclose carbon emissions and the outcomes are worthwhile, they begin carbon transparency. Under this concept, signaling theory and agency theory have become keystones for some factors that motivate carbon emissions disclosure.

Institutional theory is the third and last theoretical framework that explains carbon emissions disclosure as a company's voluntary behavior. Institutional theory believes that practical activities and symbolic concepts constitute the organizing principles of both organizations as institutions and individuals (Akbaş & Canikli, 2018). When systems believe in one or more concepts, entities or firms follow the guide and

apply it to their activities (Tang & Luo, 2016). In their research, Herold states that from an institutional theory perspective, there are two assumptions for the carbon disclosure framework (Herold et al., 2019). First, at the field level, carbon disclosure has been institutionalized and represented as an established social fact; therefore, companies are expected to take action in carbon disclosure practices (Herold et al., 2019). Although carbon reporting practices are voluntary in different jurisdictions, some companies, such as those in the United Kingdom, Australia, France, and New Zealand, have introduced carbon emissions as a mandatory requirement (Houqe & Khan, 2023; Tauringana & Chithambo, 2015). Second, voluntary carbon emission disclosure practices are threatened by credibility issues (Herold et al., 2019). It is challenging to determine a company's 'true' carbon situation because of this inherent uncertainty resulting from a firm's choice over sharing carbon-related information. In this context, institutional theory assists research exploring how companies practice carbon emissions disclosure.

We conclude the theoretical literature review by employing combined theories to identify the crucial firm attributes and corporate governance factors that could influence carbon emissions disclosure and formulate the study's hypotheses. A prior study (Hahn et al., 2015) states that the empirical results of previous research are not strongly established for only one of these theories.

4. Empirical literature review and hypothesis development

This present section provides an overview of the literature about the factors that influence carbon disclosure. It also develops a hypothesis based on theoretical foundations, empirical evidence, and contextual settings.

4.1. Institutional ownership and carbon emission disclosure

From the stakeholder theory perspective, companies strive to harmonize their activities with stakeholder expectations. Institutions, including those in Indonesia, have increased their awareness of climate change and carbon issues, as reflected in their participation in carbon trading. Institutions are also relevant shareholders who pressure companies on hot carbon issues. The theoretical stakeholder framework provides a perspective on the role of institutional investors in companies. Institutional investors with significant ownership can promote carbon emission reduction activities as part of their environmental responsibilities (Shiu & Yang, 2017). This perspective is supported by the idea that the engagement of companies and institutional investors in environmental responsibility fosters a harmonious relationship between them (Lins et al., 2017). Prior studies demonstrate that institutional ownership positively impacts carbon emissions disclosure (Chang & Zhang, 2015; Cotter & Najah, 2012; Safiullah et al., 2022; Solikhah et al., 2021).

Furthermore, substantial institutional ownership within a company can be used to protect shareholder rights by demanding transparent communication. High levels of institutional ownership lead to tighter management monitoring. Institutional investors proactively encourage companies to implement carbon reduction measures. This push aims to minimize the potential financial losses that institutional investors might face owing to a reduced corporate image and competitive advantage if the public perceives the company as environmentally indifferent (Aghion et al., 2013). Consequently, companies are more likely to provide information related to carbon emissions disclosures because of the close oversight of institutional investors with high institutional ownership. According to the theoretical view, empirical literature, and research or contextual insights, the hypothesis is as follows:

H1: Institutional ownership has a significant positive influence on carbon emission disclosure.

4.2. National diversity of the board and carbon emission disclosure

Although smaller than the other theories in this study, one of the veins of institutional theory states that companies' board characteristics are developed by social norms, regulations, and practices in their countries (Huo et al., 2021). The highlight of this theoretical framework is that in a broader institutional environment (Fainshmidt et al., 2018), including Indonesia, the national diversity of the board may play a role

in companies' decision-making. Like other boards, foreign boards hold crucial positions in corporate governance structures. The board of directors and commissioners within a company is part of the top management, which plays a crucial role in defining the company's business strategy as a sustainable entity (Jizi et al., 2014). In addition, the board is responsible for overseeing the company's effective operations and ensuring transparent information disclosure to the public (Ben-Amar et al., 2017). The board's role in implementing environmental responsibilities is significant. The board of commissioners can advise the board of directors to assume environmental responsibilities (Asni & Agustia, 2022), including those related to carbon emissions, to enhance a company's image and reputation. Board diversity also influences the effectiveness of governance management. Diversity brings various perspectives, ideas, and crucial information to management discussions and company decision-making (Estélyi & Nisar, 2016). Board diversity is often shaped by shareholder heterogeneity and the board background. Foreign board members often accompany major shareholder profiles, particularly among multinational corporations owned by foreign companies. In this context, foreign boards act as social actors within an organization. Previous empirical studies have found that foreign boards have a positive influence on voluntary environmental disclosure (El-Bassiouny & El-Bassiouny, 2019; Mardini & Elleuch Lahyani, 2022; Setiawan et al., 2021; Toumi et al., 2022).

Foreign board members with strong environmental concerns can encourage companies to prioritize carbon emissions and enhance their ability to disclose them. National diversity within a company's board also pressures the company to implement and disclose high-quality carbon emissions information. (Jannah & Narsa, 2021) show that foreign board members positively influence carbon emissions disclosure. The greater the number of foreign board members in a company, the more information it tends to disclose about carbon emissions (Kılıç & Kuzey, 2019). In this context, based on theory, the results of the empirical research, and the research setting or contextual insight, the following hypothesis is formulated:

H2: A board's national diversity has a significant positive influence on carbon emissions disclosure.

4.3. Profitability on carbon emission disclosure

Legitimacy and stakeholder theories, as sociopolitical theories, purport that society and stakeholders expect transparent company information on how they generate profits (Chithambo & Tauringana, 2014). The general public and investors demand greater disclosure from profitable firms. Agency theory states that voluntary disclosure is closely related to publishing costs and after-benefits; hence, companies engage in voluntary disclosures based on financial performance (Guidry & Patten, 2012). When companies possess sufficient financial resources to disclose carbon emissions and the outcomes are worthwhile, they begin carbon transparency. Therefore, financial conditions, especially profitability, are closely related to motivating companies' carbon emissions disclosure practices. Prior studies, such as those (Logsdon, 1985) and (Nagendrakumar et al., 2022), argue that corporate environmental policies (including carbon emissions) are sensitive to adequate funds. Good financial performance allows companies to provide detailed information about their emissions (Hermawan & Gunardi, 2019; Zaidi et al., 2021). The profitability ratio is a company's performance and financial stability benchmark. Profitability indicates a company's proficiency in generating profits from its operational activities (Dirman, 2020). High profitability means that a company can fulfill social and environmental responsibilities, particularly when profitability comes from the efficient use of natural resources (Wahyuningrum et al., 2023). Companies voluntarily provide funds and resources for investment and publication of information related to carbon emissions (Bae Choi et al., 2013). Another prior study (Darus et al., 2020) proves that companies with high profitability positively influence carbon emission disclosure. Although theoretical premises and some empirical results support the relationship between profitability and carbon emissions disclosure, the direction of this link is debatable. Previous studies found that profitability has a negative or no effect on the disclosure of carbon emissions (Andrikopoulos & Krikilani, 2013; Bae Choi et al., 2013; Kalu et al., 2016; Yanto & Muzzammil, 2016). Therefore, this relationship requires further probing; however, this research can still be convinced by the statement that companies with high profits find it easier to add resources to disclose their carbon emissions. The third hypothesis is then as follows:

H3: Profitability has a significant positive effect on carbon emission disclosure.

4.4. Leverage on carbon emission disclosure

Economic theory, in the form of agency and signaling theory, states that voluntary disclosure is closely related to publishing costs and after-benefits. Hence, companies engage in voluntary disclosure based on their financial performance. When stable finances encourage companies to implement carbon emission reduction and disclosure activities, unstable (weak) financial conditions have the opposite effect. A company's high leverage indicates that it is experiencing a decline in financial conditions, resulting in the company experiencing difficulties in implementing voluntary activities such as carbon emissions (Bae Choi et al., 2013). Declining financial conditions can prevent companies from engaging in social interaction. Companies with high leverage focus on fulfilling credit responsibilities rather than engaging in carbon emissions disclosures.

Moreover, they assume such activities exacerbate and harm financial conditions (Clarkson et al., 2008; Luo et al., 2013). This aligns with the stakeholder theory that companies should be careful when using funds to disclose their carbon emissions. Although the theoretical premises support a direct relationship between leverage and carbon disclosure, empirical studies have provided mixed results. While the theoretical underpinnings bolster the direct correlation between leverage and carbon disclosure, the research has yielded inconsistent findings. Prior studies (Chithambo & Tauringana, 2014; Desai, 2022; Hapsari & Prasetyo, 2020) found that leverage has a negative effect on corporate carbon emissions disclosures. However, other studies (Akbaş & Canikli, 2018; Lemma et al., 2021) showed that companies with a high commitment to climate change activities, such as carbon emissions, issue a larger proportion of debt to fund these activities. This raises doubts about the relationship between leverage and carbon emissions disclosures. Therefore, the fourth hypothesis is framed as follows:

H4: Leverage has a significant negative effect on the carbon emission disclosure.

4.5. Media exposure to carbon emission disclosure

The legitimacy theory framework explains that the media represents public opinion. Stakeholder theory considers society an important company stakeholder, and the media occupies this position. However, media can act as a form of public opinion, so companies often use media exposure to improve their societal reputations (Trianaputri & Djakman, 2019). Media exposure involves mass media reports highlighting a company (Sriningsih & Wahyuningrum, 2022). Legitimacy theory states that information provided by companies through various mass media has the purpose of communicating to gain recognition from the community (Rupley et al., 2012). Several studies have empirically tested the effect of media exposure on carbon emissions disclosure (Li et al., 2017; Shao & He, 2022). They confirmed the tenets of the theoretical framework and found that media exposure positively impacted carbon emissions disclosure. When environmental opinions and issues develop in the mass media with strong public debate, these conditions tend to frame corporate projects related to the environment (Dusyk et al., 2018). Companies increasingly make environmental disclosures when the media actively highlights their environmental activities (Jose & Lee, 2007). The media have a significant effect on climate change issues, regardless of the role of other parties (Carmichael & Brulle, 2018). The greater the media exposure, the higher the level of carbon emissions disclosure by a business entity (Solikhah & Maulina, 2021). Thus, companies with excellent media visibility are motivated to disclose more information on carbon emissions in their sustainability reporting. The fifth hypothesis is framed as follows:

H5: Media Exposure has a significant positive effect on carbon emission disclosure.

4.6. Environmental performance to carbon emissions disclosure

The legitimacy theory posits that companies must take responsibility for environmental issues to meet societal expectations (Chariri & Ghazali, 2007). This theory suggests that companies should build public

perceptions through environmental legitimacy, portraying them as responsible for their carbon footprint and reduction (Kuo & Yi-Ju Chen, 2013). In addition, legitimacy theory posits that companies' environmental awareness develops from their environmental performance (Zameer et al., 2021). As crucial as administrative forms such as environmental or carbon disclosure, the countable perspective also represents company responsibility. A firm's management encourages countable or seen performance to gain legitimacy and maintain social contracts. Signaling theory also supports that companies with better environmental and carbon performance are more likely to adopt voluntary disclosure, such as carbon emissions disclosure (Akbaş & Canikli, 2018). Companies prefer to signal to their stakeholders and the public that they have produced superior environmental performance (Dhaliwal et al., 2011). Excellent environmental performance is worthwhile only if it leads to a better fiscal impact due to better investor decisions and improves environmental or societal outcomes. To achieve these results, companies must use their environmental performance in voluntary carbon disclosures to establish legitimacy, reduce transaction costs, lower information asymmetry, and be timely and flexible for stakeholders (Kaplan & Ramanna, 2021). Theoretically, environmental performance is closely related to carbon emissions disclosures. Prior studies found empirical evidence that companies with more environmental activity improve their voluntary carbon disclosures (Jiang & Tang, 2023; Tsang et al., 2023). Companies with excellent environmental performance are more likely to handle climate change opportunities and threats and sustain a long-term commitment across all operations, thereby integrating climate change into their business strategies (Elsayih et al., 2018; Liao et al., 2015; Peters & Romi, 2015; Rupley et al., 2012).

Furthermore, the literature indicates that companies' environmental performance significantly moderates the relationship between voluntary environmental disclosure and its factors. Carbon disclosure plays an affirmative role in the environmental performance of stakeholders. The affirmative role is more effective within a company with better environmental performance because related parties compare real environmental or carbon performance to their carbon disclosure (Michelon & Parbonetti, 2012). In this context, this study develops a research model that utilizes environmental performance to moderate carbon emissions disclosure and its influence on factors. The sixth hypothesis is framed as follows:

H6: Environmental performance has a significant positive effect on the disclosure of carbon emissions.

4.6.1. Institutional ownership toward carbon emission disclosure of with moderation of environmental performance

The institutional theoretical framework predicts that corporate commitment to environmental management practices can increase promotion and investment in environmentally friendly activities such as reducing carbon emissions (Aslam et al., 2021). Institutional investors positively assess a company's environmental performance in an institutional form in a shareholding structure, which can increase the influence of institutional ownership on carbon emissions disclosure. Institutional investors perceive environmental performance opportunities as advantageous because they improve a company's reputation and image (Chang, 2011). Therefore, they have an indirect positive effect on investment returns. Environmental performance is the benchmark for environmental management. One environmental performance assessment in Indonesia is a company's PROPER rating (Haninun et al., 2018). When a company engages in PROPER and obtains a good rating, institutional investors use that component to force the company to increase environmental investments (including carbon emissions). Institutional investors push a company to become stronger when its PROPER indicates poor environmental performance. A previous study (Jannah & Narsa, 2021) revealed that PROPER ratings can impact carbon emission disclosures. Environmental performance encourages companies to care more about the environment and add value to their assets by disclosing carbon emissions, which is followed by the supervision of institutions as investors. In this context, based on theory, the results of the empirical research, and the research setting or contextual insight, the following hypothesis is formulated:

H6a: Environmental performance moderates the effect of institutional ownership on carbon emission disclosure.

4.6.2. National diversity of the board toward carbon emission disclosure with moderation of environmental performance

Institutional theory reveals that companies' organizational behavior is formed by their countries' social norms, regulations, and practices. (T. M. Lee et al., 2015) found high concern for the environment and climate change in developed countries. The top ten countries are developed countries (T. M. Lee et al., 2015), and several are involved in the Indonesian industry. The presence of developed countries in Indonesian companies' shareholding structures enables foreign commissioners. Multinational companies often place foreign representatives, such as commissioners or directors, in their management structures. The level of environmental concerns in developed countries and the presence of foreign boards in Indonesian companies support the implementation of carbon emissions disclosures. Foreign commissioners often consider environmental issues an important factor that companies must consider regarding the companies' sustainable development and going-concern purpose (Kılıç & Kuzey, 2019). As a benchmark for corporate environmental responsibility, environmental performance indicates how much a company cares about its carbon emissions. Prior studies have revealed that foreign boards are positively associated with environmental performance (Du et al., 2020; Mardini & Elleuch Lahyani, 2022). Foreign boards can play an important role in enhancing environmental activity within leading companies by strengthening the moral and strategic motivations for environmental performance (Giannetti et al., 2015). In this context, foreign boards can encourage the publication of their companies' environmental performance through carbon emissions disclosures. Foreign boards often use environmental performance as the reason for their influence in disclosing carbon emissions. The results of a company's environmental performance should be an initiative to gain stakeholder legitimacy. Therefore, environmental performance provides additional leverage to companies to convey information related to carbon emissions disclosure, followed by the pressure exerted by foreign boards. Therefore, the following hypothesis is formulated based on the theory, the results of the empirical research, and the research setting or contextual insight:

H6b: Environmental performance moderates the effect of board nationality diversity on carbon emissions disclosure.

4.6.3. Profitability of carbon emission disclosure with moderation of environmental performance

Economic theories suggest that voluntary environmental activities are closely related to costs and after-effects. Environmental activity includes investment in technology or expert labor, execution, and effective maintenance/management, and may be assumed to be a costly process for producing excellent corporate environmental performance (Braam et al., 2016). Hence, companies with relatively good or bad environmental performance employ carbon emissions disclosure to enhance corporate value as long as the predicted marginal benefits exceed the marginal costs (Matsumura et al., 2014). Companies that have funded environmental activities and already produced environmental performance do not seem to want to waste their finances without publishing it. According to a previous study, sustainable finance prioritizes environmental preservation as a profit objective (Ali et al., 2022). Disclosure of their environmental activities, such as funding efforts, may result in benefits such as greater stakeholder trust in the level of organizational commitment, creation of sustainable values, higher legitimacy, and image enhancement (Hahn et al., 2015). Companies attempt to gain public trust by improving environmental performance. An empirical previous study from (Giannarakis et al., 2017) shows that environmental performance affects carbon emission disclosure. From this viewpoint, financial conditions increase carbon emissions disclosures in line with environmental performance.

Therefore, companies require stable financial conditions to meet societal demands (Zaidi et al., 2021). Good financial performance makes it easier for companies to be more flexible in disclosing carbon emissions driven by adequate environmental performance. This is also supported by Alam et al. (2019), who find that company investment in research and development (R&D) in the environmental sector significantly impacts environmental performance. Strong funding supports R&D efforts in the environmental sector. The flow framework from high financial performance or profitability leads companies to improve their financial performance and implement carbon emissions disclosures. However, a company's environmental performance motivates it to be more active in reporting its emission-reduction activities. Therefore,

based on the theory, the results of the empirical research, and the research setting or contextual insight, the following hypothesis is formulated:

H6c: Environmental performance can moderate the effect of profitability on carbon emission disclosure.

4.6.4. Leverage on carbon emission disclosure with moderation of environmental performance

Agency theory reveals that environmental activities are closely related to costs and after-benefits. Improving companies' environmental activities requires extra funds and resources for investment in technology, expertise, and environmental protection implementation. However, funds and resource capacity are often limited (Braam et al., 2016). Some companies with poor financial conditions are carefully considering increasing their funds for environmental activities. Conversely, companies active in environmental protection and related activities may receive financial incentives, favorable industrial policies, or other preferential financial support that reduces business risks (Zhang & Chen, 2017). Currently, with active carbon trading, as in Indonesia, companies with extra effort to engage in environmental activities can gain funds by selling carbon credits. In addition, companies with less effort that produce large residues, such as carbon footprints, will be threatened by carbon taxes. In this context, companies with high leverage use their environmental activities and performance to increase their carbon emissions disclosure. It describes a company's environmental risk and is related to its financial condition (Sun et al., 2022). Environmental performance can be a moderating variable influencing leverage and carbon emissions disclosure. The negative effect of the total debt ratio on carbon emissions is mitigated when environmental performance is enhanced. Therefore, the following hypothesis is formulated based on the theory, the results of the empirical research, and the research setting or contextual insight.

H6d: Environmental performance can moderate the effect of leverage on carbon emission disclosure.

4.6.5. Media exposure to carbon emission disclosure with moderation of environmental performance

Sociopolitical theories reveal that companies initiate environment-related activities because of political pressure from various parties, including the media, as an extension of the public's hand (Desai, 2022). A prior study found that the media is not only a form of public opinion but also an opinion leader or influence maker of most public thinking (Bromley-Trujillo & Poe, 2020; McCombs & Valenzuela, 2020; Sriningsih & Wahyuningrum, 2022). Today, as digital information grows, companies realize that mass media is a valuable tool. The mass media plays a role in presenting prominent information about the company (Kjaergaard et al., 2011); therefore, the companies can use media coverage to convey environmental performance that has been achieved. Companies that have funded environmental activities and already produced environmental performance do not want to waste media power to publish it. Media coverage can be submitted through newspapers, magazines, television, websites, Facebook, and other communication media (Solikhah et al., 2021). In addition, the higher the company's visibility when exposed to environmental information, the more the public will be aware that the company is responsible for the environment. These conditions render a company unable to retreat from its environmental responsibility. The community demands that companies disclose more about their environmental issues, such as carbon emissions. Media has become one of the motives that can encourage companies to improve their environmental performance within the framework of stakeholder theory. Mass media significantly influences corporate environmental performance (Rupley et al., 2012). Therefore, companies with better environmental performance will report through media coverage and be motivated to enhance their carbon emissions disclosure by adding more carbon content. Therefore, the following hypothesis is formulated based on the theory, the results of the empirical research, and the research setting or contextual insight.

H6e: Environmental performance moderates the effect of media exposure on carbon emissions disclosure.

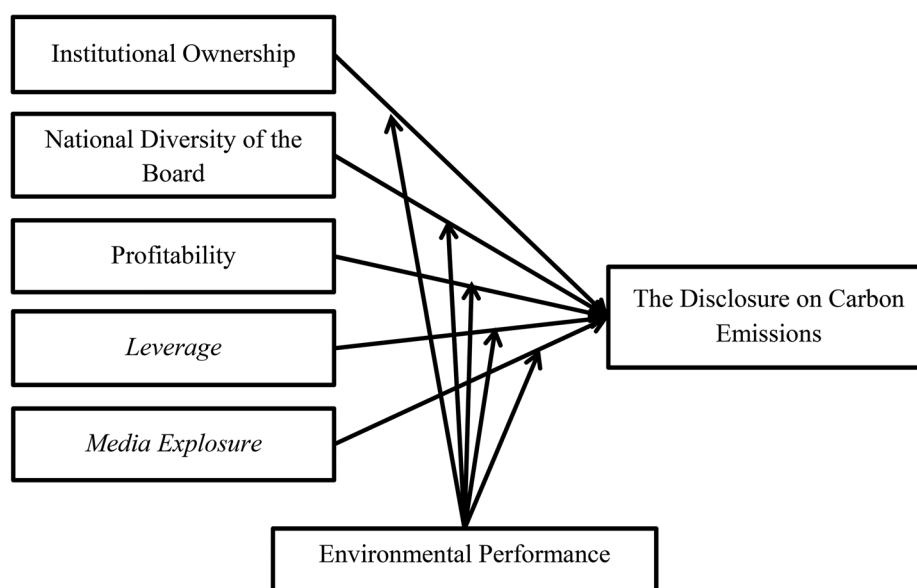


Figure 1. Framework of the study.

Based on the literature review, the research framework for this study is presented in [Figure 1](#). This moderating model explains the mechanism of the relationships between the variables, namely (1) carbon information disclosure as the dependent variable; (2) institutional ownership, national diversity of the board, leverage, and media exposure as the independent variables; and (3) environmental performance as a moderating variable.

5. Research design

5.1. Data and sample selection

Nonfinancial companies listed on the Indonesian Stock Exchange (IDX) between 2017 and 2021 were used in this study. Carbon emissions disclosures were officially introduced in 2011 under Presidential Decree No. 61 2011. However, the realization of disclosing information on carbon emissions is in line with Financial Services Authority Regulation Number 51/POJK.03/2017 concerning the issuance of sustainability reports. Therefore, this study attempts to explore this issue in 2017. Based on the IDX database, the total population consists of 2,285 consistently listed firms. Because the sample must publish sustainability reports consistently from the population during that time, 2085 firm-years were removed from the overall population. The sample comprised nonfinancial companies that join the PROPER rankings. After excluding non-PROPER non-financial companies, the total number of firms was 175. Next, 10-unit analyses of the sample were removed because companies' sustainability reports could not be accessed, and 10-unit analyses were used as outlier data. Following the sample selection process, the final sample comprised 165 firm-years.

5.2. Measurement

This section explains the dependent, independent, and moderating variables used in the study. [Table 2](#) presents the references, data sources, and operational definitions used to measure these variables ([Table 2](#)).

5.2.1. Dependent variables

Carbon information disclosure was the dependent variable. There are several proxies for measuring the level of carbon emissions disclosures. This proxy is an analytical approach to the content disclosed in a company's sustainability reports. A non-weighted index on a binary scale was designed to examine the

Table 1. Selection of firms for the Year 2017–2021.

Criteria	Total
Population non-financial companies listed on IDX within 2017–2021	2285
Minus:	
Inconsistent companies in disclosing sustainability report	(2085)
	<u>200</u>
Non-participated PROPER rank companies	(15)
	<u>185</u>
Companies with incomplete data and unavailable report	(10)
	<u>175</u>
Outlier data	(10)
	<u>175</u>
Total sample companies	165

Table 2. Variable definitions.

Variables	Measurements	Data source	References
Dependent variable: Carbon emission disclosure (CED)	An analytical approach to the content disclosed in a company's sustainability reports and scored with a binary scale, the formula is as follows: $\frac{\text{Total disclosure score}}{18}$	Sustainability report	(Bae Choi et al., 2013); (I. F. S. Wahyuningrum et al., 2022)
Independent variable: Institutional ownership (KI)	Institutional ownership: $\frac{\text{Number of shares owned by the institution}}{\text{Number of outstanding shares}}$	Annual report	(Pirzada et al., 2015)
Independent variable: National diversity of the board (FD)	The national body of the board: $\frac{\text{Number of foreign board members}}{\text{Total members of the board of directors and commissioners}}$	Annual report	(Jannah & Narsa, 2021)
Independent variable: Profitability (ROA)	The return on asset ratio: $\frac{\text{Net Income}}{\text{Total Assets}}$	Annual report	(Uyar et al., 2021)
Independent variable: Leverage (DER)	The debt-to-equity ratio: $\frac{\text{Total Debt}}{\text{Total Equity}}$	Annual report	(Lu & Abeysekera, 2014)
Independent variable: Media exposure (ME)	A dummy variable, that takes the score of 1 for companies that provide information related to carbon emission disclosure through company websites, and the score of 0 otherwise.	Companies' website	(Abdullah et al., 2020)
Moderating variable: Environmental performance (KL)	The scoring is according to the PROPER rating as follows: Black = 1, Red = 2, Blue = 3, Green = 4, Gold = 5.	Announcement or report of PROPER rank every year	(Abdullah et al., 2020)

narrative section of a company's sustainability reports. Therefore, indicators and items are explored in the sustainability report. This study uses a set of indicators to measure carbon emission disclosure, adopted by Bae Choi et al. (2013) and developed by I. F. S. Wahyuningrum et al. (2022). A total of 18 indicators were identified, with the guideline that if the company disclosed certain items (each), it would be given a score of 1 and 0 otherwise. Once these items are collected, the carbon emissions disclosure score is calculated by dividing the total score (disclosed items) by the sum of the company's maximum scores (maximum items disclosed). Appendix A provides the carbon information disclosure checklist. The formula for calculating the item disclosure level score is as follows:

$$CED = \frac{\sum_{i=1}^t C_i}{t}$$

Information: where $C_i = 0$ or 1 , then:
CED = Carbon emission disclosure

$C_i = 0$ if the item is not disclosed,

$C_i = 1$ if the item is disclosed,

t = Maximum value of carbon emission disclosure items disclosed by the company (18 items)

5.2.2. Independent variables

The independent variables were institutional ownership, board diversity, leverage, and media exposure. Table 1 presents the definitions and proxies of each variable considered in this study. Institutional ownership assesses how many institutional investors own shares in a company and is measured as the percentage of ownership (the number of shares owned by institutional investors divided by the total number of shares) (Pirzada et al., 2015). Board nationality was adopted as a measure from research (Jannah & Narsa, 2021) by comparing the number of foreign board members to the total number of directors and commissioners. In this study, profitability refers to a measure in which net income is divided by a company's total assets (Uyar et al., 2021). Furthermore, leverage is obtained by calculating total debt with equity (Lu & Abeysekera, 2014). Media exposure is measured through a dummy scale by assigning a value of 1 for companies that provide information related to carbon emissions disclosure on their websites and 0 otherwise (Abdullah et al., 2020).

5.2.3. Moderation variables

This study provides novel insights by moderating the effects of independent variables (institutional ownership, board nationality, profitability, leverage, and media exposure) on carbon emissions disclosure. Environmental performance was evaluated for its moderating role on these variables. Environmental performance impacts environmental disclosures such as carbon emissions (Clarkson et al., 2008; Giannarakis et al., 2017; Luo & Tang, 2014). This study considers relevant proxies for measuring companies' environmental performance to suit the proposed research model by considering companies involved in PROPER. An environmental performance assessment in Indonesia can be viewed regarding a company's PROPER rating (Haninun et al., 2018). Therefore, the proxy for environmental performance was the PROPER rating received from the government rating agency. The assessment uses a score of 1 for a black rating, 2 for a red rating, 3 for a blue rating, 4 for a green rating, and 5 for a gold rating (Abdullah et al., 2020).

5.3. Research model

This study used documentation to obtain data from sustainability reports, annual reports, and company websites. The collected data were analyzed by multiple linear regressions using IBM SPSS 25 (IBM SPSS Statistics for Windows, IBM Corp., Armonk IBM Corp. 2023. All rights are reserved). Additionally, this study seeks to explore the moderating relationship between environmental performance and all independent variables. We adopted a moderated regression analysis to estimate the effect of the independent variables and the role of the moderating variables on carbon emissions disclosure. The scheme is expressed as a multiple linear regression equation as follows:

$$CED = a + \beta_1 KI + \beta_2 FD + \beta_3 ROA + \beta_4 ME + \beta_5 DER + \beta_6 KL + \beta_7 KI * KL + \beta_8 FD * KL + \beta_9 ROA * KL + \beta_{10} ME * KL + \beta_{11} ME * KL + e \quad (1)$$

where CED denotes carbon emissions disclosure, measured using a non-weighted index on a binary scale or dummy variable, taking a score of one if the companies voluntarily disclose the items of carbon emissions disclosure and 0 otherwise in the sustainability report; KI denotes institutional ownership; FD denotes the national diversity of the board; ROA denotes profitability; DER denotes leverage; ME denotes media exposure; and KL denotes environmental performance. A research model was formed by multiplying KL by the independent variables to measure the role of environmental performance. The effects of the independent variables and the role of the moderating variables were examined by examining the p-values of the regression results. This was measured using classical assumption tests to ensure the research model achieved unbiased results. This study also used descriptive statistical analysis by processing the results into graphs to answer the research

Table 3. Results of descriptive statistics.

Variables	N	Minimum	Maximum	Mean	Std. Deviation
KI	165	0	0.99	0.70	0.19
FD	165	0	66.67	14.77	18.27
ROA	165	-0.12	0.53	0.07	0.09
DER	165	0.11	3.41	0.91	0.67
ME	165	0	1.00	0.52	0.50
KL	165	2.00	5.00	3.39	0.61
CED	165	5.56	83.33	37.47	23.06

Source: Output SPSS, 2023.

questions. Four charts were used in this study. The current study adopts prior research viewpoints using the processed statistical graphs (Akhter et al., 2023), which in this study used Microsoft Power BI (Copyright © Microsoft. All Rights Reserved) for visualization.

5.4. Robustness test

To ensure that this study fulfills the endogeneity and reliability of the empirical results, we apply a robustness test using an alternative measure of the moderating variable. Specifically, we use the natural logarithm of environmental performance (Ln (KL)) in the regression model, as suggested by Chen and Ma (2021). These robustness tests aimed to validate the statistical and economic significance of the empirical results.

6. Empirical results and discussion

6.1 Empirical results

6.1.1. Results of descriptive statistics and classical assumptions test

Table 3 indicates that carbon emissions disclosure averages 37.47 and a standard deviation of 23.06. Investor ownership averages 70%, indicating significant ownership. Board nationality in the structure of the company's board of directors and commissioners exhibited the highest percentage (66%), or there were six to seven people out of ten board members. However, some companies do not have foreign boards in their management structure. The ROA has an average of 0.07 and a standard deviation of 0.09. Leverage has an average of 0.91 and a standard deviation of 0.67. Descriptive analysis indicated that the average value was greater than the standard deviation, indicating that the data could be distributed fairly well. The average level of carbon emissions disclosure in Indonesia is only 37.47%, implying that several companies disclose information on carbon emissions at a minimal or substandard level. There is a gap among several companies, where the highest disclosure is seen in 83.33% of the total items disclosed, while the lowest is only 5.56% of the items disclosed.

The one-sample Kolmogorov-Smirnov test was used to test for normality. The results indicated a significance level of $0.200 > 0.05$, indicating that the data were normally distributed. The regression model employed in this study escapes correlation features with the multicollinearity test, indicating a tolerance value greater than 0.10 and a VIF value less than 10. The White test was used to perform the heteroscedasticity test, which indicated that the calculated chi-square was smaller than the table value ($18.647 < 156.508$). Therefore, the regression model used in this study did not show heteroscedasticity.

6.1.2 Results of moderated regression analysis

This study considers panel data from 2017 to 2021. The presence of environmental performance as a moderating variable made this study use a moderating regression analysis. The significance of the analysis can be determined by testing the relationship between the independent and dependent variables. Table 4 presents the results of moderated regression analysis.

Table 4 presents the results of this study's Moderated Regression Analysis (MRA) test. H1 is rejected by the KI with a significance level of 0.159, indicating that institutional ownership has no significant effect on carbon emissions disclosure. The diversity of board nationality has a significance value of

Table 4. Statistical test results.

Model	Unstandardized coefficients		Standardized coefficients	T	Sig
	B	Std. Error	Beta		
(Constant)	-48.385	26.590		-1.820	0.071
KI	57.135	40.379	0.467	1.415	0.159
FD	1.403	0.434	1.112	3.231	0.002
ROA	182.537	74.949	0.750	2.435	0.016
DER	-33.702	13.308	-0.975	-2.532	0.012
ME	44.000	15.478	0.956	2.843	0.005
KL	27.686	7.962	0.735	3.477	0.001
KI*KL	-28.296	12.288	-0.831	-2.303	0.023
FD*KL	-0.356	0.130	-0.928	-2.744	0.007
ROA*KL	-48.798	21.343	-0.734	-2.286	0.024
DER*KL	10.108	4.125	0.944	2.450	0.015
ME*KL	-4.392	4.710	-0.361	-0.932	0.353

Source: Output SPSS, 2023.

Table 5. Robustness check.

	Model 1 (ENV)		Model 2 (LnENV)	
	T	Sig	T	Sig
(Constant)	-1.820	0.071	-1.423	0.157
KI	1.415	0.159	1.160	0.248
FD	3.231	0.002	2.847	0.005
ROA	2.435	0.016	3.619	0.000
DER	-2.532	0.012	-2.120	0.036
ME	2.843	0.005	2.351	0.020
KL	3.477	0.001	2.488	0.014
KI*KL	-2.303	0.023	-1.632	0.105
FD*KL	-2.744	0.007	-2.465	0.015
ROA*KL	-2.286	0.024	-3.363	0.001
DER*KL	2.450	0.015	2.079	0.039
ME*KL	-0.932	0.353	-0.698	0.108

Source: Output SPSS, 2023.

0.002 < 0.05, indicating that it affects carbon emissions disclosure. Thus, H2 is accepted. H3 exhibited a significance value of 0.016 < 0.05; therefore, the H3 is accepted. Thus, H4 is accepted because the significance value for leverage is 0.012 < 0.05. Media exposure showed a significant value of 0.005 < 0.05, thus supporting H5.

Furthermore, through Hypotheses 5–10, environmental performance significantly moderates the relationship between institutional ownership, foreign boards, profitability, leverage, media exposure and carbon emissions disclosure. H6 has a significance value of 0.023, indicating its acceptance. H7 had a significance value of 0.007, less than 0.05; thus, it was accepted. Thus, H8 was accepted, and the significance value of 0.024 was less than 0.05. H9 had a significance value of 0.015; therefore, the H9 is accepted. H10 had a significance value of 0.353, greater than 0.05, indicating that H10 was rejected.

6.1.3. Robustness test results

Table 5 presents the robustness test results. The following robustness tests were conducted to verify the reliability of the empirical results. Using the natural environmental performance logarithm (Ln (ENV)) as a substitute for the ENV variable to regress the model, according to Chen and Ma (2021), the robustness test results confirm the core model results. The robustness test results confirmed the significance of the moderating role of the environmental performance variable on the influence of certain factors and carbon emissions disclosures.

6.2. Analysis

6.2.1. Data interpretation of descriptive statistical analysis results

To answer the first research question, 'How do Indonesian companies disclose carbon emissions, what information is preferred, and how are they trending?' The authors analyzed published sustainability

reports to answer the questions projected in the graphs. The first research question contains three points: carbon emission practices, trends, and preferred information; thus, the current study provides some charts with a detailed viewpoint.

The first figure sheds light on the carbon emissions disclosure trend of non-financial listed companies in Indonesia for the five years from 2017 to 2021 (Figure 2). The trend analysis showed a steady trend, with a slight increase from year to year. From 2017 onward, the carbon emissions disclosure level did not appear to have reached half of the items disclosed. This result is similar to previous studies that found the average level of carbon emissions disclosure still minimally 38.9% from 2013 to 2017) (Ratmono et al., 2020) and only 28.06% from 2018 to 2021 (Mahmudah et al., 2023). This result also proves that carbon emissions disclosure practices are still low. However, the enhancement of carbon emissions disclosure appears annually in line with strengthening awareness and widespread use of carbon practices (Blanco et al., 2017). These findings imply that there are slits for improving carbon emission disclosure practices in line with increasing company efforts on this issue each year.

This empirical result shows that the practice of carbon emissions disclosure is a potential way for Indonesia to implement carbon reduction targets set by the government, with companies as subjects. Carbon emissions disclosure reflects environment-related activities, such as carbon practices (Al-Tuwaijri et al., 2004; Clarkson et al., 2008; Luo & Tang, 2014). Carbon emissions disclosures are positioned as authentic evidence regarding company decisions and actions that are easily accessible to outside parties (Barako & Brown, 2008). Based on the second processed graph (Figure 3), corporate environmental performance in sectors aligns with the corporate carbon emissions disclosure score. Non-financial companies in Indonesia are the samples of the current research divided into seven sectors based on the IDX issuer categories: basic materials, consumer cyclical, consumer non-cyclical, energy, healthcare, industry, and technology. Most non-financial sectors, except technology (not considered statistically because it is represented by only one company), seem to produce carbon emissions disclosure levels similar to their PROPER rank. In Indonesia, the PROPER rank program includes carbon emission reduction activities by companies; hence, the PROPER grade also represents companies' carbon performance (Forestry, 2021b). Thus, how companies disclose their carbon emissions depends on their environmental performance (Luo & Tang, 2014). Based on Figure 2, unique thinking also appears as to why companies with constant or a slight increase in environmental performance have significantly increased carbon emissions disclosure scores compared to companies with greatly improved PROPER ranks, which produce carbon emissions disclosure enhancement step-by-step. This issue can be addressed because companies with excellent PROPER grades still do not optimally disclose carbon emissions, especially if they are voluntary (Datt et al., 2020). In addition, different sectors have different carbon perspectives and systems, producing

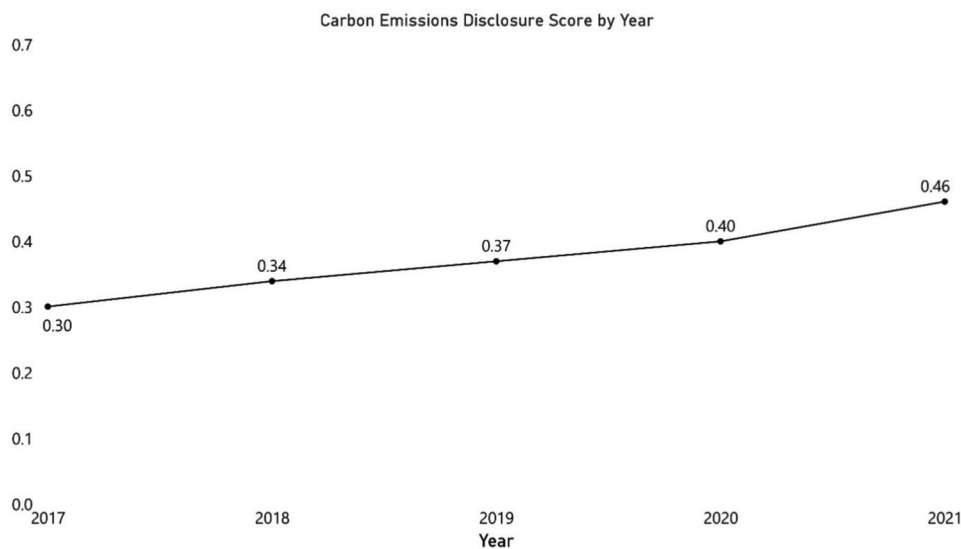


Figure 2. Trends in carbon emissions disclosure among non-financial listed companies in Indonesia from 2017 to 2021. Source: Processed data by authors, 2023.

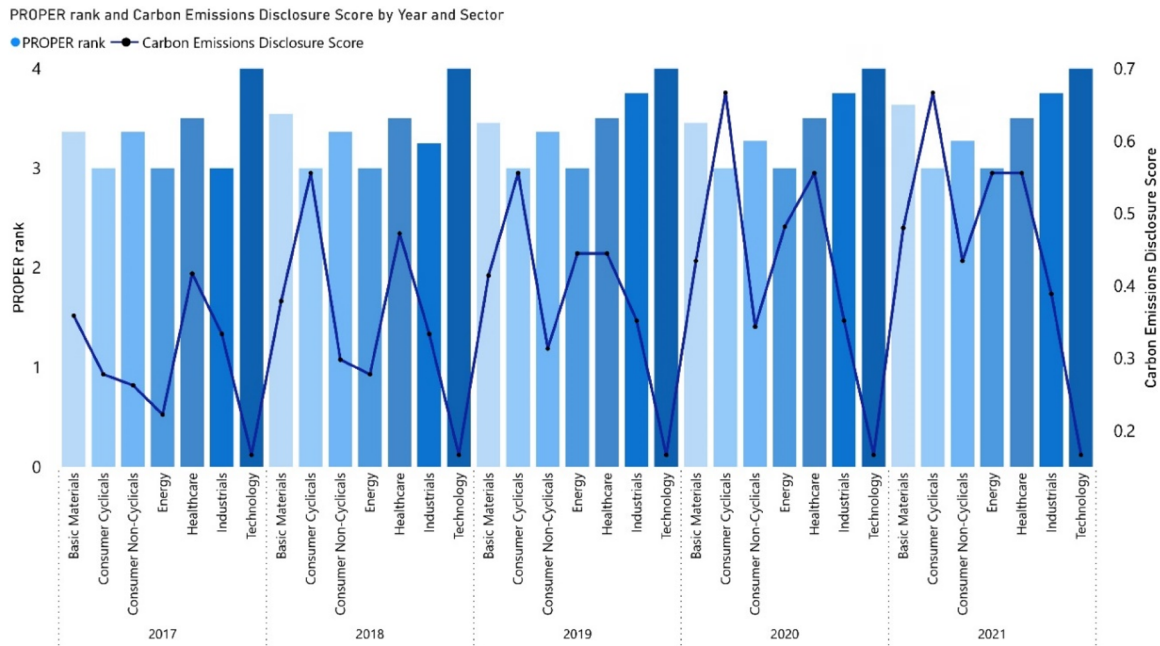


Figure 3. PROPER rank and carbon emissions disclosure score by year and sector. Source: Processed data by authors, 2023.

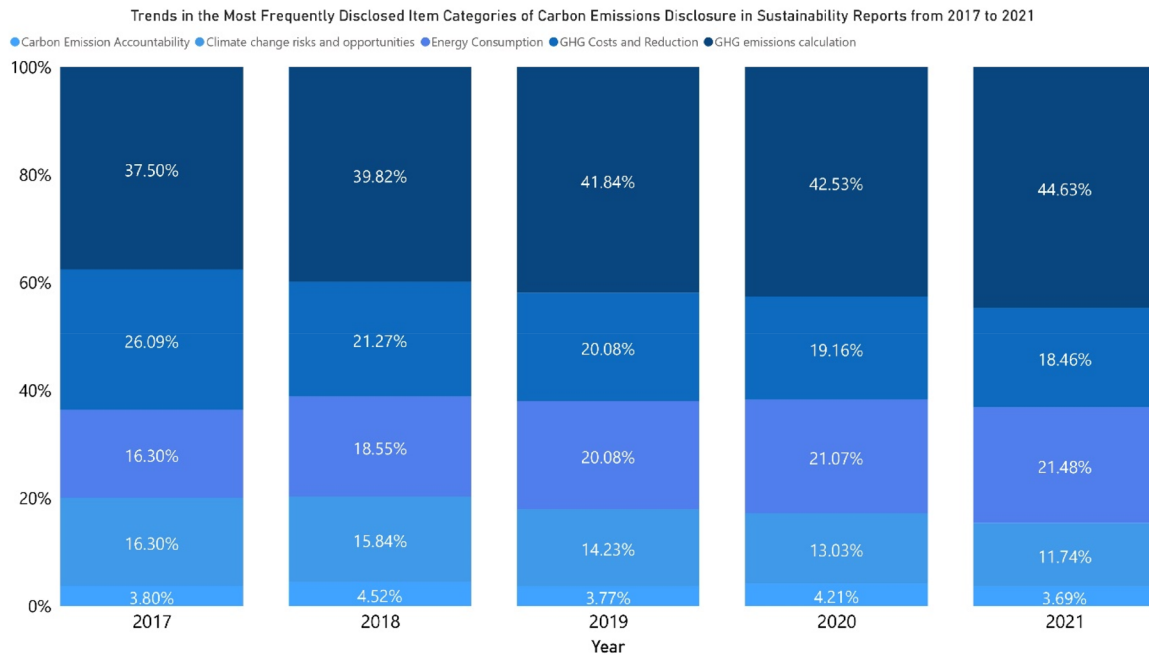


Figure 4. Trends in the most frequently disclosed item categories of carbon emissions disclosure in sustainability reports from 2017 to 2021. Source: Processed data by authors, 2023.

diverse carbon emission disclosures (Luo et al., 2013). These findings imply a disclosure problem if carbon emissions disclosure is voluntary and does not have specific policies or guidelines.

Considering the first research question, the third graph provides an overview of the trends in the carbon-item categories disclosed by companies in their sustainability reports. Figure 4 shows that GHG emissions calculation is the most declared item category. This category has seven items disclosed more

reasonably than in the other categories. However, if we look in detail only at GHG emission calculations and energy consumption as item categories that increased, the other categories seemed to decrease or fluctuate. GHG emission calculations and energy consumption as item categories provide countable information to make them visible and more understandable to the public (Vesty et al., 2015). Although climate change risks and opportunities and GHG costs and reductions are essential, companies appear to constrict their information to these categories. At this point, companies appear to have reduced their priority on detailed risk, impact, costs, and reduction of carbon emission activities, so information on these issues decreases. Rather than focusing on long-term information not understood by the public, companies prefer to show things that can be calculated and measured (Broberg et al., 2010; Vesty et al., 2015). Based on the Indonesian setting, it is reasonable for companies to engage in uneven, inconsistent, and biased reporting because there are no guidelines for disclosing carbon emissions, and even disclosure is still voluntary (Abdullah et al., 2020). Companies in Indonesia prefer to position themselves in the middle of the bow when practicing voluntary disclosures. Prior studies have found that companies try to maintain their public image by not providing information about risk and the impact of their operations on carbon production (Veltri et al., 2020). Furthermore, companies maintain their image as skeptical investors by providing unclear cost and activity information on carbon (Ganda, 2018; Yuan et al., 2022). However, companies choose preferred item categories for many reasons. For assurance, the current study provides a set of items used for content analysis in Appendix A. This finding is in line with legitimacy and stakeholder theories, in which the goal of voluntary disclosure is to manage perceptions and assist companies in responding to social and political pressures, especially from the public and investors (Desai, 2022).

After identifying the most disclosed item categories, this study also analyzed the most declared item of carbon emissions by non-financial listed companies in Indonesia (Figure 4). An item with an RC1 code becomes the most liked item, disclosed by 87% of sample companies and then followed by a CC1-code item informed by 73% of sample companies. The RC1 code item contains information on a detailed plan or strategy for reducing GHG emissions. Furthermore, the CC1 code items state the assessment/description of risks (specific and general rules/regulations) related to climate change and the actions taken to address these risks. The RC1 and CC1 code items were considered standard information for carbon emissions disclosure. Information about the plan or strategy and the company's view of climate change risk will be felt during its operations (Blanco et al., 2017; Datt et al., 2019), so they are essential to disclose. Therefore, it is natural for many companies to select these items as an introduction to carbon emissions information. However, half of the companies disclosed three items: EC1 regarding total energy consumption, GHG3 regarding total GRK emission production, and EC3 regarding energy based on types/facilities/segments. All three items are valuable because they provide information on the input and output of carbon emissions from corporate operational activities. Conversely, the RC4 code item was not disclosed at all by sample companies. RC4 consists of information on the costs of future emissions that are considered in capital expenditure planning. (Warwick & Ng, 2012) companies did not focus much on emissions costs in their capital expenditure planning, although capital expenditure was positively associated with actual carbon emissions (Karim et al., 2021). However, companies tend not to be transparent about detailed emissions cost information in their sustainability reports (Figure 5).

Finally, the article concludes with a few points. First, carbon emissions disclosures in Indonesia seem to have a steady trend, with a slightly increasing step-by-step year-to-year trend. However, there are limitations to improving carbon emissions disclosure practices because they are still low. Related parties, particularly governments, should take advantage of this opportunity. This statement aligns with the second point that the carbon emissions disclosure practice is a potential way for Indonesia to implement carbon reduction targets due to corporate environmental performance in sectoral alignment with the corporate carbon emissions disclosure score. Third, companies prefer numbers or countable information to be visible and more understandable to the public. Fourth, companies focus on standard information for carbon emissions disclosures and do not disclose their capital expenditure plans for carbon costs. These findings imply that the current study has implications for these direct parties in developing a structured framework to enhance sustainable finance practices.

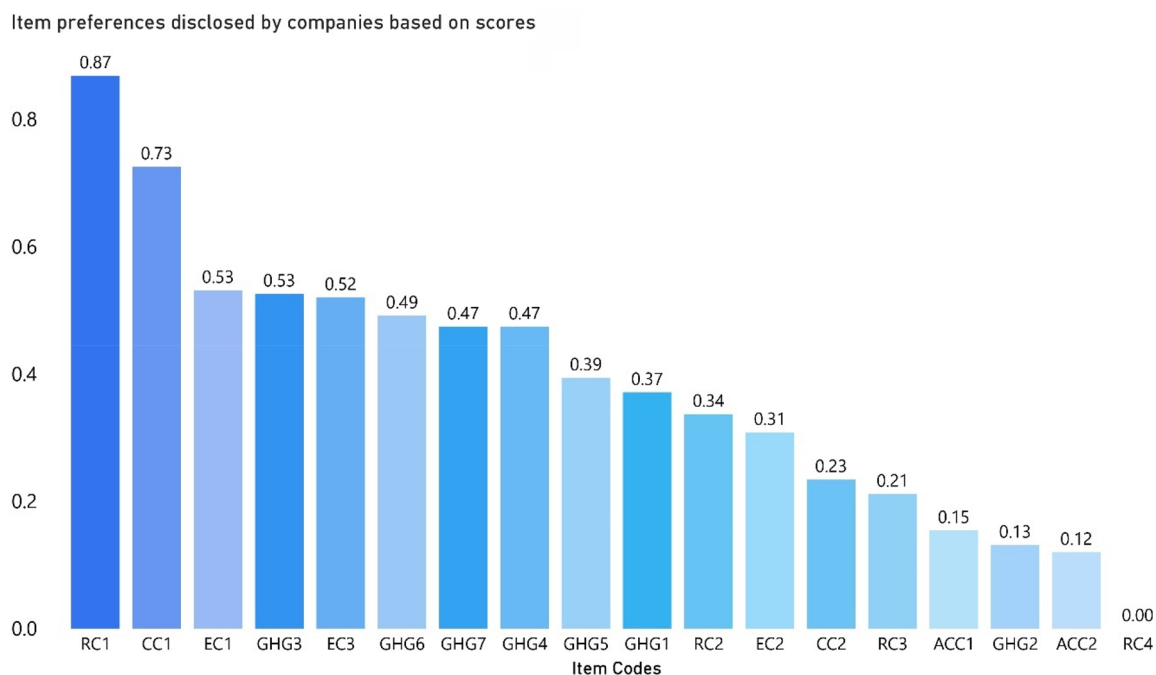


Figure 5. Item preferences disclosed by companies based on scores.
Source: Processed data by authors, 2023.

6.2.2. Discussion

Effect on institutional ownership of the board on carbon emission disclosure: In contrast to the stakeholder theory, which states that institutional investors in companies play a significant role in promoting carbon emissions reduction activities as part of their environmental responsibilities, the empirical results show that institutional ownership does not affect carbon emissions disclosure. Regardless of whether there is significant institutional ownership within the shareholder structure, companies' decisions on carbon emissions are not influenced by institutional ownership. Institutional investors view short-term stock trading as more attractive than focusing on additional company-related information, such as carbon emissions (Kochhar & David, 1996). Institutional investors prefer information related to a company's financial and operational strategies that impact their investment returns rather than concentrating on reducing carbon emissions, which refers to long-term strategies (Elyasiani & Jia, 2010). This may occur when institutional investors' awareness of environmental issues remains low. Institutional investors have yet to consider reducing carbon emissions as a crucial issue affecting their profits in the long run. (Hermawan et al., 2018; Pfeifer & Sullivan, 2008) Institutional ownership does not affect the level of carbon emission disclosure because the decision to disclose information voluntarily is the management's prerogative in determining policy. This results in the information submitted by the company, which varies according to each company's policies. This is in line with the opinion of Halimah and Yanto (2018) that institutional investors have a weak influence in encouraging companies to make voluntary reports. This study aligns with the results of (Dawkins & Fraas, 2010; Elyasiani & Jia, 2010; Hermawan et al., 2018). These results do not align with previous studies' results (Chang & Zhang, 2015; Cotter & Najah, 2012; Safiullah et al., 2022; Solikhah et al., 2021).

Effect of national diversity of the board on carbon emission disclosure: Foreign boards in a company's management structure encourage companies to implement carbon emissions disclosures. The empirical results of the current study show that foreign boards significantly influence the disclosure of carbon emissions; thus, the hypotheses are accepted. This result is supported by the institutional theory, which states that companies' board characteristics are developed by social norms, regulations, and practices in their countries (Huo et al., 2021). Nowadays, non-financial companies in Indonesia, especially almost all sample companies in this study, have at least one foreign board due to the presence of developed countries in Indonesian companies' shareholding structures, which allows foreign boards to exist. The

duties of the board of directors as executors and commissioners as supervisors play a crucial role in determining company policies, including the foreign boards (Kılıç & Kuzey, 2019). Therefore, a foreign board can influence the perspectives, ideas, and information necessary to determine policies, including issuing high-quality carbon emissions disclosures (Estélyi & Nisar, 2016). Board diversity, including nationality, can effectively enhance a board's ability to explore the needs and interests of various groups (Harjoto et al., 2015). Companies with foreign boards are usually multinational companies with shareholder heterogeneity that trade in international markets (Estélyi & Nisar, 2016); therefore, they have a large audience. These conditions can pressure companies to engage in environmental practices such as carbon emissions. Foreign boards can influence a company's business through the cultural values and sensitivities of the board's country of origin (Frias-Aceituno et al., 2013). Board members from countries with high environmental sensitivity play a role in influencing the implementation of these values. The results of this study are supported by prior studies revealing that foreign boards are positively associated with environmental performance (Du et al., 2020; Mardini & Elleuch Lahyani, 2022). Foreign boards can play an important role in enhancing environmental activity within leading companies by strengthening the moral and strategic motivations for environmental performance (Giannetti et al., 2015). In this context, foreign boards can encourage the publication of their companies' environmental performance through carbon emissions disclosures. The results also align with the studies of (Jannah & Narsa, 2021; Kılıç & Kuzey, 2019).

Effect of profitability on carbon emission disclosure: The regression results indicate that profitability influences the disclosure of carbon emissions; thus, the hypotheses are supported. This result is supported by socio-political theories that purport that society and stakeholders expect transparent company information on how they generate profits (Chithambo & Tauringana, 2014). The general public and investors demand higher disclosure from profitable firms, especially when profitability comes from using natural resources. Companies are not only legally obliged but also morally responsible. Companies that benefit from nature must protect the environment so that their operations can survive for a long time. In addition, companies with stable and sound financial conditions have several financial resources to fund costs related to identifying, compiling, and reporting information on carbon emissions (Bae Choi et al., 2013). Carbon emissions disclosure helps gain legitimacy from the public and leads to long-term benefits for companies; therefore, companies are willing to allocate funds for carbon emissions disclosure (Chithambo & Tauringana, 2014). Additionally, companies with high profitability often use environmental disclosures, including carbon emissions, to demonstrate their financial strength to the public (Bewley & Li, 2000). This statement aligns with agency theory, which states that voluntary disclosures are closely related to publishing costs and after-benefits; hence, companies engage in voluntary disclosures based on financial performance (Guidry & Patten, 2012). When companies possess sufficient financial resources to disclose carbon emissions and the outcomes are worthwhile, they begin carbon transparency. Once again, financial conditions, especially profitability, are closely related to motivating companies' carbon emissions disclosure practices. Prior studies, such as those (Logsdon, 1985) and (Nagendrakumar et al., 2022), argue that corporate environmental policies (including carbon emissions) are sensitive to adequate funds. Good financial performance allows companies to provide detailed information about their emissions (Hermawan et al., 2018; Zaidi et al., 2021). These results are consistent with those of previous studies (Bae Choi et al., 2013; Darus et al., 2020; Nagendrakumar et al., 2022).

Effect of leverage on carbon emission disclosure: The hypothesis-testing results show that leverage negatively influences carbon emissions disclosure. As a stable financial condition positively affects carbon emissions disclosure, a weak financial condition is reflected in the amount of a company's debt compared to the company's total assets. Aligned with economic theory's viewpoint in the form of agency and signalling theory, which states that voluntary disclosure is closely related to publishing costs and after-benefits, companies engage in voluntary disclosure based on their financial performance (Guidry & Patten, 2012). When a company has a high level of leverage, it is difficult to pay its debt from profits and assets. (Bae Choi et al., 2013) high leverage in companies may indicate declining financial conditions, resulting in difficulties implementing voluntary activities such as carbon emissions. Companies with high leverage focus on fulfilling credit responsibilities rather than engaging in carbon emissions disclosures. They assume such activities adversely affect financial conditions (Clarkson et al., 2008). (Luo et al., 2013) support the statement that companies experience pressure from creditors to prioritize paying interest

and principal debt. This study finds that leverage negatively affects the disclosure of carbon emissions. This result, in line with prior studies from (Chithambo & Tauringana, 2014; Desai, 2022; Hapsari & Prasetyo, 2020), shows that leverage decreases companies' savings when practicing corporate carbon emission disclosures.

Effect of media exposure on carbon emission disclosure: An empirical study found that media visibility reinforces a company's commitment to publishing high-quality carbon emissions disclosures. In other words, the hypothesis of the current study is accepted: increasing media visibility can enhance companies' carbon emission disclosure practices in Indonesia. In legitimacy theory, the media represents public opinion, whereas in stakeholder theory, the media is an important stakeholder. Media can act as a form of public opinion; therefore, companies often use media exposure to improve their reputation. Furthermore, when public highlights are strengthened, the media can pressure companies to respond to public demand. Several past studies have empirically found an effect of media exposure on carbon emissions disclosure (Li et al., 2017; Shao & He, 2022). When environmental opinions and issues develop in the mass media with strong public debate, these conditions tend to frame corporate projects related to the environment (Dusyk et al., 2018). Therefore, companies tend to disclose environmental information, including carbon emissions, on their websites, indicating their commitment to and concern for the environment. (Rupley et al., 2012) stated that mass media and private property, such as company websites, are intended to communicate information to gain community legitimacy. Therefore, the company attempts to convey this information through the media as much as possible. The company goes hand-in-hand with the opinions and current societal issues, which builds its awareness of environmental activities (Dusyk et al., 2018). However, when companies receive solid public scrutiny, they experience public pressure to remain consistent with their carbon emissions disclosure commitments. The greater a company's media exposure, the more actively they report carbon emissions. This study aligns with (Carmichael & Brulle, 2018; Jose & Lee, 2007; Li et al., 2017; Shao & He, 2022; Solikhah & Maulina, 2021).

Effect of environmental performance on carbon emission disclosure and its role as a moderating variable: The regression results show that almost all the variables in the current study influence carbon emissions disclosures by non-financial companies in Indonesia. Except for the institutional ownership variable, the variables of a foreign board, profitability, leverage, and media exposure significantly impact carbon emissions disclosure. The results show the moderating role of environmental performance variables on the effects of previous variables on carbon emissions disclosures.

The current hypothesis is accepted because good environmental performance affects the quality of companies' carbon emissions disclosure. In line with institutional theory, a company's commitment to the environment is observed in environmental performance, increased promotion, and investment in environmentally friendly activities such as reducing carbon emissions (Aslam et al., 2021). Furthermore, the legitimacy theory considers companies' environmental awareness developed from their environmental performance (Zameer et al., 2021). Environmental performance is a benchmark for environmental management (Phan & Baird, 2015). A firm's management encourages countable or seen performance to gain legitimacy and maintain social contracts. Signaling theory also supports that companies with better environmental and carbon performance are more likely to adopt voluntary disclosure, such as carbon emissions disclosure (Akbaş & Canikli, 2018). Companies prefer to signal to their stakeholders and the public that they have achieved superior environmental performance (Dhaliwal et al., 2011). This study shows that environmental performance affects carbon emissions disclosure. This aligns with prior studies that found empirical evidence that companies with more environmental activity improve their voluntary carbon disclosure (Jiang & Tang, 2023; Tsang et al., 2023). The continuity of the results supports the moderating role of environmental performance on variables independent of carbon emissions disclosure. These statistics indicate that environmental performance moderates the independent variables of institutional ownership, board nationality, profitability, and leverage. However, environmental performance does not moderate the effect of media exposure on carbon emissions disclosures.

Moderating variables as contingency variables can change the nature and direction of the relationship between the independent and dependent variables (Arnold, 1982). In this study, environmental performance changed the direction of the influence of the independent variables on carbon emissions disclosure. First, institutional investors pressure companies toward environmental performance, leading to

decreased carbon emissions disclosure. Institutional investors view environmental performance as a minimal requirement that does not require companies to publish their carbon emissions optimally. This result contradicts the institutional theoretical framework that predicts that corporate commitment to environmental management practices can increase promotion and investment in environmentally friendly activities such as reducing carbon emissions (Aslam et al., 2021). This is because institutional investors prioritize short-term stock trading as more attractive than focusing on additional information related to companies, such as carbon emissions (Kochhar & David, 1996). Institutional investors argue that transparency of carbon activities may help, but it is a long way from adequate to respond to the challenges of campaigning institutional climate finance (Ameli et al., 2020). Therefore, they choose environment-related performance as an easy method instead of voluntary carbon disclosure. Environmental performance is sufficient to represent a company's environmental concern (Braam et al., 2016). This is due to institutional investors' low awareness of carbon reduction activities. Although environmental performance is advantageous for improving a company's reputation and image, institutional investors consider carbon emissions disclosure as a waste activity. Additionally, institutional investors may believe that companies can use other proxies, such as involvement in carbon trading, to support their carbon practices. This also applies to the foreign nationality variables.

Second, although a company has a foreign board in its management structure, environmental performance is sufficient to address the environmental responsibilities that the foreign board wants. These conditions have prevented companies from formulating carbon emission policies. A board's nationality is considered to increase its ability to effectively explore the needs and interests of various interest groups (Harjoto et al., 2015). However, foreign boards may also view environmental performance as an opportunity to confirm stakeholder needs regarding a company's financial condition, as represented by profitability and leverage in this study. Therefore, good environmental performance is more valuable to foreign boards than voluntary disclosure. Therefore, the role of environmental performance in this study reverses the influence of foreign boards on carbon emissions disclosures.

Environmental performance's third and fourth roles also reverse the relationship between financial conditions and carbon emissions disclosures. Companies require stable financial conditions to meet societal demands (Zaidi et al., 2021). The company considers environmental performance as a practical step in allocating funds related to the environment rather than focusing more on carbon emissions. When a company is in weak financial condition, reflected in high leverage, it tries to gain community legitimacy by being active in environmental components, such as carbon emissions. The purpose of the decision is for stakeholders such as creditors, investors, and the public to be interested in funding environmentally friendly company operations and using the company's services and products. However, (Lemma et al., 2021) showed that companies with a high commitment to climate change activities, such as carbon emissions, issue a larger proportion of debt to fund these activities. The results of this study confirm that the combination of environmental performance in the framework of factors influencing carbon emission disclosure has reversal expectations. The presence of environmental performance from the viewpoints of institutional ownership, foreign boards, and profitability reduces companies' motives for carbon emissions disclosure practices. This result considers related parties, especially companies that perceive environment-related performance as unity with carbon emissions disclosures. Hence, companies do not emphasize the importance of carbon emissions disclosure.

7. Conclusions

The current study aims to expand research by achieving three objectives: finding the carbon emissions disclosure practices in Indonesia in detail, seeking factors that influence carbon emissions disclosure, and analyzing the moderating role of environmental performance on factors. This study uses 165 firm-year observations from non-financial firms in Indonesia between 2017 and 2021. This study obtained data from sustainability reports, annual reports, and company websites. Furthermore, this study acquired results from IBM SPSS version 25 statistical testing for descriptive statistics, moderated regression analysis, and Microsoft Power BI visualization for data representation concerning the robustness test for endogeneity using natural logs from environmental performance. The results of descriptive statistics and data representation show three points: carbon emissions disclosure in Indonesia seems to have a steady

trend with a slightly increasing year-to-year alignment with companies' environmental performance; companies prefer numerical or countable information; and companies focus on standard information for carbon emissions disclosure without disclosing their capital expenditure planning of carbon costs. In addition, the findings show that foreign boards, profitability, and media exposure have a significant favorable influence, whereas leverage significantly and negatively influences carbon emissions disclosure. Conversely, institutional ownership does not influence carbon emissions disclosure. Nevertheless, moderated regression testing confirms that environmental performance has a significantly favorable influence and moderates the independent factors of carbon emissions disclosure, except for media exposure.

This study contributes to existing literature in several ways. First, it provides empirical evidence of how non-financial companies in Indonesia disclose their carbon emissions in a specific or detailed view by exploring trends and comparisons towards companies' environmental performance, preferred disclosed item categories, and most disclosed items of carbon emissions. Therefore, the second contribution of this study is that carbon emissions disclosure must be improved to implement carbon reduction targets. Carbon emissions disclosure reflects environment-related activities such as carbon practices. It is hoped that the government will optimize the Financial Services Authority on the No. 51/POJK.03/2017 regulations by developing guidelines, rewards, and penalties for companies regarding carbon emission-related activities. Third, the presence of foreign boards, increased media visibility, and stable financial conditions motivate companies to disclose carbon-emission-related information. Fourth, the findings of environmental performance as a moderating variable have implications for companies to see environment-related performance, including carbon performance, as unity with carbon emission disclosures. Therefore, related parties must pressure companies to enhance carbon performance and disclosures.

This study had several limitations. First, the findings cannot be generalized to different markets, as each market in a nation has different characteristics. By comparing developed and emerging markets, future research can produce more thorough findings across several nations incorporating control variables representative of the features of each nation. Second, this study has not yet determined why, from a management perspective, companies choose to disclose preferred carbon items. Future research should use new approaches to tackle this issue, such as surveys, interviews, and other qualitative methods. Third, this study used proxies from prior studies, especially for carbon emissions disclosure measurements. Future research should create a new proxy that comprehensively describes the quality of carbon emissions disclosures.

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Authors' contributions

Conception and design: I.F.S Wahyuningrum; analysis and interpretation of the data: S. Sriningsih and M. Ihlashul'amal; the drafting of the article: I.F.S Wahyuningrum and S. Utami; revising it critically for intellectual content: H.G. Djajadikerta; and the final approval of the version to be published: I.F.S Wahyuningrum; and that all authors agree to be accountable for all aspects of the work.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article (and/or) its supplementary materials.

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Appendix

Appendix A. Carbon emission disclosure information checklist.

Category	Items
Climate change risks and opportunities	CC1 – Assessment/description of the risks (both specific and general rules/regulations) related to climate change and the actions taken or actions taken to address these risks. CC2 – Current (and future) assessment/description of the financial implications, business implications and opportunities of climate change.
GHG emissions calculation	GHG1 – Description of the methodology used to calculate (calculate) GHG (greenhouse gas or ISO) emissions. GHG2 – The existence of verification from external parties in measuring the amount of GHG emissions by whom and on what basis. GHG3 – Total GHG emissions produced. GHG4 – Disclosure of scope 1 and 2, or scope 3 direct GHG emissions. GHG5 – Disclosure of GHG emissions based on origin and source (for example: coal, electricity, etc.) GHG6 – Disclosure of GHG emissions by facility or segment level of GHG GHG7 – Comparison of GHG emissions with the previous year
Energy consumption	EC1 – Total energy consumed (e.g. tera joule MAP-joule). EC2 – Quantification of energy used from renewable resources. EC3 – Disclosure by type, facility or segment
GHG costs and reduction	RC1 – Detailed plan or strategy to reduce GHG emissions RC2 – Specification of target levels and years for reducing GHG emissions RC3 – Emission reductions and costs or savings achieved to date as a result of carbon emission reduction plans RC4 – Cost of future emissions costs taken into account in capital expenditure planning
Carbon emission accountability	ACC1 – Indication of the board committee (or other executive body) that has responsibility for action related to climate change ACC2 – Description of the mechanism by which the board (or another executive body) reviews the company's progress on climate change