JURNAL ILMU LINGKUNGAN
Volume 23 Issue 2 (2025) : 472-486 ISSN 1829-8907

Carbon Emission Disclosure and Its Impact on Developing Countries

Indah Fajarini Sri Wahyuningrum[1*], Linda Agustina[1], Muhammad Ihlashul'amal[1], Kuat Waluyo Jati[1], Suci Sularsih[1], Syaiful Anwar[1], and Sriningsih[1]

[1]Department of Accounting, Faculty of Economics, Universitas Negeri Semarang, Semarang, Indonesia; email: i.fajarini@mail.unnes.ac.id

ABSTRAK

Penelitian ini bertujuan untuk mengeksplorasi praktik pengungkapan emisi karbon di Indonesia, dan melakukan pengujian ekstensif dengan menyediakan satu variabel yang mewakili setiap kelompok faktor yang dianggap berpengaruh. Menggunakan 113 unit analisis sebagai sampel penelitian pada perusahaan publik non keuangan yang terdaftar di Bursa Efek Indonesia (BEI) tahun 2019-2021. Data dikumpulkan dari laporan tahunan dan laporan keberlanjutan dan dianalisis menggunakan uji statistik deskriptif dan regresi linier berganda. Analisis deskriptif menunjukkan bahwa tingkat pengungkapan emisi karbon di Indonesia masih rendah namun berada pada tren stabil dan meningkat dari tahun ke tahun. Kinerja lingkungan dapat meningkatkan pengungkapan emisi karbon. Perusahaan dengan kinerja lingkungan yang baik akan mengungkapkan keberhasilannya melalui pengungkapan emisi karbon. Selain itu, perusahaan-perusahaan muda ditemukan memiliki tingkat pengungkapan karbon yang lebih baik dibandingkan perusahaan-perusahaan yang lebih dewasa. Demikian pula, perusahaan dengan visibilitas media yang tinggi tidak mengungkapkan emisi karbon lebih baik dibandingkan perusahaan dengan visibilitas media yang rendah. Hasil penelitian ini telah memenuhi uji kecukupan ketahanan dan endogenitas melalui metode regresi lainnya dan membantu manajer menggunakan kinerja lingkungannya untuk merancang kebijakan keterbukaan informasi terkait emisi karbon. Hasil penelitian menunjukkan perlunya pedoman pengungkapan emisi karbon oleh regulator/pemerintah. Terlebih lagi, Indonesia sebagai negara yang diprediksi paling lambat dalam mencapai net-zero carbon dibandingkan negara lain.

Kata kunci: Teori Legitimacy, Teori Stakeholder, Teori Agency, Pengungkapan Carbon emissions, Perusahaan non-keuangan, Kinerja keuangan, Media Exposure

ABSTRACT

This study aims to explore carbon emission disclosure practices in Indonesia, and extensive testing by providing one representative variable for each group of factors thought to be influential. Using 113 analysis units as research samples of non-financial public companies listed on the Indonesia Stock Exchange (BEI) in 2019-2021. Data collected from annual and sustainability reports and analyzed using descriptive statistical tests and multiple linear regression. The descriptive analysis shows that the level of carbon emission disclosure in Indonesia is still low but is on a stable trend, increasing from year to year. Environmental performance can increase carbon emission disclosure. Companies with good environmental performance will proudly reveal their success through carbon emission disclosures. In addition, young companies were found to have better levels of carbon disclosure than older companies. Likewise, companies with high media visibility do not disclose carbon emissions better than companies with low media visibility. The results of this study have met the adequacy of robustness and endogeneity tests through other regression methods and help managers use their environmental performance to design information disclosure policies related to carbon emissions. The research results show the need of carbon emission disclosure guidelines by regulators/government. Moreover, Indonesia as the country is predicted to be the slowest to reach net-zero carbon compared to other countries.

Keywords: Legitimacy theory, Stakeholder theory, Agency theory, Carbon emissions disclosure, Non-financial companies, Environmental Performance, Media Exposure

Citation: Wahyuningrum, I. F. S., Agustina, L., Amal, M. I., Jati, K. W., Anwar, S. dan Sriningsih. (2025). Carbon Emission Disclosure and Its Impact on Developing Countries. Jurnal Ilmu Lingkungan, 23(2), 472-486, doi:10.14710/jil.23.2.472-486

1. INTRODUCTION

Companies significantly contribute to greenhouse gas emissions through their business activities. (Moorhead and Nixon, 2016) estimated that, in 2016, the world's 500 largest companies collectively generated more than five gigatonnes of carbon emissions (10% of global emissions) through their business operations and regular energy consumption. These companies represent almost 28% of the worldwide economy, reflecting how the world is already facing a formidable climate challenge (Moorhead and Nixon, 2016). By 2022, energy-

burning activities and industrial processes had increased total global carbon emissions by 0.9% or around 321 billion tonnes, bringing total global carbon emissions to an all-time high of 36.8 gigatonnes of CO2 (Economic and Affairs, 2022). This condition has caused all countries in the world to be threatened by environmental problems and drastic climate change (Abbas and Abdulhussein, 2022; Arslan et al., 2022; Nasih et al., 2019). As responsible parties, companies must prioritize the issue of carbon emissions and not only focus on financial gain. Therefore, under this issue, related parties like regulators, policymakers, investors, NGOs, and even the public put increased pressure on companies for more information regarding the companies' carbon emissions behavior.

Even while emission reduction initiatives are vital, much earlier research believes that disclosing carbon information is also necessary (Cohen et al., 2023; Safiullah et al., 2022). Details on how carbon has been produced, reduced carbon, and other related information are represented as assurance and company accountability to inform their stakeholders (Bilal et al., 2022). Many prior studies consider the importance of the existence of carbon emissions disclosure (Jaggi et al., 2018; Luo and Tang, 2014; Qian and Schaltegger, 2017). However, the companies' motives for disclosing carbon emissions are still debatable (Jaggi et al., 2018). From a global viewpoint or scope, some studies suggest that companies are motivated by their protection effort on reputation and relationship with stakeholders (Liu, Q. and Komal, 2022; Scholtens and Kleinsmann, 2011). All things that come from stakeholders can encourage companies to disclose carbon emissions. This point aligns with stakeholder theory, which 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 approval obtained from its stakeholders (Rob et al., 1995). Previous studies also suggest the desire to disclose carbon emissions comes from the companies' characteristics (Ben-Amar et al., 2017; Chithambo, 2013; Liao et al., 2015). To harvest legitimacy from society (Kuo and Yi-Ju Chen, 2013) and avoid any blame (Galbreath, 2011), these motivate companies' carbon disclosure activities. Even so, over the past studies, companies' motives for disclosing carbon emissions can differ depending on their setting and the country's culture (Luo et al., 2013). Therefore, research on carbon emissions disclosure still needs to be developed further. This study examines these issues in Indonesia by relating some companies' points of view on the existence of carbon emissions, their practical activities, and what these disclosure drivers are.

Investigating practices of carbon emissions disclosure in Indonesia is essential for several reasons. First, similar to the other 100 countries, Indonesia set an ambitious net-zero emissions target in 2060, aligning with Indonesia's commitment to ratifying the Kyoto Protocol to reduce carbon emissions (Mangku, 2021). However, a prior study found Indonesia became the country to reach net zero emissions later than the global average (van Soest et al., 2021). Second, Indonesia started its target with a short-term result by reducing greenhouse gas emissions by over 31,89% through its efforts and reaching 43,20% support from international parties in 2030 (Forestry, 2023). But in reality, Indonesia ranked as the 10th most significant contributor to world carbon emissions with 589.5 billion tons of CO2 (Bank, 2018). At this point, we know Indonesia is still far from reaching its target. Third, though Indonesia is committed to reducing carbon emissions and Indonesia plays a significant contributor, till now, there is a lack of legal structure in place to regulate the amount of carbon emissions and how they are disclosed (Ayostina et al., 2022). Unlike a few countries, such as the United Kingdom, Australia, France, and New Zealand (Houqe and Khan, 2023), carbon reporting or publishing carbon information in Indonesia has not yet changed from voluntary to mandatory disclosure. Until now, carbon information disclosure hasn't had fixed guidelines and is only stated in annual or sustainability reports (Maharani et al., 2023). As a result, carbon emissions disclosure in Indonesia is still low, lacks improvement, and is uneven, inconsistent, and biased due to companies' freedom in practice. We identified Indonesia's unique setting regarding carbon emissions-related activities.

This study examines the impact of some factors on the disclosure of carbon emissions. For this purpose, we look to research trends regarding carbon emissions disclosure in Indonesia's lack of consistency in results. (Hermawan et al., 2018; Nasih et al., 2019) found that company size, corporate governance, and industry characteristics affect carbon emissions. Meanwhile, (Wahyuningrum, I. F.S. et al., 2022) found PROPER ratings, profitability, leverage, and audit committees did not significantly encourage disclosure of carbon emissions. These results contradict the research (Abdullah et al., 2020), who examined company size, profitability, leverage, and environmental performance, which positively affect disclosure of carbon emissions. However, (Ratmono, 2021) found that profitability and leverage negatively influence the disclosure of carbon emissions. Moreover, previous studies have also brought up new determinants that are thought to affect carbon emissions. Likewise, the mass media was tested for its relationship to carbon emissions, which was found to have a negative relationship (Purwanti et al., 2022). The inconsistency of the results and the variation in the determinants thought to have an effect have given impetus to research related to the determinants of carbon emissions disclosure. The current study also addresses this call. Once again, in light of this, this study's reexamination of several of these criteria was motivated by the gaps in the previous literature

covering the determinants of carbon emission disclosure.

Using the unique setting of Indonesia and the gaps in prior research as background, the current study explored the practices of carbon emissions disclosure in Indonesia through the lens of some factors that possibly motivated it. The recent study-specific questions to address were as follows:

RQ1. How are Indonesian companies currently practicing carbon emissions disclosure?

RQ2. What factors motivate companies to publish carbon emissions disclosures?

Therefore, the current research objectives are two-fold. First, this study thoroughly explored carbon emissions disclosure practices in Indonesia. Second, we investigate the role of some factors in influencing carbon emissions disclosure. Those factors are company age as a company characteristic, profitability as company financial conditions, the presence of independent commissioners as corporate governance, environmental performance as company performance, and media exposure as public/stakeholder. In light of research purposes, these are also the novelty of this research. This research explores the disclosure of carbon emissions in Indonesia in a comprehensive way, which, to our knowledge, is still limited. Furthermore, current research uses comprehensive testing by providing one representative for each group of factors that may relate to carbon emissions disclosure and based on inconsistent results in prior studies.

Considering the scant investigation into carbon emissions disclosure studies, this study makes multiple contributions to the current literature in several ways. From an institutional setting view, this study focuses on Indonesia, which is one of the countries that predicted later than other countries to reach net-zero carbon. Hence, this study gives the reality of carbon emissions disclosure practices that are impactful for related parties like policymakers to overcome this issue by creating regulations. Policymakers or regulators must construct detailed guidelines for companies to disclose their carbon emissions information. Second, the complex factors investigated give insight to related parties regarding the motive of companies to disclose carbon emissions. For this side, this study confirms these factors, which still vary in prior studies.

Our sample comprises non-financial firms on the Indonesia Stock Exchange, included in the PROPER rating program, where firms exhibit an environmental-related performance. PROPER rating program was developed to assess and reward companies whose performance surpasses regulatory requirements and to encourage adherence to environmental laws (Afsah et al., 2010). This rating includes companies' general environmental performance and provides carbon practices as an assessment. This study takes 2019 until 2021 as the research period and consists of a measurement of carbon emissions disclosure developed by prior research. In the current investigation, we employed 18 indicators with five dimensions formulated from three scopes. This measurement has provided proof for the practices of carbon emissions that (Bae Choi et al., 2013) have developed. Our analysis shows that carbon emissions disclosure practices by Indonesia's non-financial companies have a reasonably steady trend with a slight increase year to year. Furthermore, we have investigated that environmental performance increases companies' efforts to disclose carbon emissions. Besides, media exposure and age tend to reduce a company's motivation to disclose carbon emissions. The findings emphasize that profitability and the independent commissioner don't relate to carbon emissions disclosure.

The rest of the paper is structured as follows: section 2 is a theoretical review, section 3 provides a literature review and hypotheses development, section 4 describes the research method, section 4 presents empirical results and discussions, and section 5 gives conclusions and implications.

2. THEORETICAL REVIEW

From the extensive literature review, carbon emission disclosure is part of environmental-related activities, so the theoretical foundation is the same as other voluntary environmental-related disclosures. (Hahn et al., 2015) states that three primary theoretical frameworks have influenced the disclosure of carbon emissions: sociopolitical theories (Rob et al., 1995), economic theories/information asymmetry (Desai, 2022), and institutional theory (Hahn et al., 2015). In this study, we use two of three theory groups to support the hypothesis development. We present the theoretical foundation for this study in this session.

First, from the perspective of socio-political theories, voluntary disclosure is viewed as a conveying tool for stakeholders and society. Companies are emphasized to fulfill various parties' expectations, so under sociopolitical theories, firms can be punished if they do not operate consistently in their view (Cotter et al., 2011; Desai, 2022). Hence, according to the carbon footprint issue, which is hot right now, carbon emissions disclosure also reaches stakeholders' awareness as a disclosure trend that companies need to take note of. In this study, sociopolitical theories are divided into legitimacy theory and stakeholder theory (Cotter et al., 2011; Hahn et al., 2015). Both legitimacy theory and stakeholder theory use social and political viewpoints, giving an outside outlook on companies' activity (Roberts, R. W., 1992). The common thread between stakeholder theory and legitimacy theory is who the crucial parties are, among others (O'Donovan, 2002). Legitimacy theory focuses on society, whereas stakeholder theory is related to stakeholders.

Legitimacy theory states that to maintain companies' concern, companies should adapt to social norms where they operate (Connelly et al., 2011). When the carbon emissions issue gets plentiful

attention from society, companies start to take responsibility and awareness regarding this issue (Deegan, 2002). Legitimacy theory encourages companies to reduce their carbon footprint and publish related information so that companies can get or maintain their social legitimacy (Kuo and Yi-Ju Chen, 2013). Under this point, producing carbon emissions disclosure is reasonable as symbolic of company concern. Furthermore, stakeholder theory purports that companies concentrate on satisfying stakeholders' pressure, needs, and expectations according to their closest relationship between both (Berthelot and Robert, 2011; Gibson, 2000). Establishing a company requires the support of various parties, and its survival is contingent on the approval obtained from its stakeholders (Rob et al., 1995) so that companies strive to meet stakeholders' needs. Currently, stakeholders, such as consumers, non-profit organizations, the media, and even internal stakeholders, pressure companies to address environmental issues such as carbon emissions (Lee et al., 2015). From this point of view, to demonstrate that their operations meet stakeholder expectations (Alfani and Diyanty, 2020), 2020), companies have revealed more details on their operations' environmental effects, especially the carbon emissions issue. Under stakeholder theory and legitimacy, firms willingly report carbon emissions to justify their activities and control the expectations of various stakeholders.

Second, this study's framework of thinking is also formed by the viewpoint of economic theories. The economic theory's view purports that carbon emissions disclosure is a tool to solve information asymmetry between management and financial-related stakeholders (Gould et al., 2023). Financial-related stakeholders like investors, creditors, or the government require credible information about companies' survival to determine their financial decisions (Desai, 2022). To resolve this point, economic theories are anchored by agency theory. Agency theory realizes that companies' management and shareholders have a conflict of interest that brings information asymmetry and agency costs (Cuevas-Rodríguez et al., 2012; Jensen and Meckling, 2012). Besides, agency theory also states that voluntary disclosure is closely related to publishing prices and after-benefits; hence, managers engage in voluntary disclosure based on financial performance (Guidry and Patten, 2012). Therefore, companies disclose carbon emissions to solve information asymmetry and reduce agency costs based on their economic conditions and the reciprocal relationship between price and benefit (Mahmoudian et al., 2023). When companies possess enough financial resources to afford carbon emissions disclosure and the outcomes worthwhile, companies start carbon transparency. Under this concept, agency theory becomes a keystone for some factors as motives for carbon emissions disclosure.

Based on the description above, we conclude our theoretical literature review. In this study, we utilize combined theories to identify key business characteristics and corporate governance elements that may influence carbon emissions disclosure and the formulation of the study's hypotheses. Integrated approaches contain legitimacy theory, stakeholder theory, and agency theory. A recent study (Hahn et al., 2015) found that the empirical results of earlier research are not firmly established for only one of these theories.

3. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

This section presents an overview of the recent literature trend written about determinants or factors that influence carbon emissions disclosure. Then, combining the prior literature, theoretical foundations, empirical evidence, and contextual setting, we developed our research hypotheses.

3.1. Profitability and Carbon Emissions Disclosure

Agency theory purports that implementing voluntary disclosure of information such as carbon emissions is closely related to the company's financial condition (Guidry and Patten, 2012). The company has to bear additional costs to disclose this information. Meanwhile, carbon emission management activities also require investment in the form of technology and human resources to optimize operations and reduce the production of emissions (Nagendrakumar et al., 2022). Good financial conditions in companies are the primary support in providing sources of funds to implement carbon emission reduction practices (Hermawan et al., 2018; Zaidi et al., 2021). Companies will be more flexible in allocating funds for investment in carbon emission reduction practices and the cost of publishing information related to carbon emissions when the company's financial condition is good (Zaidi et al., 2021). On the other hand, based on legitimacy and stakeholder theory as sociopolitical theories, companies with large profits are considered to have used natural resources intensively and disposed of residues such as pollution and carbon emissions into the environment (Chithambo and Tauringana, 2014), so those companies are responsible for improving the environment. Therefore, high company profitability shows the company's ability to carry out practices related to carbon emissions and a form of corporate responsibility for the environment (Wahyuningrum, Indah Fajarini Sri et al., 2023). (Darus et al., 2020) found that companies with high profitability better disclose information on their carbon emissions. Thus, a company's profitability—as a reflection of its financial stability—positively affects the disclosure of carbon emissions:

H1. Profitability has a significant positive effect on the carbon emission disclosure.

3.2. Company Age and Carbon Emissions

The number of years that have elapsed since an organization was built is considered an organization age (William Q. Judge and Zeithaml, 1992). Moreover, prior studies define a company's age as the years since being listed on the stock exchange to the present (Liu, X. and Anbumozhi, 2009; Vismara et al., 2012). Age has proven to be a powerful construct in company characteristics (Hossain and Farooque, 2019). Under the agency theory perspective, age impacts the disclosure of financial and non-financial information (Dolinšek and Lutar-Skerbinjek, 2018). Mature companies usually have strong legitimacy in the eyes of the public to survive for a long time. Close relationships between companies and the community can be formed by maintaining the quality of their products, services, and innovations, demonstrating their concern for social and environmental issues (Asif et al., 2013). Therefore, old companies will try to preserve this legitimate relationship through adaptation to developing crucial issues, including carbon emissions. Company age shows the strength of the company's legitimacy and indicates the stability of its management and finances so that it can be a going concern for a long time. Furthermore, because older organizations are more likely to have established reporting procedures, full disclosure is less expensive (Dolinšek and Lutar-Skerbinjek, 2018). The publication of carbon emission information is expected to build and maintain a favourable reputation for the company over the period ahead. Prior studies have found that company age influences the level of disclosure of carbon emission information (Hossain and Reaz, 2007; Kılıç and Kuzey, 2019; Solikhah et al., 2021). Based on the theories, empirical results, and research setting or contextual insight, the second hypothesis has been framed as follows:

H2. Company age has a positive effect on the disclosure of carbon emissions.

3.3. Environmental Performance and Carbon Emissions

Legitimacy theory states that companies must address environmental-related issues and meet societal expectations to maintain social legitimacy (Chariri and Ghazali, 2007). Legitimacy theory suggests that companies can known as environmentally conscious organizations when portraying them as responsible for their carbon footprint and its reduction (Kuo and Yi-Ju Chen, 2013). However, countable performance and administrative forms are more recommended to combine as a step toward gaining legitimacy (Aragón-Correa et al., 2016; Dhaliwal et al., 2011). Bayu found that a company's commitment and responsibility to the environment can be assessed through its environmental performance (Braam et al., 2016). Good environmental performance reflects how the company prioritizes environmentally friendly operations, invests in environmental management, and is sensitive to environmental issues. Furthermore, as an administrative form, voluntary disclosure of environmental-related information can establish legitimacy, reduce transaction costs, lower information asymmetry, and be timely and flexible for stakeholders (Kaplan and Ramanna, 2021). Theoretically, environmental performance is closely related to carbon emissions disclosure. This aligns with prior studies by (Aslam et al., 2021; Giannarakis et al., 2017; Jiang and Tang, 2023; Tsang et al., 2023), who argue that good environmental performance will increase company promotion and investment in environmental issues such as carbon emissions. According to a study by (Ren et al., 2022), an improvement in environmental performance correlated with a rise in the adoption of carbon emission disclosure. The study used companies' carbon emissions as a measure of environmental performance. According to earlier studies, environmental performance affects how much a company discloses its carbon emissions (Giannarakis et al., 2017; Jiang and Tang, 2023; Tsang et al., 2023). Before that, based on the theories, empirical results, and research setting or contextual insight, the hypothesis has been framed as follows:

H3. Environmental performance has a positive effect on the disclosure of carbon emissions.

3.4. The Existense of an Independent Board and Carbon Emissions Disclosure

The existence of an independent board in the top management structure of a company aims to strengthen the board's independence, performance, and effectiveness as a whole (Oyewo, 2023). Nowadays, the independent board is almost always there in the board structure, becomes an important part of corporate governance, and has a valuable impact on a company's effective decisions (Elsayih et al., 2021). From a theoretical perspective, legitimacy theory purports that a company must adhere to societal norms since it has an implicit or explicit social contract with the community (Tang and Luo, 2016). Hence, companies with sound corporate governance are considered more responsible for adapting to social norms (Mori et al., 2015) and likely transparent about their operations that have caused an impact on the ecosystem (Elsayih et al., 2018). Besides, under the stakeholder theory, board independence transforms into management accountability that enhances corporate governance (Hussain et al., 2018). An independent board member of commissioners who do not collude with company management will suppress management's opportunism to prioritize stakeholders. Furthermore, the independence of a board of commissioners, as a non-executive board, can come from representatives of institutional investors or on their own behalf, meaning they will be more interested in fulfilling corporate sustainability responsibilities. Corporate social and environmental responsibility information will increase their social prestige and the company's value, image, and reputation. Independent board members can also be

professional people with different backgrounds, and their presence will help achieve corporate environmental accountability (Khan et al., 2021). The presence of an independent board provides more objective feedback and fresh insight, which can, in turn, lead to elevated carbon issues on company strategy. Empirically, prior studies found that an independent board has a relationship with carbon-related activities (Elsayih et al., 2021; Elsayih et al., 2018; Lim et al., 2007). Therefore, an independent board of commissioners with a significant role will enhance the promotion and implementation of environmental issues such as carbon emissions. According to the theoretical view, empirical literature, and research or contextual insights above, the hypotheses are as follows:

H4. The existence of an independent board of commissioners influences the disclosure of carbon emissions.

3.5. Media Exposure and Carbon Emissions Disclosure

Table 1. Sample Distribution

Industry	Frequency	Percentage
Panel A: Sample based on classification of the industry		
Consumer Non-Cyclicals	27	22.5
Energy	15	12.5
Basic Materials	48	40
Industrials	9	7.5
Consumer Cyclicals	6	5
Healthcare	12	10
Technology	3	2.5
Total	**120**	**100**
Panel B: Sample per examination year		
Year	Frequency	
2019	40	
2020	40	
2021	40	
	120	

Financial and non-financial reporting is the company's media for communication with stakeholders regarding strategy, processes, results, and responsibility for the company's business (Hoffmann and Fieseler, 2012; Turzo et al., 2022). The media in this study refers to the mass media as an external party that reports information about the company. Mass media represent public or societal opinion in the framework of legitimacy theory (Rupley et al., 2012). Furthermore, prior studies approved that the mass media not only acts as an intermediary for communication but also forms public opinion (Trianaputri and Djakman, 2019). Media exposure can be interpreted as news that positively and negatively highlights the company (Sriningsih and Wahyuningrum, 2022). Legitimacy theory also explains that the mass media can play a role in increasing public pressure on companies (Brown and Deegan, 1998). Therefore, the media are considered essential company stakeholders under the stakeholder theory.

On the other hand, companies often delegate the part of communicating with society to the media to gain public recognition (Rupley et al., 2012). The company's reciprocal relationship with public opinion through the mass media encourages companies to adapt to current issues, such as the issue of carbon emissions (Dusyk et al., 2018). However, like a two-edged sword, the media can contribute to companies winning public legitimacy while also being capable of exerting intense pressure on companies. The greater the company's visibility, the stronger the media pressure on the company to act on environmental issues. Prior empirical evidence found that media exposure impacts the disclosure of carbon emissions (Li et al., 2018; Shao and He, 2022). Once again, companies that enjoy high media attention are naturally inclined to include more information about their carbon emissions in their sustainability reports. According to the theoretical view, empirical literature, and research or contextual insights above, the hypotheses are as follows:

H5. Media exposure has a positive effect on the disclosure of carbon emissions.

4. METHODS

4.1. Sampling Design and Data Collection

This study investigates how non-financial firms with listings on the Indonesia Stock Exchange with PROPER ratings are implementing the disclosure of carbon emissions for 2019–2021. We initiative with non-financial than all sector companies in Indonesia because this group of sectors is prone to environmental issues. Besides, we prefer companies included in the PROPER rating program because these ratings reaffirm the companies' effort to control pollution, follow the standard, and create innovative systems or technology for water, hazardous waste, and air (García et al., 2007).

All companies included in the study's population have been selected using a purposive sampling technique through specific criteria adapted to the research objectives. According to the IDX database check, the total population from 2019-2021 consists of 767 firms. Then, we eliminated the financial sector companies for our research purpose, 105 financial companies. Next, one of the processes that reduces the most candidate samples is PROPER rating member selection. After excluding non-PROPER-rating non-financial companies, the number of temporary samples is as much as 58 companies. Lastly, we only choose companies that disclose their annual report and sustainability reports. Following the regression process, we pulled out 7-unit analyses as outlier data. Therefore, the final sample consists of 113 firm-years. The sample distribution is presented in Table 1. This study used reports from companies in the sample to collect data on carbon emissions and other variables to be tested. The documentation method was used to obtain data gleaned from annual reports, sustainability reports, company websites, and news carried by the mass media.

Table 2. Measurement of Variables

Variable	Measurement
Disclosure of carbon emissions (CED)	The measurement of disclosure of carbon emissions was adopted from (Bae Choi et al., 2013) and developed by (Wahyuningrum, I. F.S. et al., 2022), the formula is as total disclosure divided by 18.
Profitability (PROFIT)	The measurement formula is net profit divided by total assets.
Company age (AGE)	Company age is measured based on the research period minus the year the company was first listed on the Indonesia Stock Exchange (Wahyuningrum, I. F.S. et al., 2022).
Presence of independent commissioners (COM_IND)	Calculated by dividing the total number of commissioners by the number of independent commissioners, this percentage represents the proportion of independent members on the board of commissioners (Elsayih et al., 2021).
Environmental performance (ENV)	The rating is according to the proper rating as follows: black = 1, red = 2, blue = 3, green = 4, gold = 5 (Abdullah et al., 2020).
Media exposure (MEDIA)	Natural logarithm of the amount of news (both positive and negative) related to the company found with the Google search engine in the study period (Martínez-Ferrero et al., 2015)

4.2. Measurement of Variables

This study analyzes the trend of disclosing carbon emissions using a paper-based method through sustainability reports published by companies. The carbon emission information listed is analyzed using a checklist of items with a non-weight index in the form of a binary scale (items that are disclosed receive a score of 1, while those that are not disclosed receive a score of 0). This study defines a series of items examined related to carbon emissions based on previous research measurement indicators (Ben-Amar et al., 2017; Nagendrakumar et al., 2022). To ensure the judgement of the checklist item score of carbon emissions information is not biased, (Haniffa and Cooke, 2005; Wicaksono et al., 2024) suggest a precautionary principle. Researchers carefully read the entire sustainability report, search for detailed carbon emissions disclosure and make any judgment. Then, the collected carbon emissions information is calculated to derive the ratio of the actual score of carbon emissions disclosure by dividing it by the maximum score the company can achieve. On the other hand, this study also uses a number of proxies to measure the independent variables that will be tested for their correlations with the disclosure of carbon emissions. The independent variable measurements (profitability, firm age, the presence of an independent board of commissioners, environmental performance, and media exposure) are described in Table 2.

4.3. Methods of Data Analysis

To explore and investigate the effect of independent variables on carbon emissions disclosure in Indonesian non-financial companies from 2019 to 2021, this research develops a regression model as follows:

$$CED_{i,t} = \beta_0 + \beta_1 PROFIT + \beta_2 MEDIA + \beta_3 ENV + \beta_4 COM_{IND} + \beta_5 AGE + \varepsilon_{it} \quad (1)$$

5. EMPIRICAL RESULTS AND DISCUSSIONS

5.1. Empirical Results

This study seeks to explore the main topic, namely the trend of disclosure of carbon emissions in Indonesia, especially for companies that were members of the PROPER rating system from 2019 to 2021. To answer the first question, this study interprets the results of the collection and descriptive analysis of the research data in graphical form to convey detailed information regarding the trend of disclosure of carbon emissions. This is shown in Figure 1, which shows the upward movement of disclosure of carbon emissions by public companies participating in PROPER in Indonesia from 2019 to 2021. Trend analysis highlights a fairly steady increase from year to year. In 2019, the level of disclosure of carbon emissions was 0.28 (28% of carbon emission items disclosed). In 2020, it was 0.30 30% of carbon emission items disclosed); in 2021, it was 0.36 (36%). However, the enhancement of carbon emissions disclosure appears year to year in line with the strengthening awareness and widespread of carbon practices (Blanco et al., 2017). Furthermore, what needs to be observed is that, until 2021, the level of disclosure of carbon emissions in Indonesia, especially in PROPER participating companies, will still be relatively low. Companies in Indonesia are only able to convey information about less than half of the total disclosure items related to carbon emissions. This situation can be caused by the low level of company awareness regarding the issue of carbon emissions (Jung et al., 2018; Tillotson et al., 2023), meaning that companies have not presented information on carbon emissions optimally (Matsumura et al., 2014). According to the descriptive statistical test findings, companies with a disclosure level of only 0.06 or 6% and companies with a disclosure level of 0.72 (72%). Companies tend to set policies independently in disclosing carbon emissions, so each company's disclosure level varies (Abdullah et al., 2020).

Even so, this empirical finding demonstrates that carbon emissions disclosure practice is an effective strategy the government has developed with companies as its subjects. Disclosure of carbon emissions has reflected environmental actions such as carbon practices (Al-Tuwaijri et al., 2004; Clarkson et al., 2008; Luo and Tang, 2014). Carbon emissions disclosure is positioned as authentic evidence regarding company decisions and actions that are easily accessible to outside parties (Barako and Brown, 2008).

Table 3. Descriptive Statistics Analysis Result

Variables	N	Minimum	Maximum	Mean	Std. Deviation
CED	120	0.06	0.72	0.31525	0.19285542
PROFIT	120	-0.17893	2.71137	0.1383349	0.32824232
MEDIA	120	3.58352	8.52119	6.2139767	1.22445297
ENV	120	3	5	3.425	0.65674
COM_IND	120	0.2	0.83333	0.3958548	0.11314644
AGE	120	9	115	44.43	17.585

Note(s): CED = carbon emissions disclosure level; PROFIT = profitability; MEDIA = media exposure; ENV = environmental performance; COM IND = the proportion of independent commissioners; AGE = firm age

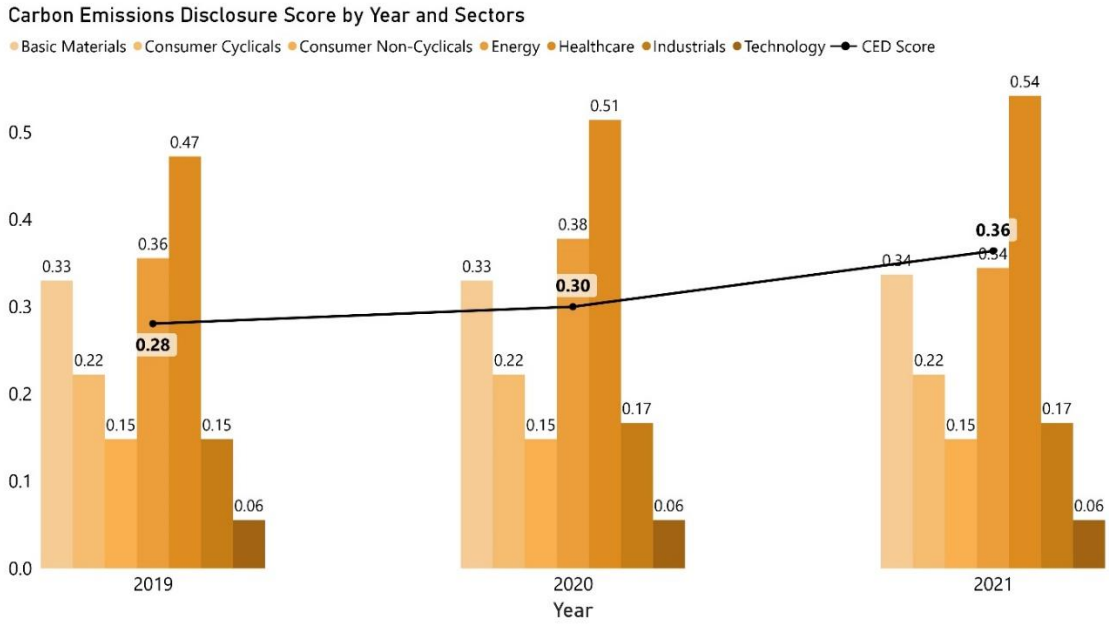

Figure 1. Trends in Disclosure of Carbon Emissions in 2019-2021 by Year and Sectors
Source: Processed data by authors, 2023

This study tested the regression model using the classical assumption test scheme. The results of this test show that the regression model has passed to the next analysis stage. The authors employed the One-Sample Kolmogorov-Smirnov Test to determine if the data was normally distributed. This test yielded a significant value of 0.067 > 0.05. The regression model is autocorrelation-free according to the Durbin-Watson score of 1.7809 < 2.069 < 2.2191 obtained from the autocorrelation test. The correlation matrix for the variables this study investigated is shown in Table 4. The results show that carbon emissions disclosure is negatively correlated with media exposure and company age. Conversely, carbon emissions disclosure is positively associated with environmental performance. All the coefficient correlations shown in Table 4 seem less than 0.8, indicating no serious multi-collinearity problem. Then, as evidenced by the regression model, it has a tolerance value greater than 0.10 days and a VIF value less than 10. The regression model has already been tested on some kind of heteroscedasticity test like the Park test, White test, and Glejser test. Still, those show a heterogeneity of the data between the samples. Following (Almutairi and Quttainah, 2017; Chamberlain et al., 2020; Mukhibad et al., 2023), this study used a weighted least square to analyze data without being influenced by heteroscedasticity.

The analysis's relevance may be seen by evaluating the correlation between the independent and dependent variables. Weighted least square regression analysis results are shown in Table 5. Table 5. presents multiple linear regression test results in this study. H1 is recognized as incompatible with the study hypothesis or rejected. H1's significance of over 0,05 proves it. Then, for the second hypothesis, the p-value or significance is 0,05, but the t-value shows a negative direction or in other words, its assumption is rejected.

Furthermore, the p-value of H3 seems to be under 0,05, and the influence is positive based on the t-value. Hence, the H3 is accepted. Next, the H4 does not have significant influence, as seen from the p-value over 0,05. Lastly, the fifth hypothesis has similarities with the second hypothesis, which is that it has influence, but in the opposite way. Regarding the result, the hypotheses testing shows only the environmental performance assumption has been accepted.

Endogeneity issues often influence the study of carbon emissions disclosure. The endogeneity bias is caused by variables that are not observed, variables that are left out, the dependent and independent variables co-occurring, and measurement errors in

the variables (Roberts, M. R. and Whited, 2013). This study used another possible regression model as a robust test, the pooled regression with robust standard error (Mukhibad et al., 2023). The results are presented in Table 4, which gives a comparative view of the main results. The p-value was statistically significant for media exposure, environmental performance, and company age. Moreover, the influence direction of the significant variables is the same as the main regression result. Those determined the robustness of our results.

5.2. Discussion

Our results prove that high and low profitability are not associated with the level of carbon emissions disclosure. This result is the opposite of the theoretical foundation, both sociopolitical theories and agency theory. Previously, sociopolitical theory purported that society and stakeholders expect transparent company information about how they generate profits (Chithambo and Tauringana, 2014). But, in the case of the carbon issue continuing to gain social attention (Shen and Wang, 2023; Wang et al., 2022), many parties, especially stakeholders, expect every company to disclose carbon emissions. Under this statement, companies with high and low-level profitability have no difference in the level of carbon emissions disclosure. Although empirical evidence has found that Indonesia's level of carbon emissions disclosure is still low, profitability is not one of the company's motives for increasing carbon emissions disclosure. From a different point of view, profitability can't strengthen companies' disclosure activity about carbon emissions because companies do not yet consider this issue important (Datt et al., 2022; Wahyuningrum, I. et al., 2022), especially Indonesia's non-financial companies. High-profitable companies are not immediately more concerned with high levels of carbon emissions disclosure, and the same is true for low-profitable companies (Aggarwal and Singh, 2019). This issue is also due to carbon emissions disclosure still being included in sustainability reporting, so financial resources insignificantly influence that. Some companies think disclosing the information is just an attempt at sweet word processing or a green washing strategy (Mateo-Márquez et al., 2022) without using significant funds. Those conditions signal the government to develop guidelines for carbon emissions disclosure following the lack of policy about this issue. Lastly, this result contradicts some prior studies that found that profitability affects the disclosure of carbon emissions (Darus et al., 2016; Hermawan et al., 2018; Wahyuningrum, Indah Fajarini Sri et al., 2023; Zaidi et al., 2021). However, it is supported by some recent studies (Larasati et al., 2020; Wahyuningrum, I. et al., 2022).

Table 4. Pearson Corelation Matrix

		1	2	3	4	5	6
1	CED	1					
2	PROFIT	0.059	1				
3	MEDIA	-.192*	-0.002	1			
4	ENV	.403**	.331**	-0.112	1		
5	COM_IND	0.007	0	-0.046	0.032	1	
6	AGE	-.215*	0.07	-0.004	-0.048	.376**	1

Note(s): Relationship is significant at * = p ≤ 0.05, ** = p ≤ 0.01, respectively. CED – total carbon emissions disclosure level; PROFIT is profitability (the ration of net profit to total assets); MEDIA is media exposure; ENV represents environmental performance by PROPER rank; COM IND represents the proportion of independent commissioners; AGE is firm age

Table 5. Multiple Regression Results

	Weighted Least Square				Pooled Least Square with Robust Standar Error			
	Coef.	Std. Error	t	p	Coef.	Robust Std. Err.	t	p
(Constant)	0.167	0.141	1.181	0.24	0.155	0.142	1.092	0.277
PROFIT	-0.04	0.166	-0.25	0.8	-0.112	0.187	-0.597	0.552
MEDIA	-0.02	0.013	-1.83	.070*	-0.024	0.015	-1.635	.100*
ENV	0.107	0.023	4.598	.000***	0.116	0.023	4.984	.000***
COM_IND	0.171	0.153	1.117	0.266	0.122	0.192	0.634	0.528
AGE	-0	0.001	-2.65	.009**	-0.003	0.001	-2.12	.036**

R-Squared: .279
Adjusted *R*-Squared: .245 (24.5%)
SE of regression: 1.19099
F-Statistic: 8.263
p (*F*-statistics): 0.000
Dependent variable: Carbon emission disclosure
Sample: 2019, 2021; periods included: 3; cross sections included 40
Total panel (minus outliers) observations: 113
Note(s): Relationship is significant at * = p ≤ 0.1, ** = p ≤ 0.05, *** = p ≤ 0.01, respectively. CED – total carbon emissions disclosure level; PROFIT is profitability (the ration of net profit to total assets); MEDIA is media exposure; ENV represents environmental performance by PROPER rank; COM IND represents the proportion of independent commissioners; AGE is firm age
Source: Output SPSS, 2023

Although financial conditions or profitability levels are not associated with carbon emissions disclosure, companies' characteristics, represented by age, influence carbon emissions disclosure. However, it is unfortunate that increasing a company's age reduces the disclosure of carbon emissions. Mature or old companies are less aware of carbon emissions than younger companies, so age negatively influences the disclosure of carbon emissions. In other words, this result is opposed to agency theory, which states that age impacts financial and non-financial information disclosure (Dolinšek and Lutar-Skerbinjek, 2018). This is because old companies are poor at adapting to current issues (Leyva-de la Hiz and Bolívar-Ramos, 2022). Age is a powerful construct in company characteristics (Hossain and Farooque, 2019). Old companies have basic guidelines and values that have lasted a long time (Koiranen, 2002; Reichheld and Teal, 1996). Hence, they are challenging to change compared to young companies that can innovate according to developing issues such as carbon emissions. Old companies believe their legitimacy value is still founded in society due to their product quality, society's behavior is not easy to change, and trust has been gained since their founding. The company's age affects how much environmental data, such as carbon emissions, is published but negatively (Chen et al., 2017; Leyva-de la Hiz and Bolívar-Ramos, 2022). Besides, prior studies found that start-ups or other younger companies are in full swing to gain social legitimacy (Pierrakis and Owen, 2023; Thorsen, 2021), one of them is through carbon emissions disclosure.

Consistent with the findings of (Aslam et al., 2021; Giannarakis et al., 2017; Jiang and Tang, 2023; Tsang et al., 2023), the study argues that good environmental performance will increase company promotion and investment in environmental issues such as carbon emissions. Good environmental performance affects companies' quality of carbon emission disclosure, so the current hypothesis is accepted. According to the legitimacy theory, the environmental awareness of companies is represented by their environmental performance (Phan and Baird, 2015; Zameer et al., 2021). Companies with excellent environmental performance will consciously make a splash by publishing their performance for all parties. This study shows that environmental performance affects carbon emission disclosure. The current study found that based on PROPER ratings, companies in Indonesia have at least three points or good environmental performance. Hence, when the PROPER rank increases, it follows with the improvement of carbon emissions disclosure. They are the two that go hand in hand. Besides, in Indonesia, the PROPER rank program has an assessment that includes carbon emissions reduction activities by companies, so the PROPER grade also represents companies' carbon performance (Forestry, 2021). Carbon disclosure can also enhance the company's value by signaling to investors and other stakeholders about the corporate environmental performance as they consider environmental factors when making investment decisions (Dhaliwal et al., 2011). This aligns with prior studies that found empirical evidence that companies with more environmental activity will improve their voluntary carbon disclosure (Jiang and Tang, 2023; Tsang et al., 2023).

Similar to the first hypothesis, the fourth hypothesis does not influence the disclosure of carbon emissions. The levels of disclosure of carbon emissions are not considerably impacted by the presence of an independent board of directors within the corporation, so H4 is rejected. This result does not align with some prior studies (Elsayih et al., 2021; Elsayih et al., 2018; Lim et al., 2007) (Liao et al., 2015). The current study collected new insight into this issue. Nowadays, even when the independent board is almost always present in the board structure (Elsayih et al., 2021; Oyewo, 2023), this research found the sample companies have at least three independent board members. It can be seen that no matter how much the independent board doesn't change carbon disclosure levels, if we match this condition with carbon emissions disclosure levels in the current study. In reality, independent boards can't influence companies' carbon emissions disclosure strategy. A company has a board structure with seats that are not only filled by independent members, so the influence of an independent board is considered not to have a bearing on making decisions regarding carbon emissions. This situation can also occur because separate boards tend to be more conservative on the issue of carbon emissions and even concerning disclosing information about it in the company's annual/sustainability reports (Nasih et al., 2019). This research shows that, regardless of the number of independent board members, it does not impact how much information about carbon emissions is disclosed when the level of environmental awareness of those independent members is low.

Finally, our result also found that prominent media visibility does not provide better disclosure of carbon emissions than companies with low media visibility. Media exposure reduces the level of disclosure of carbon emissions, so H5 is rejected. This result may be opposed and supported by legitimacy theory, which explains that the mass media can increase public pressure on companies (Brown and Deegan, 1998). If we look in detail at the results of the current study, public pressure is enhanced by mass media but in other ways. The media conveys information about companies and can shape public opinion (Rupley et al., 2012), so companies are insecure about negative responses from the public (Paananen et al., 2021). Companies with high media visibility fear disclosing negative news regarding their operations to the public (Garcia-Sanchez et al., 2014). The amount of carbon emissions emitted by the company due to its operational activities is considered a negative thing by

the company (Prado-Lorenzo et al., 2009). In other words, the company is actively destroying the environment. This assumption is still ongoing, resulting in companies not being sensitive to the fact that the critical point of corporate responsibility is to create accountable information disclosure about carbon emissions in the form of preventive, post-operative, and investment steps concerning carbon emissions. This research aligns with the results of (Purwanti et al., 2022).

6. CONCLUSION AND IMPLICATIONS

This study sought to explore research by bringing two objectives: finding the carbon emissions disclosure practices in Indonesia and investigating factors that influence carbon emissions disclosure. The current study uses a sample of 101 units of analysis between 2019 and 2021, mainly from Indonesia non-financial companies included in the PROPER ratings program. This study obtains data from sustainability reports, annual reports, and company websites. Furthermore, the current research acquires results from IBM SPSS version 25 statistical testing for descriptive statistics. The result of descriptive statistics and graphical interpretation shows that the trend of disclosing information on carbon emissions increased from 2019 to 2021 (24.7% to 32.1%). However, the level of disclosure of this information is still relatively low. This can be seen through the trend analysis results for each company, which tend to vary, indicating that awareness regarding the issue of carbon emissions is not evenly distributed among companies in Indonesia. Considering the findings of the hypothesis test, companies that are good stewards of the environment also disclose their carbon emissions to a high degree. Besides, company age and media exposure reduce the level of disclosure. Then, profitability and the existence of an independent board have no effect.

This study contributes to current literature in several ways. First, due to Indonesia as the background, this study gives insight into carbon emissions disclosure practices by companies. This research has practical implications regarding the disclosure of carbon emissions, which can be increased through the cooperation of various parties. The government can put pressure on companies through strict regulations about the environment and carbon emissions. Then, the government can focus on disseminating information to mature companies that have difficulty adapting to the issue of carbon emissions, as well as dismissing the notion that disclosing carbon emissions will reveal the harmful impact of company operations on the environment. Second, based on the study's results, environmental performance is essential in enhancing carbon emissions disclosure in Indonesia. So, policymakers can adapt the PROPER rating program to the growing carbon emissions disclosure issue. One of the study's limitations is the level of transparency of carbon emissions determined quantitatively. In the future, further research could explore the quality of disclosure of carbon emissions so that efforts to increase and improve the implementation of this disclosure can be structured. Future research could also test other proxies that are thought to affect carbon emissions.

ACKNOWLEDGEMENTS

The authors are deeply grateful for the detailed comment, constructive and illuminating suggestions from two anonymous reviewers on earlier versions of this paper. The authors also grateful to editor for all the support throughout the review process of this paper.

REFERENCES

Abbas, H. K., & Abdulhussein, M. A. A. (2022), "Effect of AgNps and different sources of Zinc on rooting and acclimation of strawberry (Fragaria ananassa Duch) cv. Rubygem in vitro", *Kufa Journal for Agricultural Sciences*, 14(2), 1-13.

Abdullah, M. W., Musriani, R., Syariati, A., & Hanafie, H. (2020), "Carbon emission disclosure in indonesian firms: The test of media-exposure moderating effects", *International Journal of Energy Economics and Policy*, 10(732-741.

Afsah, S., Dahlan, R., Laplante, B., Makarim, N., Ratunanda, D., Ridho, R., Afra, A. S., Sarjanto, A., Satiawan, M. A., & Wawointana, F. (2010), "What is PROPER: reputational incentives for pollution control in Indonesia", *Disclosure*,

Aggarwal, P., & Singh, A. K. (2019), "CSR and sustainability reporting practices in India: an in-depth content analysis of top-listed companies", *Social Responsibility Journal*, 15(8), 1033-1053.

Al-Tuwaijri, S. A., Christensen, T. E., & Hughes, K. E. (2004), "The relations among environmental disclosure, environmental performance, and economic performance: a simultaneous equations approach", *Accounting, Organizations and Society*, 29(5), 447-471.

Alfani, G. A., & Diyanty, V. (2020), "Determinants of carbon emission disclosure", *J. Econ. Business, Account. Ventur*, 22(3), 333-346.

Almutairi, A. R., & Quttainah, M. A. (2017), "Corporate governance: evidence from Islamic banks", *Social Responsibility Journal*, 13(3), 601-624.

Aragón-Correa, J. A., Marcus, A., & Hurtado-Torres, N. (2016), "The natural environmental strategies of international firms: Old controversies and new evidence on performance and disclosure", *Academy of Management Perspectives*, 30(1), 24-39.

Arslan, H. M., Chengang, Y., Bilal, Siddique, M., & Yahya, Y. (2022), "Influence of senior executives characteristics on corporate environmental disclosures: a bibliometric analysis", *Journal of Risk and Financial Management*, 15(3), 136.

Asif, M., Searcy, C., Zutshi, A., & Fisscher, O. A. M. (2013), "An integrated management systems approach to corporate social responsibility", *Journal of Cleaner Production*, 56(7-17.

Aslam, S., Elmagrhi, M. H., Rehman, R. U., & Ntim, C. G. (2021), "Environmental management practices and financial performance using data envelopment analysis in Japan: The mediating role of

environmental performance", *Business Strategy and the Environment*, 30(4), 1655-1673.

Ayostina, I., Napitupulu, L., Robyn, B., Maharani, C., & Murdiyarso, D. (2022), "Network analysis of blue carbon governance process in Indonesia", *Marine Policy*, 137(104955.

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

Bank, T. W. (2018). Trends in Solid Waste Management. Retrieved from https://datatopics.worldbank.org/what-a-waste/trends_in_solid_waste_management.html

Barako, D. G., & Brown, A. M. (2008), "Corporate social reporting and board representation: evidence from the Kenyan banking sector", *Journal of Management & Governance*, 12(4), 309-324.

Ben-Amar, W., Chang, M., & McIlkenny, P. (2017), "Board gender diversity and corporate response to sustainability initiatives: Evidence from the carbon disclosure project", *Journal of business ethics*, 142(369-383.

Berthelot, S., & Robert, A.-M. (2011), "Climate change disclosures: An examination of Canadian oil and gas firms", *Issues in Social and Environmental Accounting*, 5(1/2), 106-123.

Bilal, Tan, D., Komal, B., Ezeani, E., Usman, M., & Salem, R. (2022), "Carbon emission disclosures and financial reporting quality: Does ownership structure and economic development matter?", *Environmental Science & Policy*, 137(109-119.

Blanco, C., Caro, F., & Corbett, C. J. (2017), "An inside perspective on carbon disclosure", *Business Horizons*, 60(5), 635-646.

Braam, G. J., De Weerd, L. U., Hauck, M., & Huijbregts, M. A. (2016), "Determinants of corporate environmental reporting: The importance of environmental performance and assurance", *Journal of cleaner production*, 129(724-734.

Brown, N., & Deegan, C. (1998), "The public disclosure of environmental performance information - A dual test of media agenda setting theory and legitimacy theory", *Accounting and Business Research*, 29(21-41.

Chamberlain, T., Hidayat, S., & Khokhar, A. R. (2020), "Credit risk in Islamic banking: evidence from the GCC", *Journal of Islamic Accounting and Business Research*, 11(5), 1055-1081.

Chariri, A., & Ghazali, I. (2007). Teori Akuntansi, Badan Penerbit UNDIP: Semarang.

Chen, H., Zeng, S., Lin, H., & Ma, H. (2017), "Munificence, Dynamism, and Complexity: How Industry Context Drives Corporate Sustainability", *Business Strategy and the Environment*, 26(2), 125-141.

Chithambo, L. (2013), "Firm Characteristics and The Voluntary Disclosure of Climate Change and Greenhouse Gas Emission Information", *International Journal of Energy and Statistics*, 01(03), 155-169.

Chithambo, L., & Tauringana, V. (2014), "Company specific determinants of greenhouse gases disclosures", *Journal of Applied Accounting Research*, 15(3), 323-338.

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

Cohen, S., Kadach, I., & Ormazabal, G. (2023), "Institutional investors, climate disclosure, and carbon emissions", *Journal of Accounting and Economics*, 101640.

Connelly, B. L., Ketchen, D. J., & Slater, S. F. (2011), "Toward a "theoretical toolbox" for sustainability research in marketing", *Journal of the Academy of Marketing Science*, 39(1), 86-100.

Cotter, J., Lokman, N., & Najah, M. M. (2011), "Voluntary disclosure research: which theory is relevant?", *Journal of Theoretical Accounting Research*,

Cuevas-Rodríguez, G., Gomez-Mejia, L. R., & Wiseman, R. M. (2012), "Has Agency Theory Run its Course?: Making the Theory more Flexible to Inform the Management of Reward Systems", *Corporate Governance: An International Review*, 20(6), 526-546.

Darus, F., Mohd Zuki, H. I., & Yusoff, H. (2020), "The path to sustainability : Understanding organisations' environmental initiatives and climate change in an emerging economy", *European Journal of Management and Business Economics*, 29(84-96.

Darus, F., Yusoff, H., Mohamed, N., & Nejati, M. (2016), "Do governance structure and financial performance matter in CSR reporting", *Int. J. Econ. Manag*, 10(267-284.

Datt, R., Prasad, P., Vitale, C., & Prasad, K. (2022), "International evidence of changing assurance practices for carbon emissions disclosures", *Meditari Accountancy Research*, 30(6), 1594-1628.

Deegan, C. (2002). The Legitimizing Effect of Social and Environmental Disclosures, Theoretical Foundation Accounting, Auditing and Accountability Journal, Vol. 15.

Desai, R. (2022), "Determinants of corporate carbon disclosure: A step towards sustainability reporting", *Borsa Istanbul Review*, 22(5), 886-896.

Dhaliwal, D. S., Li, O. Z., Tsang, A., & Yang, Y. G. (2011), "Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting", *The accounting review*, 86(1), 59-100.

Dolinšek, T., & Lutar-Skerbinjek, A. (2018), "Voluntary disclosure of financial information on the internet by large companies in Slovenia", *Kybernetes*, 47(3), 458-473.

Dusyk, N., Axsen, J., & Dullemond, K. (2018), "Who cares about climate change? The mass media and socio-political acceptance of Canada's oil sands and Northern Gateway Pipeline", *Energy Research & Social Science*, 37(12-21.

Economic, U. N. D. o., & Affairs, S. (2022), *The Sustainable Development Goals: Report 2022*, UN,

Elsayih, J., Datt, R., & Tang, Q. (2021), "Corporate governance and carbon emissions performance: empirical evidence from Australia", *Australasian Journal of Environmental Management*, 28(4), 433-459.

Elsayih, J., Tang, Q., & Lan, Y.-C. (2018), "Corporate governance and carbon transparency: Australian experience", *Accounting Research Journal*, 31(3), 405-422.

Forestry, M. o. E. a. (2021). *Peraturan Menteri Lingkungan Hidup dan Kehutanan Republik Indonesia Nomor 1 Tahun 2021 tentang Program Penilaian Peringkat Kinerja Perusahaan dalam Pengelolaan*

Lingkungan Hidup. (1). Indonesia: Ministry of Environment and Forestry Retrieved from https://ditppu.menlhk.go.id/portal/uploads/laporan/1616488753_PERMENLHK%20NO%2001%20TH%202021%20ttg%20PROPER.pdf.

Forestry, M. o. E. a. (2023). Ministry of Environment (KLHK) data for 2021. Retrieved from https://www.youtube.com/watch?v=rY2jFHLJrtY

Galbreath, J. (2011), "To What Extent is Business Responding to Climate Change? Evidence from a Global Wine Producer", *Journal of Business Ethics*, 104(3), 421-432.

Garcia-Sanchez, I.-M., Cuadrado-Ballesteros, B., & Sepulveda, C. (2014), "Does media pressure moderate CSR disclosures by external directors?", *Management Decision*, 52(6), 1014-1045.

García, J. H., Sterner, T., & Afsah, S. (2007), "Public disclosure of industrial pollution: the PROPER approach for Indonesia?", *Environment and Development Economics*, 12(6), 739-756.

Giannarakis, G., Konteos, G., Sariannidis, N., & Chaitidis, G. (2017), "The relation between voluntary carbon disclosure and environmental performance", *International Journal of Law and Management*, 59(784-803.

Gibson, K. (2000), "The moral basis of stakeholder theory", *Journal of business ethics*, 245-257.

Gould, A. M., Joullié, J. E., & Gould, K. (2023), "First things first: Unselfconscious corporate virtuosity and corporate performance", *Business Strategy and the Environment*,

Guidry, R. P., & Patten, D. M. (2012), "Voluntary disclosure theory and financial control variables: An assessment of recent environmental disclosure research", *Accounting Forum*, 36(2), 81-90.

Hahn, R., Reimsbach, D., & Schiemann, F. (2015), "Organizations, Climate Change, and Transparency:Reviewing the Literature on Carbon Disclosure", *Organization & Environment*, 28(1), 80-102.

Haniffa, R. M., & Cooke, T. E. (2005), "The impact of culture and governance on corporate social reporting", *Journal of Accounting and Public Policy*, 24(5), 391-430.

Hermawan, A., Aisyah, I. S., Gunardi, A., & Putri, W. Y. (2018), "Going green: Determinants of carbon emission disclosure in manufacturing companies in Indonesia", *International Journal of Energy Economics and Policy*, 8(1), 55.

Hoffmann, C., & Fieseler, C. (2012), "Investor relations beyond financials", *Corporate Communications: An International Journal*, 17(2), 138-155.

Hossain, M., & Farooque, O. (2019), "The emission trading system, risk management committee and voluntary corporate response to climate change – a CDP study", *International Journal of Accounting & Information Management*, 27(2), 262-283.

Hossain, M., & Reaz, M. (2007), "The determinants and characteristics of voluntary disclosure by Indian banking companies", *Corporate Social Responsibility and Environmental Management*, 14(5), 274-288.

Houqe, M. N., & Khan, H. Z. (2023), "What determines the quality of carbon reporting? A system-oriented theories and corporate governance perspective", *Business Strategy and the Environment*, 32(6), 3197-3216.

Hussain, N., Rigoni, U., & Orij, R. P. (2018), "Corporate Governance and Sustainability Performance: Analysis of Triple Bottom Line Performance", *Journal of Business Ethics*, 149(2), 411-432.

Jaggi, B., Allini, A., Macchioni, R., & Zagaria, C. (2018), "The factors motivating voluntary disclosure of carbon information: Evidence based on Italian listed companies", *Organization & Environment*, 31(2), 178-202.

Jensen, M., & Meckling, W. (2012), "Theory of the firm: Managerial behavior, agency costs, and ownership structure", *The Economic Nature of the Firm: A Reader, Third Edition*, 283-303.

Jiang, Y., & Tang, Q. (2023), "Mandatory carbon reporting, voluntary carbon disclosure and ESG performance", *Pacific Accounting Review*, 35(4), 534-561.

Jung, J., Herbohn, K., & Clarkson, P. (2018), "Carbon Risk, Carbon Risk Awareness and the Cost of Debt Financing", *Journal of Business Ethics*, 150(4), 1151-1171.

Kaplan, R. S., & Ramanna, K. (2021), "How to fix ESG reporting", *Harvard Business School Accounting & Management Unit Working Paper*, 22-005),

Khan, M. K., Zahid, R. M. A., Saleem, A., & Sági, J. (2021), "Board Composition and Social & Environmental Accountability: A Dynamic Model Analysis of Chinese Firms", *Sustainability*, 13(19), 10662.

Kılıç, M., & Kuzey, C. (2019), "Determinants of climate change disclosures in the Turkish banking industry", *International Journal of Bank Marketing*, 37(3), 901-926.

Koiranen, M. (2002), "Over 100 Years of Age But Still Entrepreneurially Active in Business: Exploring the Values and Family Characteristics of Old Finnish Family Firms", *Family Business Review*, 15(3), 175-187.

Kuo, L., & Yi-Ju Chen, V. (2013), "Is environmental disclosure an effective strategy on establishment of environmental legitimacy for organization?", *Management Decision*, 51(7), 1462-1487.

Larasati, R., Seralurin, Y. C., & Sesa, P. V. S. (2020), "Effect of profitability on carbon emission disclosure", *The International Journal of Social Sciences World (TIJOSSW)*, 2(2), 182-195.

Lee, S.-Y., Park, Y.-S., & Klassen, R. D. (2015), "Market Responses to Firms' Voluntary Climate Change Information Disclosure and Carbon Communication", *Corporate Social Responsibility and Environmental Management*, 22(1), 1-12.

Leyva-de la Hiz, D. I., & Bolívar-Ramos, M. T. (2022), "The inverted U relationship between green innovative activities and firms' market-based performance: The impact of firm age", *Technovation*, 110(1-10.

Li, D., Huang, M., Ren, S., Chen, X., & Ning, L. (2018), "Environmental Legitimacy, Green Innovation, and Corporate Carbon Disclosure: Evidence from CDP China 100", *Journal of Business Ethics*, 150(4), 1089-1104.

Liao, L., Luo, L., & Tang, Q. (2015), "Gender diversity, board independence, environmental committee and greenhouse gas disclosure", *The British Accounting Review*, 47(4), 409-424.

Lim, S., Matolcsy, Z., & Chow, D. (2007), "The Association between Board Composition and Different Types

of Voluntary Disclosure", *European Accounting Review*, 16(3), 555-583.

Liu, Q., & Komal, B. (2022), "A Corpus-Based Comparison of the Chief Executive Officer Statements in Annual Reports and Corporate Social Responsibility Reports", *Frontiers in Psychology*, 13(

Liu, X., & Anbumozhi, V. (2009), "Determinant factors of corporate environmental information disclosure: an empirical study of Chinese listed companies", *Journal of cleaner production*, 17(593-600.

Luo, L., & Tang, Q. (2014), "Does voluntary carbon disclosure reflect underlying carbon performance?", *Journal of Contemporary Accounting & Economics*, 10(3), 191-205.

Luo, L., Tang, Q., & Lan, Y. C. (2013), "Comparison of propensity for carbon disclosure between developing and developed countries", *Accounting Research Journal*, 26(1), 6-34.

Maharani, A., Agustia, D., & Qomariyah, A. (2023), "The mediating role of green investment in political connection and carbon information disclosure: Empirical evidence in emerging stock market", *Cogent Business & Management*, 10(3), 2264004.

Mahmoudian, F., Yu, D., Lu, J., Nazari, J. A., & Herremans, I. M. (2023), "Does cost of debt reflect the value of quality greenhouse gas emissions reduction efforts and disclosure?", *Journal of International Accounting, Auditing and Taxation*, 52(100563.

Mangku, D. G. S. "Implementation and Consequences for the Indonesian Nation After the Ratification of the Kyoto Protocol", (Ed.), *ICLSSE 2021: Proceedings of the 3rd International Conference on Law, Social Sciences, and Education, ICLSSE* 178.

Martínez-Ferrero, J., Garcia-Sanchez, I. M., & Cuadrado-Ballesteros, B. (2015), "Effect of Financial Reporting Quality on Sustainability Information Disclosure", *Corporate Social Responsibility and Environmental Management*, 22(45-64.

Mateo-Márquez, A. J., González-González, J. M., & Zamora-Ramírez, C. (2022), "An international empirical study of greenwashing and voluntary carbon disclosure", *Journal of Cleaner Production*, 363(132567.

Matsumura, E. M., Prakash, R., & Vera-Muñoz, S. C. (2014), "Firm-Value Effects of Carbon Emissions and Carbon Disclosures", *The Accounting Review*, 89(2), 695-724.

Moorhead, J., & Nixon, T. (2016), "Global 500 Greenhouse Gases Performance 2010-2015", *Thomson Reuters*,

Mori, N., Golesorkhi, S., Randoy, T., & Hermes, C. (2015), "Board composition and outreach performance of microfinance institutions: Evidence from East Africa", *Strategic Change*, 24(1), 99-113.

Mukhibad, H., Nurkhin, A., Anisykurlillah, I., Fachrurrozie, F., & Jayanto, P. Y. (2023), "Open innovation in shariah compliance in Islamic banks – Does shariah supervisory board attributes matter?", *Journal of Open Innovation: Technology, Market, and Complexity*, 9(1), 100014.

Nagendrakumar, N., Alwis, K. N. N., Eshani, U. A. K., & Kaushalya, S. B. U. (2022), "The Impact of Sustainability Practices on the Going Concern of the Travel and Tourism Industry: Evidence from Developed and Developing Countries", *Sustainability*, 14(24), 17046.

Nasih, M., Harymawan, I., Paramitasari, Y. I., & Handayani, A. (2019), "Carbon Emissions, Firm Size, and Corporate Governance Structure: Evidence from the Mining and Agricultural Industries in Indonesia", *Sustainability*, 11(9), 2483.

O'Donovan, G. (2002), "Environmental disclosures in the annual report", *Accounting, Auditing & Accountability Journal*, 15(344-371.

Oyewo, B. (2023), "Corporate governance and carbon emissions performance: International evidence on curvilinear relationships", *Journal of Environmental Management*, 334(117474.

Paananen, M., Runesson, E., & Samani, N. (2021), "Time to clean up environmental liabilities reporting: disclosures, media exposure and market implications", *Accounting Forum*, 45(1), 85-116.

Phan, T. N., & Baird, K. (2015), "The comprehensiveness of environmental management systems: The influence of institutional pressures and the impact on environmental performance", *Journal of environmental management*, 160(45-56.

Pierrakis, Y., & Owen, R. (2023), "Startup ventures and equity finance: How do Business Accelerators and Business Angels' assess the human capital of socio-environmental mission led entrepreneurs?", *Innovation*, 25(4), 371-395.

Prado-Lorenzo, J. M., Rodríguez-Domínguez, L., Gallego-Álvarez, I., & García-Sánchez, I. M. (2009), "Factors influencing the disclosure of greenhouse gas emissions in companies world-wide", *Management Decision*, 47(7), 1133-1157.

Purwanti, A., Harnovinsah, H., & Nugroho, L. (2022), "Media of Carbon Emissions Disclosure and Return on Asset Operations in State-owned Enterprises Public Company", *International Journal of Energy Economics and Policy*, 12(418-424.

Qian, W., & Schaltegger, S. (2017), "Revisiting carbon disclosure and performance: Legitimacy and management views", *The British Accounting Review*, 49(4), 365-379.

Ratmono, D. (2021), "Effect of carbon performance, company characteristics and environmental performance on carbon emission disclosure: Evidence from Indonesia", *International Journal of Energy Economics and Policy*,

Reichheld, F. F., & Teal, T. (1996), "The loyalty effect: The hidden force behind growth, profits and lasting", *Harvard Business School Publications, Boston*,

Ren, X., Li, Y., Shahbaz, M., Dong, K., & Lu, Z. (2022), "Climate risk and corporate environmental performance: Empirical evidence from China", *Sustainable Production and Consumption*, 30(467-477.

Rob, G., Reza, K., & Simon, L. (1995), "Constructing a research database of social and environmentalreporting by UK companies", *Accounting, Auditing & Accountability Journal*, 8(2), 78-101.

Roberts, M. R., & Whited, T. M. (2013). Endogeneity in empirical corporate finance1 *Handbook of the Economics of Finance* (Vol. 2, pp. 493-572): Elsevier.

Roberts, R. W. (1992), "Determinants of corporate social responsibility disclosure: An application of stakeholder theory", *Accounting, Organizations and Society*, 17(595-612.

Rupley, K. H., Brown, D., & Marshall, R. S. (2012), "Governance, Media and the Quality of Environmental Disclosure", *Journal of Accounting and Public Policy*, 31(610-640.

Safiullah, M., Alam, M. S., & Islam, M. S. (2022), "Do all institutional investors care about corporate carbon emissions?", *Energy Economics*, 115(106376.

Scholtens, B., & Kleinsmann, R. (2011), "Incentives for subcontractors to adopt CO2 emission reporting and reduction techniques", *Energy Policy*, 39(3), 1877-1883.

Shao, J., & He, Z. (2022), "How does social media drive corporate carbon disclosure? Evidence from China", *Frontiers in Ecology and Evolution*, 10(1-16.

Shen, C., & Wang, Y. (2023), "How does public concern about climate change affect carbon emissions? Evidence from large-scale online content and provincial-level data in China", *Journal of Cleaner Production*, 426(139137.

Solikhah, B., Wahyuningrum, I. F. S., Yulianto, A., Sarwono, E., & Widiatami, A. K. "Carbon emission report: a review based on environmental performance, company age and corporate governance", (Ed.), *International Conference on Environment, Sustainability Issues, and Community Development Semarang, Indonesia 21 Oktober 2020,* IOP Publishing, 12-42.

Sriningsih, S., & Wahyuningrum, I. F. S. (2022), "Pengaruh Comprehensive Stakeholder Pressure dan Good Corporate Governance terhadap Kualitas Sustainability Report", *Owner: Riset dan Jurnal Akuntansi*, 6(813-827.

Tang, Q., & Luo, L. (2016), "Corporate ecological transparency: theories and empirical evidence", *Asian Review of Accounting*, 24(4), 498-524.

Thorsen, T. A. (2021). *Valuing growth: How to value young growth companies and start-ups.* University of South-Eastern Norway.

Tillotson, P., Slade, R., Staffell, I., & Halttunen, K. (2023), "Deactivating climate activism? The seven strategies oil and gas majors use to counter rising shareholder action", *Energy Research & Social Science*, 103(103190.

Trianaputri, A. R., & Djakman, C. D. (2019), "Quality of Sustainability Disclosure Among the Asean-5 Countries and the Role of Stakeholders", *Jurnal Akuntansi dan Keuangan Indonesia*, 16(180-205.

Tsang, A., Frost, T., & Cao, H. (2023), "Environmental, Social, and Governance (ESG) disclosure: A literature review", *The British Accounting Review*, 55(1), 101149.

Turzo, T., Marzi, G., Favino, C., & Terzani, S. (2022), "Non-financial reporting research and practice: Lessons from the last decade", *Journal of Cleaner Production*, 345(131154.

van Soest, H. L., den Elzen, M. G. J., & van Vuuren, D. P. (2021), "Net-zero emission targets for major emitting countries consistent with the Paris Agreement", *Nature Communications*, 12(1), 2140.

Vismara, S., Paleari, S., & Ritter, J. R. (2012), "Europe's Second Markets for Small Companies", *European Financial Management*, 18(3), 352-388.

Wahyuningrum, I., Oktavilia, S., Setyadharma, A., Hidayah, R., & Lina, M. "Does carbon emissions disclosure affect Indonesian companies?", (Ed.), *IOP Conference Series: Earth and Environmental Science Semarang* IOP Publishing, Semarang, 12-60.

Wahyuningrum, I. F. S., Hidayah, R., Oktavilia, S., Setyadharma, A., & Khafid, M. (2023), "Carbon emissions disclosure and its determinants", *AIP Conference Proceedings*, 2683(1),

Wahyuningrum, I. F. S., Oktavilia, S., Setyadharma, A., Hidayah, R., & Lina, M. (2022), "Does carbon emissions disclosure affect Indonesian companies?", *IOP Conference Series: Earth and Environmental Science*, 1108(

Wang, X., Huang, J., & Liu, H. (2022), "Can China's carbon trading policy help achieve Carbon Neutrality? — A study of policy effects from the Five-sphere Integrated Plan perspective", *Journal of Environmental Management*, 305(114357.

Wicaksono, A. P., Setiawan, D., Anni Aryani, Y., & Hartoko, S. (2024), "The effect of ownership structure on water disclosure in Indonesian companies", *Journal of Open Innovation: Technology, Market, and Complexity*, 10(1), 100185.

William Q. Judge, J., & Zeithaml, C. P. (1992), "Institutional and Strategic Choice Perspectives on Board Involvement in the Strategic Decision Process", *Academy of Management Journal*, 35(4), 766-794.

Zaidi, S. A. H., Hussain, M., & Uz Zaman, Q. (2021), "Dynamic linkages between financial inclusion and carbon emissions: Evidence from selected OECD countries", *Resources, Environment and Sustainability*, 4(100022.

Zameer, H., Wang, Y., & Saeed, M. R. (2021), "Net-zero emission targets and the role of managerial environmental awareness, customer pressure, and regulatory control toward environmental performance", *Business Strategy and the Environment*, 30(8), 4223-4236.