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The Effect of Carbon Emission Disclosure and Green Innovation To Firm Value: Role of Institutional Ownership

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ABSTRACT

This study examines the empirical effect of carbon emission disclosure and green innovation on firm value, while examining the moderating role of institutional ownership. Utilizing a quantitative approach, secondary data were obtained from annual and sustainability reports of 172 heavy pollution industry companies listed on the Indonesian Stock Exchange (IDX) during the period 2021–2024, yielding a balance panel of 688 observations analyzed using the random effects model. The empirical results reveal that carbon emission disclosure has significant positive effect on firm value which shows that transparency of carbon emission serves as a credible signal to secure market legitimacy and mitigate information asymmetry. Conversely, green innovation insignificantly affects firm value which shows that developing capital market including Indonesia view eco-friendly research and technology investment as short-term operational cash drains rather than long-term valuable assets. Furthermore, institutional ownership significantly weakens the carbon emission disclosure's positive impact to firm value due to transient investors' anxieties regarding carbon taxes and regulatory compliance costs, while failing to moderate green innovation's positive effect to firm value due to a passive monitoring posture regarding eco-friendly investments. This research contributes to the literature on sustainability accounting by integrating signal and stakeholder theories within emerging markets. Practically, it provides management with strategic insights to balance environmental compliance and cost efficiency, while advising institutional investors to adopt long-term Environmental, Social and Governance (ESG) integration.

Keywords: Carbon Emission Disclosure, Green Innovation, Firm Value, Institutional Ownership, Heavy Pollution Industry

INTRODUCTION

Global warming and worsening climate change have shifted from being mere environmental issues to critical challenges affecting economic stability and corporate operations worldwide. This global warming and climate change are driven by massive

industrialization activities that emit substantial greenhouse gases and generate environmental pollution (Agustia et al., 2019). Currently in Indonesia, the economic transition toward an advanced industrial nation has triggered significant growth in the industrial sector, which has the potential to cause massive damage to the environment surrounding its operational activities. According to data from the Indonesian Central Bureau of Statistics (BPS), high-polluting industrial sectors which include energy, basic materials, industrials, consumer cyclicals (non-primaries), consumer non-cyclicals (primaries), and healthcare have the most direct environmental impact and were the largest contributors to carbon emissions compared to other sectors during the 2019–2022 period (Sura & Hasibuan, 2025).

Furthermore, high-polluting industrial sector companies in Indonesia are frequently involved in cases of environmental destruction without taking responsibility. One of the most phenomenal cases of environmental damage in Indonesia were the illegal mining exploitation in Bangka Belitung by PT Timah Tbk during the 2015–2022 period. The company conducted unauthorized mining with a total excavation area reaching 170 million hectares across both forest and non-forest areas, resulting in estimated losses of IDR 271 trillion (nasional.kompas.com).

In recent years, which can also be referred to as the post-COVID-19 pandemic era, there has been a transition in the perception of corporate value from traditional financial performance metrics to broader metrics that incorporate sustainability aspects and long-term impacts, driven by a rising awareness of the deteriorating effects of climate change. In Indonesia, as a developing country, this transition has become increasingly evident through the growing demand from investors, regulators, and consumers for corporate responsibility and commitment to sustainability (Fu & Li, 2023; Gao & Geng, 2024).

In Indonesia, regulatory awareness regarding sustainable development for corporations is manifested through Regulation No. 51/POJK.03/2017, enforced by the Financial Services Authority (OJK) since December 11, 2020, concerning the implementation of Sustainable Finance for Financial Services Institutions, Issuers, and Public Companies. This regulation mandates public companies or issuers to disclose their sustainability strategies along with social and environmental responsibility information by publishing Sustainability Reports to ensure transparency in corporate environmental performance.

Consequently, carbon emission disclosure in sustainability reports serves as a communication tool and a means to build corporate trust and credibility, which ultimately contributes to enhancing firm value (Rahmanita, 2020). This notion is also supported by studies conducted by Alfayerds & Setiawan (2021), Bahriansyah & Ginting (2022), Hardiyansah et al. (2021), Rusmana & Purnaman (2020), and Trimuliani & Febrianto (2023). However, contradictory findings exist, such as the study by Alsaifi et al. (2020), which demonstrates that investor view carbon emission disclosures negatively because they are perceived to incur high costs without generating profit, leading to doubts regarding cost efficiency in addressing global warming. Studies by Luthfi & Firmansyah (2025), Shafira

(2024), Saka & Oshika (2014), and Rachmadhika & Firmansyah (2025) also state that carbon emission disclosure has a negative impact on firm value.

Other information disclosed in the sustainability report is the implementation of green innovation, which serves as evidence of the company's commitment to sustainability and attracts investor attention specifically through adopting green innovation strategies in corporate operations (Budi & Sundiman, 2021). Implementing green innovation can reduce negative environmental impacts, create competitive advantages for the company, and potentially convert production waste into products that generate additional profits, which ultimately enhances firm value (Damas et al., 2021). This is also in line with research conducted by Agustia et al. (2019), Wilutama & Viverita (2024), and Dianti & Puspitasari (2024).

On the other hand, research by Xie et al. (2022) indicates that green innovation has a negative effect on firm value. Adopting green innovation requires a significant allocation of funds for investing in green innovation technology and research costs. This can potentially lower corporate profitability and shareholder returns, thereby reducing firm value. Moreover, in developing countries, the majority of investors do not view environmental responsibility as mandatory and focus solely on financial prospects or financial returns (Yasya & Muchlis, 2024). This finding is also consistent with research by Yuliandhari et al. (2023) and Sigalingging et al. (2025).

The inconsistency of the capital market in responding to green or sustainability signals indicates the presence of other factors within the corporate governance structure that influence how these signals are interpreted. One critical monitoring mechanism in corporate governance is institutional ownership. Institutional investors generally possess superior access to information, analytical capabilities, and expertise in evaluating non-financial corporate performance, rendering their monitoring function highly effective. A high level of institutional ownership structure should reinforce the transmission of green signals because they can compel management to be transparent while ensuring that fund allocations for green innovation are executed efficiently to create sustainable long-term value (Bushee, 1998; Shleifer & Vishny, 1986).

In companies within developing countries like Indonesia, institutional ownership can play a highly significant role in moderating the effects of carbon emission disclosure and green innovation on firm value due to weak environmental law enforcement and relatively fragile corporate governance mechanisms. Institutional investors can act as a substitute for formal corporate governance structures by disciplining and monitoring management, as well as ensuring transparency in sustainability disclosures and the credibility of green innovation strategies (Fernando et al., 2019). Therefore, institutional ownership is included as a moderating variable in this study to provide a more comprehensive perspective on these reciprocal relationships.

The rising demand for oversight on environmental responsibility, combined with the empirical gaps in prior findings regarding the interaction between corporate governance mechanisms and environmental policies, serves as the primary motivation for conducting this research. This study focuses exclusively on high-polluting industrial sector companies listed on the Indonesia Stock Exchange (IDX), which include the energy, basic materials, industrials, consumer cyclicals (non-primaries), consumer non-cyclicals (primaries), and healthcare sectors for the 2021–2024 period. In Indonesia, very few prior studies have examined the role of institutional ownership in moderating the joint effects of carbon emission disclosure and green innovation on firm value simultaneously, particularly in publicly listed companies within high-polluting industrial sectors. Through the theoretical integration of stakeholder theory and signaling theory, this study is expected to provide new empirical insights into how the transparency of carbon emission disclosures and the implementation of green innovation are converted into tangible economic value in the Indonesian financial market, as well as how the effectiveness of institutional investor monitoring moderates this contractual relationship.

This study is expected to provide theoretical contributions by expanding the literature on environmental accounting and finance, particularly concerning the determinants of firm value within high-polluting industrial sectors in Indonesia. This research can also serve as a strategic consideration for corporate management, especially in high-polluting industrial sectors, demonstrating that investments in eco-friendly innovations and carbon emission transparency are not merely cash-draining expenses, but rather long-term investment strategies capable of enhancing corporate value and reputation. Furthermore, this study aims to provide information and raise awareness among public company investors regarding corporate accountability toward sustainable development and to minimize investment decision risks by considering the sustainable development steps taken by companies, thereby shifting their investment orientation toward responsible investing that fully incorporates Environmental, Social, and Governance (ESG) criteria.

Within stakeholder theory, Freeman (1984) state that the primary objective of an entity is to secure maximum support from all parties interested in its activities. Gray et al. (1996) suggest that when an entity actively discloses detailed carbon emission information in its sustainability reporting, it will more easily gain the trust and support of both the public and investors. Disclosing details regarding the entity's carbon emissions serves as a form of communication to demonstrate care and commitment to sharing responsibility for worrying environmental issues. This alignment corresponds with the view of Deegan (2002), who posits that environmental information disclosure is a strategic effort by an entity to maintain social legitimacy and meet stakeholder expectations. Consequently, the greater the entity's efforts to satisfy stakeholder expectations by disclose detailed carbon emission information, the higher its reputation and its value.

According to Connelly et al. (2011), an effective signal is information that is credible, relevant, and verifiable, which reflects the quality and prospects of the company. One form of signaling that has become increasingly critical in the modern context is the disclosure of sustainability practices, including carbon emission disclosure. When a company voluntarily discloses information related to its carbon emission reduction efforts, such an action becomes a positive signal demonstrating the company's commitment to long-term sustainability and efficiency (Clarkson et al., 2008). Investors tend to respond to this signal by increasing their trust and investment interest, which ultimately enhances firm value. Research conducted by Rahmanita (2020) discovered that carbon emission disclosure is empirically proven to exert a positive impact on firm value. This finding is also consistent with prior studies conducted by Alfayerds & Setiawan (2021), Bahriansyah & Ginting (2022), Hardiyansah et al. (2021), Rusmana & Purnaman (2020) and Trimuliani & Febrianto (2023).

H1: Carbon emission disclosure has a positive effect on firm value

Based on stakeholder theory by Freeman (1984), companies are deemed responsible for meeting the expectations of various stakeholder groups. Green innovation activities can be regarded as a strategic response to stakeholder demands that emphasize the importance of sustainability and eco-friendly business practices. Companies that implement green innovation demonstrate commitment and accountability toward environmental and social issues, thereby securing social legitimacy from stakeholders (Hart & Dowell, 2011). With enhanced legitimacy and support, companies can strengthen their market positioning, mitigate reputational risks, and attract sustainability-oriented investors, which ultimately contributes to an increase in firm value.

Based on signal theory by Spence (1973), a company's actions in implementing green innovation can be interpreted as a positive signal to the market regarding management quality and sustainability prospects. Under conditions of asymmetric information, investors and external stakeholders often face difficulties in directly assessing a company's internal performance. Therefore, concrete actions such as investing in green innovation, adopting eco-friendly technologies, and publishing environmental achievements in sustainability reports serve as signals that the company possesses a long-term orientation and is committed to environmental preservation (Clarkson et al., 2011). This positive signal can enhance market perceptions regarding the company's reputation and financial stability, as investors tend to evaluate companies committed to green innovation as having superior future prospects. Research finding by Xie et al. (2019) support this view, demonstrating that green innovation increases financial performance and firm value through enhanced cost efficiency, product competitiveness, and a positive market reputation, thereby concluding that green innovation exerts a positive effect on firm value. This is also aligned with studies conducted by Dewi & Rahmianingsih (2020), Damas et al. (2021), Agustia et al. (2019), Wilutama & Viverita (2024), and Dianti & Puspitasari (2024).

H2: Green innovation has a positive effect on firm value

Based on stakeholder theory, institutional investors represent a stakeholder group that wields significant power to influence corporate managerial policies. They generally possess long-term investment orientations and an interest in robust governance practices and corporate sustainability Dyck et al. (2019). When a company exhibits a high level of institutional ownership, monitoring and pressure on management intensify, thereby driving the firm to disclose environmental information, including carbon emissions, in a more transparent and credible manner. Active oversight from institutional investors ensures that such disclosures are not merely symbolic (greenwashing) but reflect a genuine commitment to sustainability.

According to signal theory, a substantial concentration of institutional ownership also reinforces the reliability and credibility of the signals transmitted through carbon emission disclosure. Market investors will perceive that a company backed by large institutional shareholders possesses robust governance and more trustworthy reporting practices (Bushee, 1998). Therefore, carbon emission disclosures from companies with high institutional ownership will be more convincing to other investors, as they are viewed as valid signals of the company's commitment to sustainability and long-term performance. With the increased credibility of this signal, the market will assign a more positive valuation to the firm, which is reflected in a higher firm value. Prior research by Altania & Tanno (2023) indicates that institutional ownership can enhance firm value by intensifying oversight, delivering positive signals to the market, and providing access to greater resources. Several studies conducted by Imaduddin et al. (2023), Liu (2023), Rahman et al. (2022) and Suleiman & Maharani (2022) also demonstrate a positive effect of institutional ownership on firm value. These findings lead to the conclusion that institutional ownership will strengthen the positive effect of carbon emission disclosure on firm value.

H3: Institutional ownership strengthens the positive effect of carbon emission disclosure on firm value

Based on stakeholder theory, institutional investors constitute a stakeholder group with a profound interest in the long-term sustainability of the firm and serve as an external monitoring mechanism over management actions (Shleifer & Vishny, 1986). A high level of institutional ownership indicates more stringent oversight of managerial practices, including the implementation of green innovation. Institutional investors tend to encourage companies to develop innovations that not only boost profitability but also address environmental and social aspects (Dyck et al., 2019). With such pressure and monitoring from institutional investors, management will be more compelled to implement green innovation in a substantive rather than merely symbolic manner, thereby reinforcing its impact on enhancing firm value.

From the signaling theory perspective, the presence of substantial institutional ownership enhances the credibility of green innovation signals in the eyes of the market. When a company with high institutional ownership implements green innovations, the market

will perceive that such actions are not merely public relations strategies (greenwashing) but a reflection of a genuine commitment to sustainability and good governance (Bushee, 1998). Investors in the market tend to trust signals from companies monitored by institutions because these entities possess robust analytical capacities to verify the validity and consistency of managerial strategies. Consequently, institutional ownership strengthens the effect of green innovation on positive investor perceptions, augments market confidence, and drives an increase in firm value. Prior research has shown that institutional ownership can enhance firm value by providing positive signals to the market and allowing access to greater resources (Altania & Tanno, 2023). Several studies conducted by Imaduddin et al. (2023), Liu (2023), Rahman et al. (2022) and Suleiman & Maharani (2022) also demonstrate a positive influence of institutional ownership on firm value. This leads to the conclusion that institutional ownership will strengthen the positive effect of green innovation on firm value.

H4: Institutional ownership strengthens the positive effect of green innovation on firm value

The conceptual framework illustrates how carbon emission disclosure and green innovation influence the firm value with institutional ownership as moderating variable. The framework is presented on Figure 1.

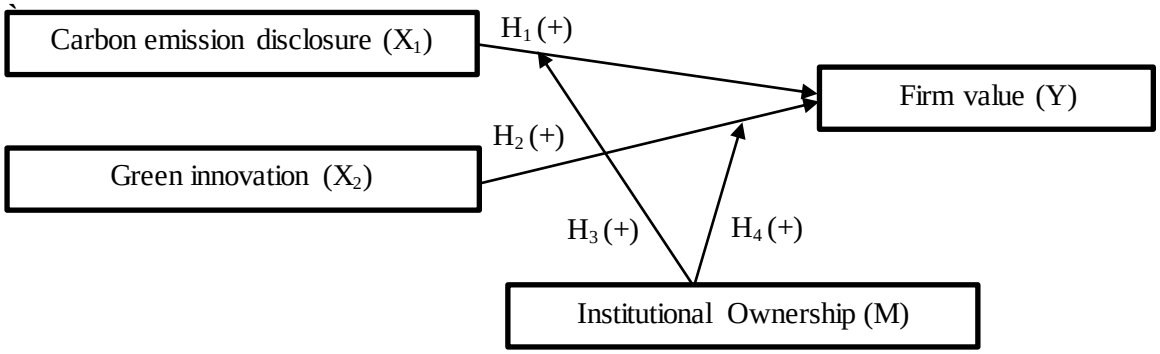

Figure 1. Research Framework

RESEARCH METHOD

The sample of this study consists of heavy pollution companies listed on Indonesian Stock Exchange for period 2021-2024. The companies that do not publish annual report and sustainability report during 2021-2024 are excluded from this research. The study requires the companies that have disclosed carbon emission consistently in the sustainability report during 2021-2024. The sample was selected using purposive sampling method and the result of screening is shown in Table 1.

Table 1. Sample Selection Results

Criteria	Total
Heavy pollution companies which listed on the Indonesian Stock Exchange in 2021-2024 period	602
Companies listed after beginning of 2021	-184
Companies that do not publish complete annual report during 2021-2024	-34
Companies that do not publish complete sustainability report during 2021-2024	-53
Companies that do not disclose Greenhouse Gas (GHG) consistently in the sustainability report during 2021-2024	-159
Total company samples	172
Research period	4
Total research data	688

Source: Data processed, 2026

This study used secondary data obtained from the IDX website and companies' official websites. This study's data source includes information from company's sustainability report and annual report. Data validation procedures were implemented to ensure accuracy and reliability. All extracted data were cross-checked against multiple sections of the annual reports to identify and correct any inconsistencies. Data processing was performed using E-views 13.

The dependent variable used in this research is firm value. According to Lang et al. (1989), firm value is measured using the Tobin's Q ratio, which illustrates a firm's investment opportunities or potential for corporate growth. This study employs the Tobin's Q ratio as the metric for firm value. As explained by Trimuliani & Febrianto (2023), Tobin's Q is a ratio that evaluates a firm's market value relative to the replacement cost of its assets which is measured at:

$$\text{Tobin's Q} = \frac{\text{(Total market value + Total liabilities)}}{\text{Total assets}}$$

Carbon emission disclosure involves the recording, recognition, disclosure, measurement, and presentation regarding the extent of carbon emissions generated by a company (Damas et al., 2021). Measurement utilizes the content analysis method based on the disclosure index from Bae Choi et al. (2013), which comprises 5 categories with 18 items. Each disclosed item is scored 1, and each undisclosed item is scored 0; these scores are subsequently summed and divided by 18.

Green innovation refers to the production processes, systems, or techniques modified to reduce the adverse environmental impacts generated by a company (Agustia et al., 2019). Measurement employs the content analysis method by assigning a score of 1 if the indicator description is met and a score of 0 if it is not met for each item, which are then summed and divided by 4 (Agustia et al., 2019).

The moderating variable used in this study is institutional ownership. Institutional ownership represents the proportion of a company's shares held by large entities, such as

banks, insurance companies, mutual funds, or pension funds (Satria & Widyawati, 2023). According to (Idzni & Purwanto, 2017), institutional ownership is measured at:

$$INSOWN = \frac{\text{(Total institution investor share x 100)}}{\text{Total outstanding shares}}$$

This research uses a multiple linear regression analysis to test the hypothesis which formulated as follows:

$$TBQit = \beta 0 + \beta 1CEDit + \beta 2GIit + \beta 3INSOWNit + \beta 4CEDit * INSOWNit + \beta 5GIit * INSOWNit + \varepsilon it$$

RESULT AND DISCUSSION

The descriptive statistics provide an overview of the central tendency, dispersion and distribution of variables used in this study. The descriptive statistical analysis results are presented on Table 2.

Table 2. Descriptive Statistic

Variable	N	Mean	Max	Min	Std. Dev.
Tobin's Q	688	1,5622	18,1074	0,2838	1,6753
CED	688	0,5592	1,0000	0,2222	0,1795
GI	688	0,3681	1,0000	0,0000	0,2800
INSOWN	688	78,5615	100,0000	0,0000	23,3483

Source: Data processed, 2026

Table 2 shows that the firm value represented by Tobin's Q has a mean value of 1,5622, indicating that, in general, these companies possess a market value approximately 1,56 times higher than the replacement cost of their assets. However, the high standard deviation value of 1,6753 reflects a considerably large variation among companies across the research period. The minimum value of 0,2838 was recorded by PT Organon Pharma Indonesia Tbk in 2021, suggesting that the company was undervalued by the market. Conversely, the maximum value of 18,1074 was achieved by PT Transcoal Pacific Tbk in 2021, indicating that the firm was highly overvalued by the market.

Table 2 demonstrates that carbon emission disclosure, represented by CED, has a mean value of 0,5592, reflecting that, on average, the companies disclosed 55,92% of the total items specified in the carbon emission disclosure index. The standard deviation value of 0,1795 reflects a moderate variation in disclosure practices, with scores ranging from 0,2222 (low disclosure) to 1 (full disclosure). The minimum value of 0,2222 indicates that some companies disclosed only 22.22% of the index items, such as PT Garuda Metalindo Tbk and others, while the maximum value of 1 indicates that certain companies achieved full disclosure across all index items, such as PT Merdeka Copper Gold Tbk.

Table 2 reveals that green innovation, represented by GI, has a mean value of 0,3681, indicating that the average fulfillment rate of green innovation criteria reached only 36,81%. The standard deviation value of 0,28 reflects a moderate variation in the implementation of green innovation. The minimum value of 0 is an indication that several companies had not yet

implemented eco-friendly technology and product within their business operations, such as PT Mitrabahtera Segara Sejati Tbk and others. On the other hand, the maximum value of 1 demonstrates that some companies had fully and optimally implemented green innovation strategies in their business operations, such as PT Diamond Food Indonesia Tbk and others.

Table 2 indicates that institutional ownership, represented by INSOWN, has a mean value of 78,5615, which means that as much as 78,56% of the company ownership is dominated by institutional investors. This reflects a strong potential for the external monitoring function within corporate governance. The minimum value of 0 shows that there were companies with no institutional investors, such as PT Pinago Utama Tbk during the 2021-2024 period. Meanwhile, the maximum value of 100 demonstrates that there was a company whose shares were entirely controlled by institutional investors, namely PT Bumi Resources Tbk in 2022.

This study has conducted classical assumption tests and it was determined that the data successfully passed the normality test and correlation test. Since the number of samples is more than 30, the data is considered normal distributed accordance with the statement of central limit theorem. For the correlation test, the result shows that the all of independent variables remain no greater than 0,8 and no less than -0,8. Therefore it can be concluded that the data has passed the classical assumption tests. For the heteroscedasticity test which used the Glejser approach, the result is the probability value of all variables are below 0,05 which indicate there is presence of heteroscedasticity in the regression model. Therefore, the regression model was estimated using heteroscedasticity robust standard errors (Sandwich Estimator) to address this issue. Autocorrelation tests were not conducted considering that the regression model used is the Random Effect Model, which is therefore considered BLUE (Best Linear Unbiased Estimator).

F test result show that the probability value is below 0,05, indicating that all independent variables simultaneously have a significant impact on firm value. Consequently, the conclusion drawn is that this regression model is suitable for predicting firm value. The adjusted R2 test result shows value of 0,015135, which means that all independent variables in this study are able to explain the dependent variable by 1,51%. The other variables not included in this study explain the remaining 98,49% of the dependent variable.

Table 3. T Test Result

Variable	Coeff	T-stat	Prob.	Sig.	Result
C	-0,8513	-0,9207	0,3575		
CED	4,0680	2,0574	0,0400	**	H_1 accepted
GI	-1,3546	-1,8328	0,0673	*	H_2 rejected
INSOWN	0,0332	2,7857	0,0055	***	
CED*INSOWN	-0,0549	-2,2942	0,0221	**	H_3 rejected
GI*INSOWN	0,0157	1,6971	0,1011		H_4 rejected

Source: Data processed, 2026

The test results in Table 3 indicate that the carbon emission disclosure (CED) variable has a positive regression coefficient with a significance probability of 0,0400. This states that an increase in carbon emission disclosure exerts a significant positive impact on firm value, leading to the acceptance of H1. This empirical finding provides strong validation for the alignment of stakeholder theory and signaling theory. For companies in heavy pollution industries, carbon emission disclosure in sustainability reports represents a form of fulfilling responsibility toward stakeholders regarding environmental issues. Viewed through the lens of signaling theory, transparency in carbon emissions emits a credible green signal to the market. The market subsequently responds to this signal by generating positive sentiment, which drives up stock demand and elevates the company's market value as a form of legitimacy for its business continuity. This result is aligned with the research by Xie et al. (2022), which discovered that environmental information transparency, particularly carbon emission disclosure in heavy pollution industries, is responded to positively by the capital market due to its capability to reduce information asymmetry between management and investors.

The research results in Table 3 show that the green innovation (GI) variable possesses a negative regression coefficient with a significance probability of 0,0673. This indicates that the green innovation variable has a negative but insignificant effect on firm value, and thus H2 is rejected. This demonstrates a conflict between ideal environmental preservation principles and the principles of investors in Indonesia who remain pragmatic and short-term oriented. Based on signaling theory, adopting eco-friendly technology or green manufacturing demands a substantial capital allocation in the initial phase to cover research and development and technological investment costs, especially for companies in heavy pollution industries. Investors in the Indonesian capital market are predominantly conventional, prioritizing short-term returns and current conventional profitability. Consequently, a dedicated fund allocation for implementing green innovation is perceived as a signal of an additional financial burden that may distort the company's profitability or short-term financial efficiency, rather than as an investment for future value creation. This short-term investor perspective causes the market to respond neutrally or tendentially negatively to the green innovation signal. This finding is consistent with the study by Yasya & Muchlis (2024), which asserts that there is a long time lag before the economic benefits of green innovation implementation can be recognized by the capital market.

The research results in Table 3 indicate that the interaction variable between carbon emission disclosure (CED) and institutional ownership (INSOWN) has a negative regression coefficient with a significance probability of 0,0221. This indicates that the moderating effect is proven significant, but the institutional ownership variable weakens the influence of carbon emission disclosure on firm value, hence H3 is rejected. From the perspective of stakeholder theory, institutional investors constitute a primary stakeholder group possessing considerable power to influence company policies through governance mechanisms. However, in

Indonesian publicly listed companies within heavy pollution industries, which are still dominated by institutional investors which remain oriented toward short-term investment targets to maintain liquidity. Based on signaling theory, when a company is overly transparent about the details of its carbon emissions, investors capture this signal as a future cost exposure risk. Investors worry that such transparency will trigger regulatory penalties or high carbon tax impositions that could deplete operational cash or reduce investment returns. Therefore, high institutional ownership instead provides strict oversight over published carbon emission information, thereby weakening the capital market's positive response to the carbon emission transparency signal. This finding reflects the phenomenon in developing nations like Indonesia, where institutional investors are not yet fully oriented toward long-term financial targets or green institutional investors. This empirical finding contradicts the research conducted by Rachmadhika & Firmansyah (2025).

The research results in Table 3 show that the interaction variable between green innovation (GI) and institutional ownership (INSOWN) has a positive regression coefficient with a significance probability of 0,1011. This demonstrates that institutional ownership fails to moderate the positive effect of innovation on firm value, leading to the rejection of H4. The insignificant result implies that oversight by institutional investors remains passive toward the signals of green innovation activities executed by publicly listed companies in heavy pollution industries in Indonesia. From the stakeholder theory standpoint, although the implementation of green innovation is aimed at satisfying stakeholder demands regarding social or environmental responsibility, institutional investors in Indonesia do not yet utilize green innovation as a primary indicator when selecting companies for investment. Institutional investors in Indonesia are not yet fully ESG-oriented in their investment strategies, causing the presence of institutional investors to fail in creating a powerful signal for the market. This finding is aligned with the study by Yu et al. (2024), which states that there is an industrial structure distortion in developing countries, including Indonesia, where capital markets are not yet mature enough to convert green innovation activities into financial value added or positive signals in the capital market.

CONCLUSION

Based on the empirical evidence from Indonesian heavy pollution companies during the 2021–2024 period, this study demonstrates that carbon emission disclosure significantly enhances firm value because capital markets interpret environmental transparency as a positive signal that reduces information asymmetry and secures organizational legitimacy. Conversely, green innovation exerts a negative but insignificant impact on firm value, as short-term-oriented investors predominantly view the substantial upfront investment and research costs as operational burdens that drain liquidity rather than valuable future assets. Furthermore, institutional ownership introduces a significant moderating effect that unexpectedly weakens the positive relationship between carbon emission disclosure and firm value; rather than providing effective governance monitoring, a high concentration of

institutional investors interprets deep emission transparency as a warning signal for future regulatory risks, such as environmental penalties or high carbon taxes, which could jeopardize investment returns. Finally, institutional ownership fails to moderate the connection between green innovation and firm value, indicating that institutional shareholders in the Indonesian capital market remain passive toward Environmental, Social, and Governance (ESG) practices and continue to prioritize conventional, short-term financial returns over long-term sustainable innovation.

Limitations

This study has several limitations such as the institutional ownership variable is measured solely on an aggregate basis, utilizing the total percentage of share ownership by all institutions as a whole which fails to distinguish specifically between domestic and foreign institutional investors, nor does it differentiate between institutions that have adopted green investment principles and conventional institutions. Then, this study restricts its observations exclusively to companies categorized within heavy pollution industries in Indonesia which make the result cannot be universally generalized to other industrial sectors on the Indonesia Stock Exchange. This study also has the qualitative measurement approach used in content analysis. The measurement of carbon emission disclosure and green innovation variables in this study relies on content analysis utilizing a dichotomous indexing system based on written information in annual and sustainability reports which unable to evaluate the actual quality or authenticity of the environmental program implementations executed by companies in the field.

Suggestions

Future studies could separate institutional ownership into several distinct categories, such as foreign versus domestic institutions to detect which specific types of institutional investors genuinely prioritize environmental issues in Indonesia. Future studies also could expand the scope by incorporating non-heavy pollution industries or conducting cross-sector comparisons on the Indonesia Stock Exchange to overcome the narrow scope of the current research subject. Future studies also could include time lag element and measure the impact of green innovation on firm value after a time lag of one or two years following the actual realization of the investment capital expenditure.

For the management of heavy pollution industry companies, it is highly recommended to continue increasing transparency regarding carbon emission disclosures, as the capital market has proven to highly appreciate and respond positively to such information openness. Regarding green innovation, management should look beyond the mere formalities of disclosure and focus on conducting rigorous capital budgeting for eco-friendly technology research. This strategic planning ensures that heavy initial capital outflows do not destabilize current operational profitability, which remains a highly sensitive metric for primary stakeholders.

For public investors on the Indonesia Stock Exchange, it is advised to begin shifting investment orientations toward long-term sustainability and returns. Investors must learn to recognize that capital spending on green innovation is a strategic long-term competitive advantage that successfully mitigates investment decision risks.

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