JDEP Vol. 8, No. 2 (2025) 115-126

JDEP

Jurnal Dinamika Ekonomi Pembangunan

https://ejournal.undip.ac.id/index.php/dinamika_pembangunan

Environmental Performance Ratings, Carbon Disclosure, and Firm Value: Evidence From Indonesia

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Received: 15th October 2025; Last Revised: 6th January 2026;
Accepted: 10th January 2026; Available Online: 10th January 2026;
Published Regularly: August 2025

Abstract

This study examines the association between environmental performance ratings, carbon emission disclosure, and firm value in Indonesia's energy and industrial sectors. The sample comprises firms listed on the Indonesia Stock Exchange and covered by the PROPER program during 2019–2023, yielding 160 firm-year observations from 32 firms. Firm value is proxied by Tobin's Q. Environmental performance is measured using the Ministry of Environment and Forestry's PROPER rating, while carbon emission disclosure is constructed based on a checklist derived from the Carbon Disclosure Project (CDP). Panel regression analysis controls profitability (ROE), sales growth, leverage (DER), and firm size (SIZE). The results indicate that environmental performance ratings are not significantly associated with firm value, whereas carbon emission disclosure exhibits a positive and statistically significant association. Among the control variables, only profitability shows a significant relationship with firm value. These findings suggest that, in this context, investors place greater weight on transparent and decision-useful carbon-related disclosure than on aggregate environmental performance ratings. The study provides evidence from an emerging market setting and offers implications for regulators and firms regarding the relative valuation relevance of disclosure quality and performance ratings.

Keywords: *Environmental Performance Ratings, Carbon Emission Disclosure, Firm Value, Emerging Market, and Indonesia*

JEL Classification*: Q56, G14, and G32*

https://doi.org/10.14710/jdep.8.2.115-126

Introduction

Heightened scrutiny of greenhouse gas (GHG) emissions has increased investor and regulatory attention to firms' environmental performance and disclosure in energy-

and industry-intensive sectors. Indonesia's policy architecture combines the Financial Services Authority's sustainable-finance framework under POJK No. 51/POJK.03/2017 and the Ministry of Environment and Forestry's PROPER public environmental rating, establishing governance expectations and a reputational mechanism that signals environmental outcomes to capital markets (OJK, 2017; KLHK, 2023). The Sustainable Finance Roadmap Phase II (2021–2025) further institutionalizes these implementation efforts (OJK, 2021). At the global level, initiatives such as the Carbon Disclosure Project (CDP) have standardized carbon emission disclosure and expanded disclosure coverage substantially since 2020 (CDP, 2023).

Environmental information has increasingly been discussed within the broader framework of environmental performance rating, which seeks to recognize, measure, and report environmental impacts in a comparable and auditable manner (Gray et al., 1996). Capital markets may respond positively to credible environmental efforts and decision-useful non-financial disclosure, although the magnitude and direction of these effects vary across institutional settings, sectors, and measurement approaches (Dhaliwal et al., 2011). Recent international evidence links carbon risk to higher audit fees and documents the value relevance of carbon performance, while Indonesia-focused studies report mixed valuation effects of sustainability reporting and CED (e.g., Ding et al., 2024; Widagdo et al., 2023; Suhartini et al., 2024).

Disclosure practices related to environmental information have matured rapidly in recent years. CDP reports an increase of more than 140 percent in corporate climate disclosures between 2020 and 2023, reflecting stronger transparency norms (CDP, 2023). In Indonesia, regulatory momentum has intensified with the introduction of a dedicated carbon exchange under POJK No. 14/2023 and the launch of IDXCarbon in September 2023 (OJK, 2023; IDX, 2023). Empirical findings, however, remain heterogeneous. Some Indonesian studies document positive associations between carbon emission disclosure or environmental performance and firm value in energy and basic-materials sectors during 2019–2023, whereas other studies report weak or insignificant relationships, consistent with international evidence suggesting context-dependent valuation effects (Oktaviani et al., 2025; Fahmi et al., 2025).

This study is grounded in stakeholder theory, legitimacy theory, and signaling theory. Stakeholder theory emphasizes firms' responsibility to address the expectations of diverse stakeholder groups through transparent reporting (Freeman, 1999). Legitimacy theory highlights the role of environmental disclosure in maintaining alignment between corporate activities and prevailing social values and norms (Dowling & Pfeffer, 1975). Signaling theory suggests that environmental information disclosure can function as a signal to the market regarding firms' governance quality, environmental risk awareness, and long-term strategic orientation (Spence, 1973). Within this theoretical framework, environmental performance ratings such as PROPER and voluntary carbon emission disclosure may convey different types of information to investors and other market participants.

Empirical research examining the influence of environmental performance and carbon emission disclosure on firm value in Indonesia remains limited and inconclusive. Several studies report positive valuation effects of carbon emission disclosure and sustainability reporting (Hardiyansah et al., 2021; Lestari & Restuningdiah, 2021; Lusiana et al., 2021; Sukmadilaga et al., 2023; Widagdo et al., 2023). Other studies find insignificant or context-specific effects, particularly when

environmental performance is measured using standardized rating systems (Fernando et al., 2024; Sukmadilaga et al., 2023; Al-Dhaimesh, 2020). These mixed findings indicate that investors may differentiate between externally validated environmental performance ratings and the informational content embedded in voluntary disclosure practices.

This study examines the association between environmental performance ratings, carbon emission disclosure, and firm value among companies in the energy and industrial sectors listed on the Indonesia Stock Exchange during 2019–2023. Environmental performance is proxied by PROPER ratings issued by the Ministry of Environment and Forestry, while carbon emission disclosure is measured using a checklist derived from the Carbon Disclosure Project (Choi et al., 2013), and firm value is proxied by Tobin's Q. The study distinguishes environmental performance ratings from disclosure transparency within a unified empirical framework and provides contextual evidence from an emerging market characterized by mandatory sustainability governance and an evolving carbon-market infrastructure. This approach advances the literature by explicitly disentangling the valuation effects of externally validated performance ratings and voluntary carbon emission disclosure, thereby illustrating how capital markets in an emerging economy differentiate between compliance-based performance signals and disclosure-based transparency when pricing firm value.

Literature Review and Hypothesis Development

Stakeholder, legitimacy, and signaling theories have been widely applied to examine the relationship between environmental performance ratings and carbon emission disclosure and firm value (Hardiyansah et al., 2021; Lestari & Restuningdiah, 2021; Lusiana et al., 2021; Sukmadilaga et al., 2023; and Widagdo et al., 2023). Stakeholder theory emphasizes that firms are accountable not only to shareholders but also to a broader set of stakeholders, including governments, communities, and consumers (Freeman, 1999). Within this perspective, environmental information serves as a mechanism through which firms communicate their responsiveness to stakeholder expectations regarding sustainability.

Legitimacy theory highlights the importance of aligning corporate activities with prevailing social values and norms (Dowling & Pfeffer, 1975). Public environmental assessments, such as PROPER ratings, and disclosures of carbon-related information may be used by firms to obtain or maintain legitimacy in the eyes of society. Higher perceived legitimacy can increase firms' ability to attract investors, business partners, and regulatory support, which may ultimately be reflected in firm value (Lestari & Restuningdiah, 2021).

Signaling theory posits that information disclosed by firms functions as a signal to the market regarding firm quality and future prospects (Spence, 1973). In this context, environmental performance ratings and carbon emission disclosure may serve as signals of governance quality, environmental risk awareness, and long-term strategic orientation. These signals can influence investor perceptions and valuation, particularly when environmental issues are considered financially material (Hardiyansah et al., 2021).

Empirical evidence on the valuation relevance of environmental performance and disclosure remains mixed. Fernando et al. (2024) report that environmental

accounting disclosure in annual or sustainability reports does not significantly affect stock prices in mining and agricultural firms in Southeast Asia. Sukmadilaga et al. (2023) similarly find that environmental reporting practices among firms receiving sustainability reporting awards do not significantly affect Economic Value Added (EVA). Al-Dhaimesh (2020), also documents a limited effect of environmental accounting practices on EVA in Qatari firms.

Other studies, however, document positive associations between environmental initiatives and firm value. Wahyuni et al. (2019) show that environmental practices, such as the use of recycled materials and renewable energy, improve environmental performance in Indonesian mining and energy firms. Lestari & Restuningdiah (2021) find that environmental performance measured using the PROPER rating is positively associated with firm value in mining and agricultural sectors. Astari et al. (2023) report similar evidence, suggesting that improved environmental performance contributes to higher firm value by enhancing environmental stability. Yuliani & Prijanto (2022) also find a positive association between PROPER-based environmental performance and firm value in Indonesia's coal mining subsector, although profitability does not significantly moderate this relationship.

Evidence related to carbon emission disclosure is more consistent. Widagdo et al. (2023) show that carbon emission disclosure positively affects firm value in high-emission industries in Indonesia. Hardiyansah et al. (2021) also document a significant positive association between carbon emission disclosure and firm value. Hapsoro & Falih (2020) further demonstrate that carbon emission disclosure strengthens the relationship between firm characteristics and firm value, although the role of profitability remains insignificant.

Greenhouse gas emission transparency has also attracted increasing attention from capital markets. Disclosure of greenhouse gas emissions is found to enhance investor trust and attract environmentally conscious investors, thereby contributing to firm value. Choi & Luo, (2021) report that markets tend to penalize firms with high emission levels, as such firms are perceived to face higher future environmental liabilities.

Prior studies report heterogeneous findings depending on sectoral characteristics, geographic context, and measurement approaches. The mixed evidence suggests that investors may differentiate between compliance-based environmental performance ratings, such as PROPER, and disclosure-based transparency, such as carbon emission reporting. These differences motivate a closer examination of how capital markets interpret and price distinct forms of environmental information within the same institutional setting.

Environmental Performance Ratings and Firm Value

Environmental performance ratings, such as PROPER, provide a standardized assessment of firms' environmental compliance and performance. A stakeholder perspective suggests that firms demonstrating stronger environmental performance may be perceived as more responsive to stakeholder expectations, potentially enhancing firm value (Carandang & Ferrer, 2020). Legitimacy theory further indicates that public environmental ratings can help firms maintain social acceptance by signaling conformity with prevailing environmental norms and regulations (Astari et al., 2023; Wahyuni et al., 2019). A signaling perspective views environmental

performance ratings as information that may convey firms' commitment to environmental management and sustainability. The compliance-based and standardized nature of such ratings, however, may limit their informational content, implying that their valuation relevance depends on how investors interpret these signals relative to other sources of environmental information (Lestari & Restuningdiah, 2021).

Empirical evidence provides mixed but supportive insights into this relationship. Astari et al. (2023) find that environmental performance, measured using PROPER ratings, is positively associated with firm value, suggesting that stronger environmental outcomes contribute to favorable market perceptions. Lestari & Restuningdiah (2021) report similar findings, showing that higher PROPER ratings are associated with increased firm value in mining and agricultural sectors. Yuliani & Prijanto (2022) also document a positive relationship between PROPER-based environmental performance and firm value in Indonesia's coal mining subsector. These studies indicate that, under certain conditions, environmental performance ratings may function as value-relevant signals to investors. Drawing on stakeholder, legitimacy, and signaling perspectives, as well as prior empirical evidence, environmental performance ratings are expected to be associated with firm value. Accordingly, the following hypothesis is proposed:

H1: Environmental performance ratings are associated with firm value.

Carbon Emission Disclosure and Firm value

Several previous studies have shown that carbon emission disclosure has a positive effect on firm value. Based on signaling theory, carbon emission disclosure signals to stakeholders that the company is environmentally responsible and has a strategy to manage its carbon footprint. Meanwhile, legitimacy theory states that transparency in carbon emission disclosure helps companies maintain their social legitimacy. This is in line with research conducted by Hapsoro & Falih (2020); Hardiyansah et al. (2021); and Kurnia et al. (2020). Therefore, transparent carbon emission disclosure can increase investor confidence and strengthen the company's value in the market.

High carbon emission disclosure will improve the company's reputation, which in turn will increase investor confidence and access to financing, thereby increasing the company's value. This influence will be stronger in large companies operating in countries with strict environmental regulations (Kurnia et al., 2020). Based on the statement above, the hypothesis to be tested is as follows:

H_2: The implementation of carbon emission disclosure has a positive effect on firm value.

Research Method

This study examines the association between environmental performance ratings and carbon emission disclosure and firm value in the energy and industrial sectors. The data used in this study were taken from annual and sustainability reports published by PROPER indexed companies and those listed in the energy and industrial sectors of IDX during the period 2019 - 2023. Using a purposive sampling technique, 32 energy and industrial sector companies were selected as samples from 123 existing populations, with a total of 160 observations. The researcher tested the regression to

determine the effect of the variables studied. The regression test was carried out using the Multiple Linear Regression (MLR) statistical technique. Multiple Linear Regression is one of the methods in statistics that functions to create a model of the relationship between dependent variables (which are influenced) with two or more independent variables (which influence). Firm value in this study is proxied by Tobin's Q, which is measured as the ratio of the market value of equity plus the book value of liabilities to total assets, where equity is measured using market capitalization and both liabilities and assets are measured at book value (Fernando et al., 2024).

Measurement of Variable

Environmental performance ratings in this study are measured using the PROPER index. PROPER (Program Penilaian Peringkat Kinerja Perusahaan dalam Pengelolaan Lingkungan) is an environmental performance assessment program developed by the Ministry of Environment and Forestry (KLHK) to evaluate firms' environmental management practices. The PROPER rating system classifies firms' environmental performance using five color-coded categories: gold (excellent), green (good), blue (adequate), red (poor), and black (very poor). Each category is assigned a numerical score ranging from 1 (black) to 5 (gold), following prior studies (Lestari & Restuningdiah, 2021).

Carbon emissions or carbon dioxide (CO_2) emissions refer to the release of carbon dioxide gas into the atmosphere, which is mostly caused by human activities, such as the burning of fossil fuels. The amount of CO_2 released into the environment can be calculated through the calculation of the carbon footprint. To measure carbon emissions, an instrument is used in the form of a checklist that refers to the factors in the Information Request Sheet from the CDP (Choi et al., 2013).

CED is a company's practice in disclosing information related to carbon emissions resulting from its operational activities. CED is considered important because it reflects the company's commitment to environmental responsibility, which has the potential to influence investor perceptions and increase the company's value. Assessment of the level of carbon emission disclosure is carried out using indicators compiled based on guidelines from CDP (Asyari et al., 2022). The guidelines cover five main aspects, namely risks and opportunities related to climate change, recording of greenhouse gas (GHG) emissions, energy consumption, costs for reducing carbon emissions, and responsibility for managing carbon emissions.

The disclosure score will be calculated using the percentage of items disclosed by the company in the sustainability report or annual report to the total items available. Each item will be given a value of one (1) if reported in the sustainability report or annual report, and will be given a value of zero (0) if not disclosed (Hardiyansah et al., 2021)

Control variables will be used in this study, to eliminate the influence of external factors that can disrupt the relationship between the independent variable and the dependent variable (Gujarati & Porter, 2009). The control variables used in this study include profitability, proxied by return on equity (ROE); sales growth; leverage, measured by the debt-to-equity ratio (DER); and firm size, measured as the natural logarithm of total assets (Lestari & Restuningdiah, 2021).

Results and Discussion

The results of the descriptive statistical analysis show that the Tobin's Q variable value ranges from 0.384648 to 4.572721, with an average of 1.75188. This figure indicates that the market generally values the company about 1.75 times higher than the value of its assets, reflecting positive expectations about the company's prospects. A Tobin's Q value above 1 also indicates that the market value exceeds the replacement cost of assets, which could reflect market optimism or speculation. The Proper variable has a minimum value of 2 and a maximum of 5, with an average of 3.53125. This shows that most companies in the energy and industrial sectors have implemented environmental performance ratings quite well (Lestari & Restuningdiah, 2021), where the majority achieve a blue or green rating in their environmental performance. CED has a minimum value of 0.055556 and maximum of 1, with an average of 0.604514. This average shows that most companies have started to disclose carbon emission information, although not yet comprehensively (Nazwa & Fitri, 2022).

Table 1. Descriptive Statistics

Variables	OBS	Mean	Median	Max.	Min.
Tobin's Q	160	1.1751	0.9840	4.5727	0.3846
Proper	160	3.5312	3.0000	5.0000	2.0000
CED	160	0.6045	0.6944	1.0000	0.0555
ROE	160	15.615	13.8050	124.9212	-254.3475
sales growth	160	0.1800	0.03764	2.0484	-0.5114
DER	160	123.2069	67.2256	1132.5417	-40.0000
SIZE	160	30.1241	30.1207	33.7306	27.1968

Table 1 reports profitability, measured by ROE, with a mean of 15.6155 and a range from −254.3475 to 124.9212; negative values indicate losses, whereas high positive values reflect strong performance. Sales growth averages 0.1800 (range: −0.5115 to 2.0487), suggesting firms generally expanded revenues during the sample period. DER exhibits extreme dispersion, from −40 to 1132.5417, with a mean of 123.2069; very high values signal heavy reliance on debt, while negative values likely stem from negative equity or potential recording issues. The dataset is complete and internally consistent with no missing values, and although several variables show extreme observations, such features are common in financial data and remain acceptable for panel regression analysis.

Hypothesis test results in this study indicate that of the two main independent variables tested, only CED has a significant effect on firm value. CED has a t-statistic value of 2.2640 with a significance level of 0.0253 (<0.05), which indicates that carbon emission disclosure has a positive and significant effect on firm value. These results support the hypothesis that environmental information disclosure can strengthen investor confidence and increase the market value of the company. On the other hand, the environmental performance rating variable shows insignificant results on firm value, with a t-statistic value of -0.5036 and a significance level of 0.6154 (> 0.05). This finding indicates that although firms exhibit variation in environmental performance ratings, as reflected in PROPER scores, such differences do not translate into a direct positive impact on market valuation.

Table 2. Regression Output Result for T-Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.4363	4.9080	2.1263	0.0355
Proper	-0.0483	0.0959	-0.5036	0.6154
CED	0.3578	0.1580	2.2640	0.0253
ROE	0.0034	0.0014	2.3939	0.0182
Sales growth	0.0500	0.0817	0.6116	0.5419
DER	0.0003	0.0003	1.1405	0.2563
SIZE	-0.3125	0.1667	-1.8745	0.0633

Control variables, only profitability (ROE) shows a significant effect on firm value. ROE records a t-statistic value of 2.3939 and a significance of 0.0182, which means that the company's financial performance plays an important role in influencing market valuation. Meanwhile, other control variables such as sales growth, leverage (DER), and company size (SIZE) do not show a significant effect. Each has a significance level above 0.05, indicating that in this model, the three do not contribute significantly to the variation in firm value.

The regression estimates indicate that environmental performance, proxied by the PROPER rating, is not significantly associated with firm value. As shown in Table 2, the coefficient on PROPER is negative but insignificant ($p = 0.6154$), indicating that variations in PROPER scores are not related to differences in Tobin's Q among IDX-listed energy and industrial firms during 2019–2023. This finding persists after controlling for profitability, sales growth, leverage, and firm size, suggesting that environmental performance ratings do not add explanatory power beyond conventional financial determinants of market valuation.

The lack of a valuation effect may reflect the nature of the PROPER rating itself. As an ordinal and compliance-based measure, PROPER conveys limited firm-specific and forward-looking information. Given its mandatory character, higher ratings are more likely to be interpreted as indicators of regulatory compliance rather than as signals of superior environmental strategy or risk management. Consequently, improvements in PROPER scores are unlikely to meaningfully affect investor expectations regarding future cash flows or firm risk.

These findings refine the implications of stakeholder, legitimacy, and signaling theories. PROPER ratings appear to support regulatory legitimacy but do not translate into economic legitimacy as reflected in stock market valuations. Consistent with signaling theory, only signals with sufficient credibility and informational content are likely to influence investor behavior, and a standardized environmental rating with limited differentiation may lack the granularity required to be valuation-relevant.

The results further indicate that environmental performance ratings embedded in PROPER are not yet incorporated into firm value in the Indonesian capital market. This contrasts with carbon emission disclosure, which shows a positive and statistically significant association with Tobin's Q within the same empirical framework. The divergence underscores the importance of disclosure practices that convey specific and decision-useful information, rather than aggregate indicators of regulatory compliance.

These findings are broadly consistent with prior evidence reporting an insignificant relationship between environmental accounting and firm value (Carandang & Ferrer, 2020; Fernando et al., 2024). In contrast, earlier studies documenting a positive effect of PROPER-based measures (e.g., Astari et al., 2023;

Lestari & Restuningdiah, 2021) may reflect differences in sectoral focus, sample periods, or investor sensitivity to environmental issues. Taken together, the evidence suggests that the valuation relevance of environmental performance ratings is context-dependent and may be weaker than that of transparent and credible disclosure practices in more recent periods.

The regression results indicate a positive and statistically significant association between carbon emission disclosure and firm value. As reported in Table 2, the estimated coefficient on carbon emission disclosure is positive and significant ($p = 0.0253$), suggesting that firms with more extensive carbon-related disclosure tend to exhibit higher Tobin's Q. This pattern implies that investors respond more strongly to transparent and detailed carbon information than to aggregate environmental performance ratings, as such disclosures provide firm-specific insights into exposure to transition risks, mitigation strategies, and longer-term environmental commitments, thereby reducing information asymmetry relevant to valuation decisions.

The findings are consistent with signaling theory, which posits that voluntary and relatively costly disclosures can serve as credible signals of managerial quality and risk awareness. Preparing carbon emission disclosures requires firms to quantify emissions, articulate reduction targets, and describe governance arrangements for climate-related risks, making these disclosures more informative than standardized performance ratings. Carbon disclosure may therefore enhance investor confidence by clarifying how firms manage environmental risks that are increasingly perceived as financially material.

The results also align with legitimacy and stakeholder theories. Transparent carbon disclosure appears effective in addressing stakeholder expectations regarding environmental responsibility and in strengthening firms' social legitimacy. Unlike mandatory compliance-based measures, voluntary disclosure allows firms to communicate proactive engagement with sustainability issues, which may be valued by investors and other stakeholders in assessing long-term viability.

The empirical evidence is consistent with prior studies documenting a positive association between carbon emission disclosure and firm value in Indonesia (Hardiyansah et al., 2021). Lee & Cho (2021) find a positive association between carbon emissions and firm value for chaebol groups in Korea, suggesting that market interpretation of carbon-related information varies across regulatory environments and capital market structures.

These results indicate that, in the Indonesian capital market, narrative transparency in carbon reporting plays a more salient role in shaping investor perceptions than formal environmental performance classifications. In an emerging market context where sustainability regulation and reporting practices are still evolving, carbon emission disclosure is more likely to be interpreted as a proactive governance signal rather than as mere regulatory compliance, thereby enhancing its relevance for firm valuation.

Conclusions

This study examines the association between environmental performance ratings, carbon disclosure transparency, and firm value among Indonesian listed firms in the energy and industrial sectors during 2019–2023. The results show that environmental performance ratings, as measured by PROPER, are not significantly associated with

firm value, whereas carbon disclosure transparency exhibits a positive association with Tobin's Q. These findings indicate that, in the Indonesian capital market, investors respond more strongly to detailed and decision-useful carbon-related disclosures than to aggregate environmental performance ratings. The results are interpreted as associational rather than causal, given potential endogeneity in disclosure decisions.

Policy implications suggest that strengthening the quality and comparability of carbon disclosure may be more effective in enhancing market transparency than relying primarily on broad performance rating schemes. Regulatory frameworks could place greater emphasis on disclosure elements that are directly relevant for valuation, such as emission scope coverage, quantified targets, progress indicators, and third-party assurance. Firms may enhance market perceptions by providing credible and transparent carbon information that reduces uncertainty related to environmental risks and transition strategies, particularly when disclosures are integrated with measurable targets and capital allocation decisions. Investor assessment of firm value and environmental risk exposure depends on the ability to distinguish between formal environmental performance ratings and the informational content embedded in voluntary disclosures. Future research may build on these findings by employing identification strategies such as regulatory shocks or quasi-experimental designs, and by examining heterogeneity across sectors, carbon intensity, and governance structures, as well as differences between disclosure quantity and disclosure quality.

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