

CARBON DISCLOSURE IN INDONESIA: PROFITABILITY, FIRM SIZE, AND ENVIRONMENTAL PERFORMANCE AS A MODERATOR

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Abstract

Climate change issues have increasingly raised awareness of corporate carbon emission disclosure. Such disclosure not only reflects corporate social responsibility but also serves as a strategic tool for gaining legitimacy from society and stakeholders. This study aims to examine the effect of profitability and firm size on carbon emission disclosure, and to analyze the moderating role of environmental performance. A quantitative approach was employed using secondary data obtained from annual reports, sustainability reports, and PROPER ratings of 40 companies listed on the Indonesia Stock Exchange (IDX) that consistently participated in the PROPER program during 2018–2022. Purposive sampling was applied, resulting in 200 observation units. Data were analyzed using Partial Least Squares (PLS) with WarpPLS 7.0 software. The results show that profitability has a positive and significant effect on carbon emission disclosure, while firm size does not have a significant effect. Environmental performance significantly moderates the relationship between firm size and carbon emission disclosure, but does not moderate the relationship between profitability and disclosure. This research contributes theoretically to the environmental disclosure literature and provides practical implications for management and regulators to promote corporate environmental transparency and accountability.

Keywords: *profitability, firm size, environmental performance, carbon emission disclosure*

Introduction

Climate change has emerged as a critical global challenge, primarily driven by the increasing concentration of carbon dioxide (CO₂) emissions resulting from industrial activities, transportation, and fossil fuel consumption (Hardiyansah et al., 2021). As an emerging economy experiencing rapid industrial expansion, Indonesia has become a significant contributor to regional carbon emissions (Ratmono et al., 2021). This condition has intensified regulatory pressure, as reflected in Indonesia's commitment to reducing emissions by 31.89% independently and up to 43.20% with international support by 2030, as well as achieving Net Zero Emissions (NZE) by 2060. These commitments are further operationalized through policy instruments such as the Carbon Economic Value mechanism and the establishment of the Indonesia Carbon Exchange

(IDXCarbon), which indicates increasing institutional pressure on firms to manage and disclose carbon emissions (Sura & Hasibuan, 2025).

Despite these regulatory developments, carbon emission disclosure in Indonesia remains largely voluntary, leading to substantial variation in disclosure practices across firms (Kim, 2022; Lee et al., 2023). This variation raises a critical question regarding why some firms are more willing to disclose carbon emissions than others, particularly under increasing stakeholder scrutiny. Publicly listed companies, due to their economic significance and visibility, are expected to play a strategic role in supporting national environmental commitments through transparent reporting practices (Bedi & Singh, 2024; Efendy et al., 2023; Wahyuningrum et al., 2024). However, the absence of mandatory disclosure standards creates a discretionary space in which firm-level characteristics may shape disclosure decisions (Sindy et al., 2024).

From a theoretical perspective, legitimacy theory provides a robust framework to explain such behavior. Firms seek to maintain alignment between their operations and societal expectations to secure legitimacy and ensure business continuity (Wibowo et al., 2022). In this context, carbon emission disclosure functions as a strategic instrument to signal environmental responsibility and reduce legitimacy gaps, particularly for firms facing greater public visibility and scrutiny (Al-Mari & Mardini, 2024; Saraswati, Amalia, et al., 2021).

Prior studies suggest that internal firm characteristics, particularly profitability and firm size, play an important role in shaping environmental disclosure practices (Dharma et al., 2024; Syahdanti & Marietza, 2024; Yulianti & Waworuntu, 2024). However, the underlying mechanisms remain insufficiently theorized and empirically inconsistent. Profitability reflects a firm's financial capacity to allocate resources toward environmental initiatives and reporting systems (Angelia & Lastanti, 2024; Park et al., 2024). From a legitimacy perspective, highly profitable firms face greater public scrutiny, which increases pressure to justify their economic performance through socially responsible actions, including carbon disclosure (Hamdiyani, 2023; Herinda & Wijayanti, 2021). Thus, profitability is not merely a resource-based factor, but also a legitimacy-driven incentive for disclosure (Emmanuel et al., 2023; Kholmi et al., 2020).

Similarly, firm size reflects organizational complexity and the degree of exposure to external stakeholders (Saraswati, Puspita, et al., 2021). Larger firms tend to attract greater attention from regulators, investors, and the public, thereby intensifying legitimacy pressures (Abdullah et al., 2020; Hanifah & Gunaningrat, 2022). As a result, large firms are more likely to adopt transparent disclosure practices to maintain their social acceptance (Asyifa & Burhany, 2022). However, empirical findings regarding the effects of profitability and firm size on carbon emission disclosure remain inconclusive, indicating that these relationships may be contingent upon additional contextual factors (Hadi et al., 2025; Solikhah et al., 2021).

One critical but underexplored factor is environmental performance, particularly in the Indonesian context where the PROPER rating system provides a standardized measure of corporate environmental responsibility (Hidayat et al., 2022; Singh et al., 2023; Wahyuningrum et al., 2022). Environmental performance reflects the extent to which firms substantively engage in environmental management practices, such as energy efficiency and emission reduction (Giannarakis et al., 2017; Liu et al., 2023). Firms with strong environmental performance are more likely to disclose carbon emissions as such disclosure is supported by credible environmental actions (Baroroh et al., 2023).

Conversely, firms with weak environmental performance may avoid disclosure due to potential reputational risks (Noor & Ginting, 2022).

Building on legitimacy theory, environmental performance can be positioned as a moderating variable that conditions the relationship between firm characteristics and disclosure behavior (Asyari & Arieftiara, 2022; Ifada et al., 2021). Specifically, profitability and firm size may only translate into greater carbon emission disclosure when supported by strong environmental performance (Herdiawan & Dewi, 2023; Siregar & Khomsiyah, 2023). Without such substantive performance, disclosure may be perceived as symbolic and potentially undermine legitimacy (Khanifah et al., 2020; Nguyen et al., 2021). Therefore, environmental performance strengthens the credibility and strategic value of disclosure as a legitimacy mechanism (Akhter et al., 2023).

Accordingly, this study develops the following hypotheses:

H1: Profitability positively influences carbon emission disclosure.

H2: Firm size positively influences carbon emission disclosure.

H3: Environmental performance strengthens the effect of profitability on carbon emission disclosure.

H4: Environmental performance strengthens the effect of firm size on carbon emission disclosure.

This study addresses two main gaps in the literature. First, prior studies report inconsistent findings regarding the effects of profitability and firm size on carbon emission disclosure, suggesting the need for a more contingent analytical framework. Second, limited research explicitly incorporates environmental performance as a moderating variable, particularly using the PROPER rating system in the Indonesian context. By integrating firm characteristics and environmental performance within a legitimacy theory framework, this study provides a more comprehensive explanation of carbon emission disclosure behavior in emerging economies.

Method

This study employs a quantitative approach aimed at examining the relationship between profitability and firm size on carbon emission disclosure, as well as the moderating role of environmental performance in these relationships. The study uses secondary data, obtained indirectly through officially published documents issued by relevant institutions. The primary sources of data include annual reports, sustainability reports of companies listed on the Indonesia Stock Exchange (IDX), and the Decrees of PROPER Rating Results issued by the Ministry of Environment and Forestry of the Republic of Indonesia for the period 2018–2022.

Data were collected using a library research method by reviewing and analyzing relevant documents to obtain data on all research variables. The population of this study comprises all companies listed on the IDX that consistently participated in the PROPER program for five consecutive years (2018–2022), totaling 89 companies. The sampling technique employed is purposive sampling, wherein samples are selected based on specific criteria aligned with the research objectives. The sample selection criteria include: (1) the company must be listed on the Indonesia Stock Exchange (IDX); (2) the company must have consistently participated in the PROPER program from 2018 to 2022; and (3) the company must have published both annual and sustainability reports completely for all five years of observation. Based on these criteria, 40 companies

qualified for inclusion in the sample, resulting in 200 firm-year observations (40 companies × 5 years).

Several indicators were used to define and measure each variable in this study. Profitability is measured by the Return on Assets (ROA) ratio, calculated by dividing net income by total assets (Dharma et al., 2024). Firm size is measured using the natural logarithm (Ln) of total assets (Sekarini & Setiadi, 2021). Environmental performance is measured using the PROPER rating, which is converted into an ordinal scale as follows: gold = 5, green = 4, blue = 3, red = 2, and black = 1 (Maulidiavitasari & Yanthi, 2021). Carbon emission disclosure is measured using the Carbon Emission Disclosure Index (CEDIt), which refers to 18 disclosure items developed by the Carbon Disclosure Project (CDP). Each disclosed item receives a score of 1, while non-disclosed items receive a score of 0. The final index score is calculated by dividing the number of items disclosed by the total number of items (18), resulting in an index score ranging from 0 to 1 (Bae Choi et al., 2013).

Data analysis in this study was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) with WarpPLS version 7.0. The selection of PLS-SEM is based on several methodological considerations. First, this study aims to examine predictive relationships and the moderating role of environmental performance, which is consistent with the variance-based SEM approach that emphasizes prediction and explanation of variance (Hair et al., 2021). Second, PLS-SEM is more flexible in handling complex models that include moderating effects and does not require strict assumptions of multivariate normality. This is particularly relevant given that the data used in this study are secondary data derived from financial and sustainability reports, which may not follow a normal distribution (Hair et al., 2021). Third, compared to covariance-based SEM (CB-SEM) such as AMOS, which is more suitable for theory confirmation and requires large sample sizes and normally distributed data, PLS-SEM is more appropriate for exploratory and prediction-oriented research with relatively moderate sample sizes.

Furthermore, compared to multiple regression analysis, PLS-SEM allows for the simultaneous estimation of multiple relationships within a single structural model, including the testing of moderating effects, thereby providing a more comprehensive analysis of the relationships among profitability, firm size, environmental performance, and carbon emission disclosure. Therefore, the use of PLS-SEM in this study is methodologically justified as it aligns with the research objectives, model complexity, and data characteristics.

Result and Discussion

This study was conducted by analyzing panel data comprising 40 companies listed on the Indonesia Stock Exchange that consistently participated in the PROPER program during the period from 2018 to 2022, resulting in a total of 200 firm-year observations. The initial stage of analysis involved presenting descriptive statistics for each research variable, namely profitability, firm size, environmental performance, and carbon emission disclosure.

Tabel 1. Descriptive Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
Profitability	200	-3.00	53.00	8.9203	10.90938
Firm Size	200	25.77	32.24	30.0795	1.12360
Carbon Emission Disclosure	200	38.89	77.78	58.5007	10.02409

Environmental Performance	200	3.00	5.00	3.4700	.60075
Valid N (listwise)	200				

Source: Data Processing Results, 2025

Table 1 presents the descriptive statistics for each research variable. The profitability of the sampled companies shows a minimum value of -3.00 and a maximum of 53.00, with a mean of 8.9203 and a standard deviation of 10.90938. This indicates a relatively high variation in the financial performance among the companies included in the sample. Firm size ranges from a minimum value of 25.77 to a maximum of 32.24, with a mean of 30.049 and a standard deviation of 1.12360. This variation suggests that most of the firms in the sample are large-scale enterprises, although there are still meaningful differences in size across companies.

Regarding the carbon emission disclosure variable, the minimum score is 38.89 and the maximum is 77.78, with an average of 58.507 and a standard deviation of 10.02409. These figures indicate a moderate level of carbon emission disclosure among the companies in the sample. Some companies disclose a majority of the items based on the CDP index, while others report only a limited portion of the information. As for environmental performance, measured using the PROPER score converted to an ordinal scale, the minimum score is 3 (blue) and the maximum is 5 (gold), with a mean value of 3.4700 and a standard deviation of 0.60075. This suggests that most companies demonstrate moderate to good environmental performance, although variation exists among firms in terms of environmental commitment and implementation. Overall, these descriptive statistics provide an initial overview of the research variables and indicate the presence of diversity in firm characteristics, which may influence the extent of carbon emission disclosure.

Validity and Reliability Test of the Measurement Model (Outer Model)

Before examining the relationships among variables in the structural model, an initial step was conducted to assess the validity and reliability of the constructs through an outer model analysis. This assessment aims to ensure that the indicators employed in this study accurately and consistently represent the latent constructs being measured—namely, profitability, firm size, carbon emission disclosure, environmental performance, and the interaction effects between environmental performance and both profitability and firm size.

Table 2. Outer Model Significance of Weight Test Results

Variable	X1	X2	Y	Z	Z*X ₁	Z*X ₂	P-value	Description
Profitability (X ₁)	1,000	0,000	0,000	0,000	0,000	0,000	<0,001	Significant
Firm Size (X ₂)	0,000	1,000	0,000	0,000	0,000	0,000	<0,001	Significant
Carbon Emission Disclosure (Y)	0,000	0,000	1,000	0,000	0,000	0,000	<0,001	Significant
Environmental Performance (Z)	0,000	0,000	0,000	1,000	0,000	0,000	<0,001	Significant
Z*X ₁	0,000	0,000	0,000	0,000	1,000	0,000	<0,001	Significant
Z*X ₂	0,000	0,000	0,000	0,000	0,000	1,000	<0,001	Significant

Source: Data Processing Results, 2025

Based on the results presented in Table 2, all variables in the model exhibit significance values (p-values) of less than 0.001, indicating that all relationships between the constructs and their respective indicators are statistically significant at the 99% confidence level. Therefore, all indicators used in this study are considered valid and statistically capable of accurately representing their respective constructs. This finding applies to the independent variables (profitability and firm size), the moderating variable (environmental performance), the dependent variable (carbon emission disclosure), as well as the two interaction terms (ZX₁ and ZX₂) included for moderation analysis.

In addition, the diagonal weights of 1.000 indicate that each construct contributes fully to its corresponding indicator. Meanwhile, weights of 0.000 in the other columns suggest the absence of cross-loading among constructs, thereby indicating no multicollinearity between indicators in the outer model. This supports the appropriateness of the measurement model and justifies proceeding to the structural model evaluation.

Overall, the results of the outer model analysis demonstrate that the measurement model in this study meets the criteria for both convergent and discriminant validity. It can thus be concluded that the instrument used reliably and accurately measures the intended research constructs. Accordingly, the analysis may proceed to the structural model (inner model) assessment and hypothesis testing.

Structural Model Analysis (Inner Model)

Following the confirmation of the measurement model's validity and reliability, the analysis proceeded to the structural model (inner model) to evaluate the feasibility of the structural relationships among latent constructs, including moderation effects. The evaluation of the inner model involved four main aspects: Model Fit and Quality Indices, Coefficient of Determination (R²), Predictive Relevance (Q²), and Effect Size (f²).

Table 3. Model Fit and Quality Index

Model Fit and Quality Indices	Index	P-value	Criteria	Description
Average path coefficient (APC)	0,156	P = 0,006	P ≤ 0,05	Accepted
Average R-squared (ARS)	0,187	P = 0,002	P ≤ 0,05	Accepted
Average adjusted R-squared (AARS)	0,170	P = 0,003	P ≤ 0,05	Rejected
Average block VIF (AVIF)	1,175	Acceptable if ≤ 5, Ideally ≤ 3.3		Accepted
Average full collinearity VIF (AFVIF)	1,109	Acceptable if ≤ 5, Ideally ≤ 3.3		Accepted
Tenenhaus GoF (GoF)	0,432	Small ≥ 0,1; Medium ≥ 0,25; Large ≥ 0,36		Large
Sympson's paradox ratio (SPR)	0,750	≥ 0,7		Accepted
R-squared contribution ratio (RSCR)	0,989	≥ 0,9		Accepted
Statistical suppression ratio (SSR)	1,000	≥ 0,7		Accepted
Nonlinear bivariate causality direction ratio (NLBCDR)	1,000	≥ 0,7		Accepted

Source: Data Processing Results, 2025

As presented in Table 3, the model demonstrates statistically acceptable goodness-of-fit. The Average Path Coefficient (APC) is 0.156 with a p-value of 0.006, and the Average R-Squared (ARS) is 0.187 with a p-value of 0.002—both significant at the 5% level. These values indicate that the relationships among latent constructs contribute meaningfully and are statistically significant. However, the Average Adjusted R-Squared (AARS) value

of 0.170 with a p-value of 0.003 falls slightly short of the desired acceptance level, suggesting that caution is required when interpreting the proportion of variance explained by the model.

Multicollinearity indices also show satisfactory results, with AVIF and AFVIF values of 1.175 and 1.109, respectively—well below the ideal threshold of 3.3. This suggests that multicollinearity does not pose a concern in the model's structural paths. Furthermore, the Goodness of Fit (GoF) index stands at 0.432, exceeding the minimum acceptable threshold of 0.36, indicating a high overall model fit. Other supporting indices—including the Simpson's Paradox Ratio (SPR) of 0.750, R-Squared Contribution Ratio (RSCR) of 0.989, Statistical Suppression Ratio (SSR) of 1.000, and Nonlinear Bivariate Causality Direction Ratio (NLBCDR) of 1.000—also meet the established criteria for model adequacy. Therefore, it can be concluded that the structural model exhibits good quality and is suitable for further hypothesis testing.

Table 4. R-Squared

Independent Variable	Moderating Variable	Dependent Variable	R-Squared Coefficients	Adjusted R-Squared Coefficients
Profitability (X ₁) and Firm Size (X ₂)	Environmental Performance (Z)	Carbon Emission Disclosure (Y)	0,187	0,170

Source: Data Processing Results, 2025

As presented in Table 4, the coefficient of determination (R-Squared) for the dependent variable, carbon emission disclosure, is 0.187, with an Adjusted R-Squared of 0.170. This implies that approximately 18.7% of the variation in carbon emission disclosure can be explained by the combined influence of the independent variables (profitability and firm size) and the moderating variable (environmental performance). Although the value falls into the “low” category, it still offers a statistically meaningful contribution to the explanatory power of the model.

Table 5. Q-Square

Independent Variable	Moderating Variable	Dependent Variable	<i>Q-Square</i>
Profitability (X ₁) and Firm Size (X ₂)	Environmental Performance (Z)	Carbon Emission Disclosure (Y)	0,186

Source: Data Processing Results, 2025

Table 5 reports a Q-Square (Q²) value of 0.186, which is greater than zero, indicating that the model exhibits predictive relevance for the dependent variable (Hair et al., 2021). In other words, the structural model is not only capable of explaining carbon emission disclosure but also possesses adequate predictive capacity based on the constructs of profitability, firm size, and environmental performance.

Table 6. Effect Size (f²)

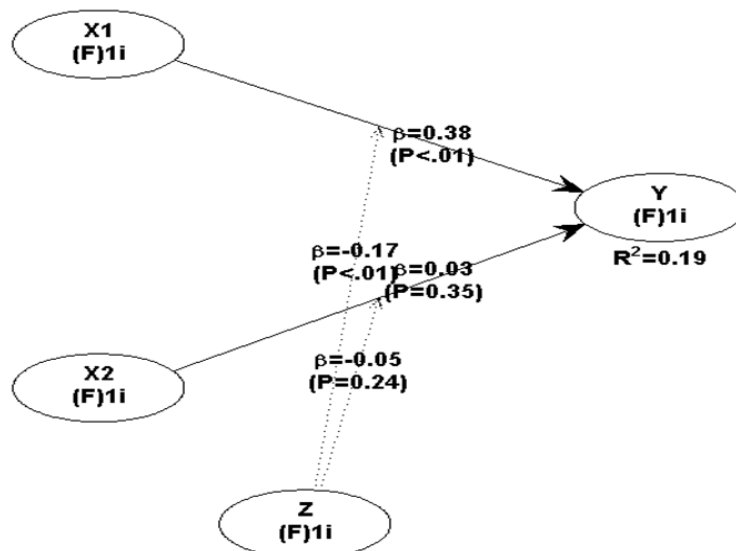
Variables	f ²	Result
Profitability (X ₁) → Carbon Emission Disclosure (Y)	0,147	Small effect
Firm Size (X ₂) → Carbon Emission Disclosure (Y)	0,002	No effect
Z*X ₁ → Y	0,008	No effect
Z*X ₂ → Y	0,033	Small effect

Source: Data Processing Results, 2025

In the context of structural models, effect size (f^2) values of 0.02, 0.15, and 0.35 are generally interpreted as representing small, medium, and large effects, respectively (Hair et al., 2021). As shown in Table 6, the effect size of profitability on carbon emission disclosure is 0.147, which is categorized as small, yet still contributes meaningfully to the model. In contrast, the effect size of firm size on carbon emission disclosure is only 0.002, which falls under the no effect category. Regarding the moderating effects, the interaction term $Z*X_1$ (environmental performance \times profitability) yields an effect size of 0.008, which also indicates no effect. Meanwhile, the interaction term $Z*X_2$ (environmental performance \times firm size) has an effect size of 0.033, categorized as small. These findings suggest that, although the moderating role of environmental performance is statistically significant, the magnitude of its effect on carbon emission disclosure remains limited—particularly in the interaction path involving firm size.

Hypothesis Testing

Hypothesis testing in this study aims to examine the extent to which profitability and firm size influence carbon emission disclosure, as well as how environmental performance moderates these relationships. The decision rule is based on comparing the p-value with a significance level (α) of 0.05. If the p-value is less than 0.05, the alternative hypothesis (H_a) is accepted and the null hypothesis (H_0) is rejected, indicating a statistically significant relationship between variables. Conversely, if the p-value is equal to or greater than 0.05, the null hypothesis cannot be rejected, implying that there is no significant effect (Hair et al., 2021).



Picture 1. Partial Least Squares (PLS) Testing Model

Table 7. Effect Size (f^2)

Hypothesis	Path Coefficient	P-values	Result
Profitability (X_1) \rightarrow Carbon Emission Disclosure (Y)	0,378	<0,001	Positive and Significant
Firm Size (X_2) \rightarrow Carbon Emission Disclosure (Y)	0,028	0,348	Positive and Insignificant
$Z*X_1 \rightarrow Y$	-0,049	0,244	Negative and Insignificant
$Z*X_2 \rightarrow Y$	-0,170	0,007	Negative and Significant

Source: Data Processing Results, 2025

Based on the results presented in Table 7, several key findings either support or refute the proposed hypotheses. First, the test reveals that profitability (X_1) has a positive and statistically significant effect on carbon emission disclosure (Y), with a path coefficient of 0.378 and a p -value < 0.001 . This finding supports the first hypothesis ($H1$), indicating that higher profitability increases the likelihood that firms disclose their carbon emissions. This result is aligned with legitimacy theory, which suggests that financially strong firms tend to adopt legitimacy strategies to maintain public trust and stakeholder confidence through environmental transparency. Carbon emission disclosure forms part of corporate social responsibility (CSR) strategies, enabling companies to demonstrate their commitment to sustainability. More profitable companies also have greater capacity to develop advanced and costly environmental reporting systems, including emission measurements, audits, and reporting to external bodies such as the Carbon Disclosure Project (CDP). Therefore, profitability emerges as a critical driver of corporate transparency concerning climate-related issues. This result corroborates findings by A. Widyastuti et al. (2023), who argue that firms with higher profits tend to voluntarily disclose environmental information to gain societal legitimacy as part of their long-term corporate development strategy. Studies by Efendy et al. (2023) and Syahdanti & Marietza (2024) further assert that strong financial performance enables firms to invest in emission-reduction initiatives while signaling environmental responsibility to investors. Similarly, research by Resya et al. (2021) and Wahyuningrum et al. (2024) suggests that profitable firms face higher expectations from the public and investors for environmental transparency, especially when profits are derived from natural resource exploitation, creating both legal and moral imperatives for long-term environmental stewardship.

Second, the effect of firm size (X_2) on carbon emission disclosure (Y) is positive but statistically insignificant, with a path coefficient of 0.028 and a p -value of 0.348. This indicates that firm size does not significantly influence the extent of carbon emission disclosure. It implies that a larger operational scale does not automatically drive firms to be more transparent about environmental issues, particularly in the absence of external pressure or strong internal awareness. This finding does not support the assumption under legitimacy theory, which posits that larger firms are more motivated to safeguard their social legitimacy through environmental reporting. The lack of significance may stem from varying levels of compliance among large firms or different strategic priorities, such as a focus on short-term profits. Some large firms may perceive that their legitimacy is already secured through other means—such as industry recognition or financial success—thus reducing the perceived necessity of explicitly disclosing carbon emissions. This finding is consistent with Septriyawati & Anisah (2019), who argue that firm size does not influence carbon emission disclosure, possibly because companies have yet to view voluntary disclosure as an effective strategic tool.

Third, the moderating effect of environmental performance yields notable findings. The interaction between environmental performance and profitability ($Z * X_1$) on carbon emission disclosure results in a negative path coefficient of -0.049 and a p -value of 0.244, indicating a statistically insignificant effect. This suggests that environmental performance does not significantly strengthen or weaken the relationship between profitability and carbon emission disclosure. Despite the negative direction, which may suggest a tendency for the effect of profitability to diminish in firms with high environmental performance, the result remains statistically inconclusive. Theoretically,

firms with both high profitability and strong environmental performance are expected to be more transparent in disclosing environmental information. However, the result implies that such firms may perceive financial and environmental legitimacy as independently sufficient and thus do not feel compelled to link the two in their disclosure strategies. In terms of legitimacy theory, the finding suggests that firms might already satisfy societal expectations through either dimension and therefore do not perceive a need for integrated disclosure. This finding is consistent with the study by Dharma et al. (2024), which indicates that environmental performance does not significantly moderate the relationship between profitability and carbon emission disclosure. Consequently, firms with high environmental performance do not necessarily exhibit greater transparency in disclosing their environmental policies.

Fourth, the interaction between environmental performance and firm size ($Z \times X_2$) on carbon emission disclosure shows a negative and statistically significant path coefficient of -0.170 , with a p-value of 0.007 . This indicates that environmental performance significantly moderates the relationship between firm size and carbon emission disclosure in a negative direction. In other words, among firms with stronger environmental performance (i.e., those rated green or gold under the PROPER program), the influence of firm size on carbon emission disclosure tends to diminish. This can be interpreted through the lens of legitimacy theory: once firms have demonstrated a high commitment to environmental stewardship, firm size no longer plays a decisive role in driving disclosure practices, as environmental legitimacy has already been attained (Efendy et al., 2023b).

Conclusion

This study aimed to analyze the influence of profitability and firm size on carbon emission disclosure, with environmental performance as a moderating variable, focusing on companies listed on the Indonesia Stock Exchange (IDX) and participating in the PROPER program during the 2018–2022 period. Using the Partial Least Squares (PLS) approach with WarpPLS 7.0 software, the results indicate that profitability has a positive and significant effect on carbon emission disclosure. This finding suggests that highly profitable firms tend to possess sufficient resources to implement transparent environmental reporting as part of their corporate social responsibility strategy. Conversely, firm size does not exhibit a statistically significant effect, indicating that asset scale is not always a direct indicator of a company's commitment to environmental transparency.

Furthermore, the moderation analysis reveals that environmental performance does not significantly moderate the relationship between profitability and carbon emission disclosure. However, it significantly moderates the effect of firm size on carbon emission disclosure in a negative direction. This implies that firms with strong environmental performance tend not to rely on their size to gain legitimacy, as their positive reputation is already established through commendable environmental achievements. These findings reinforce the relevance of legitimacy theory, which underscores the importance of maintaining favorable public perception through transparent disclosure aligned with social values and sustainability principles.

Theoretically, this study contributes to the literature by enriching the understanding of carbon emission disclosure and the role of internal firm characteristics, particularly within the context of a developing country such as Indonesia. It also emphasizes the

importance of considering environmental factors as potential moderators that may strengthen or weaken the relationships between corporate attributes and sustainability reporting. Practically, the findings offer valuable insights for corporate managers in enhancing environmental disclosure strategies as part of legitimacy-building and long-term competitiveness. In addition, the results may serve as input for policymakers in designing regulations that support greater transparency in carbon reporting, especially for large firms that have yet to actively disclose their environmental impacts.

Nonetheless, this study is subject to several limitations. First, the scope of the research is limited to companies listed on the IDX and participating in the PROPER program, which restricts the generalizability of the findings to other sectors in Indonesia. Second, the carbon disclosure measurement employed a quantitative checklist approach that does not assess the depth or quality of the disclosed information. Third, the use of secondary data poses potential constraints regarding the availability and completeness of corporate reporting.

In light of these limitations, future research is recommended to expand the sample by including non-PROPER firms or exploring other countries with different environmental policy contexts. Follow-up studies may also consider adopting qualitative or mixed-methods approaches to gain deeper insights into firms' motivations and strategies behind carbon disclosure. Finally, policymakers are encouraged to promote the adoption of more standardized and structured carbon reporting frameworks in Indonesia, such as those aligned with the Task Force on Climate-related Financial Disclosures (TCFD) or the International Sustainability Standards Board (ISSB).

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