





When sustainability disclosure falls short: A managerial accounting perspective

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ABSTRACT

Sustainability reporting has become increasingly important in corporate governance, yet its value relevance remains uncertain in emerging-market settings where disclosure quality and institutional assurance are uneven. This study examines the effects of carbon emission disclosure, debt financing, and firm size on firm value in Indonesia's energy and mining sector. It focuses on whether market valuation in a sustainability-sensitive industry is shaped by external disclosure, financing structure, or the organizational capacity that supports credible governance and reporting. Using a quantitative explanatory design, the study analyzes panel data from 70 firm-year observations spanning 2018 to 2024. The results show that firm size has a positive and significant effect on firm value, whereas carbon emission disclosure and debt financing do not. These findings indicate that, in this context, disclosure alone is insufficient to generate market value unless stronger internal capabilities and higher governance quality support it. The study contributes to the development of carbon emission disclosure research in Indonesia by showing that the market responds less to disclosure volume than to the organizational conditions that make disclosure credible. The findings also offer broader insight for sustainability accounting in Asian markets, where reporting reform is advancing faster than assurance and enforcement capacity.

Keywords: carbon emission disclosure, debt financing, environmental management accounting, firm value, resource-based view, sustainability accounting

INTRODUCTION

Sustainability reporting has become a central concern in corporate governance because firms are now assessed not only by financial outcomes but also by how credibly they disclose environmental risk and responsibility. Prior research shows that environmental disclosure can reduce information asymmetry and strengthen market confidence when the information is credible and useful for investor decision-making (Christensen et al., 2021; Hamrouni et al., 2022). However, this relationship remains uneven across institutional settings. In emerging markets, weak enforcement, limited assurance, and uneven reporting quality can reduce the credibility of sustainability disclosure, so firms may gain symbolic visibility without securing stronger valuation effects (Baier et al., 2022; Boateng et al., 2022; Uyar et al., 2024; Yuan et al., 2025).

This issue is especially important in the energy and mining sector. These industries are economically strategic, but they also face intense environmental scrutiny because of their carbon footprint and broader ecological impact. In Indonesia,

this tension is particularly visible. Sustainability reporting has expanded, but disclosure quality remains uneven and largely shaped by firm-level commitment rather than strong verification mechanisms (Qian et al., 2025). Under such conditions, carbon emission disclosure may serve legitimacy needs without necessarily convincing investors that environmental risks are being managed in a substantive and disciplined manner. This leaves an important question unresolved. Does carbon disclosure still influence firm value when institutional credibility remains weak?

That question cannot be answered solely by disclosure. In carbon-intensive sectors, firm value is also shaped by financing decisions and organizational capacity. Debt financing matters because these firms rely heavily on external capital, yet markets may read leverage differently depending on whether borrowing reflects strategic discipline or financial vulnerability. Firm size also matters because larger firms usually possess broader resources, stronger governance systems, and greater capacity to absorb compliance costs and implement sustainability routines (Azimli & Çek, 2023). The issue, then, is not simply whether firms disclose, borrow, or grow. The deeper issue is how disclosure, financing, and

organizational capability interact in shaping market valuation in an emerging economy.

This study addresses that issue through three complementary theoretical lenses. Signaling Theory explains why firms disclose information to reduce uncertainty and influence investor judgment, while also suggesting that signals lose value when they are inexpensive, unverifiable, or easy to imitate (Connelly et al., 2024). Legitimacy Theory explains why firms disclose sustainability information to align with social expectations and secure external approval, even when disclosure is not fully matched by operational change (Crossley et al., 2021; Juusola & Srouji, 2023). The Resource-Based View adds that sustainability-related value depends on internal capability, because firms need resources, routines, and control systems that can turn environmental commitments into credible and sustained performance (El Nemar et al., 2025). Taken together, these perspectives help explain why carbon disclosure and financing may fail to influence firm value in weak institutional settings, while firm-level capacity may become more decisive.

This framing also clarifies why managerial accounting is relevant to the study. Carbon disclosure is not only an external communication practice. It depends on internal measurement, classification, control, and reporting routines. In the same way, debt financing requires disciplined planning, monitoring, and evaluation if borrowed funds are to support long-term value rather than heighten risk. Larger firms are often better positioned to institutionalize such routines through environmental management accounting, sustainability-based budgeting, and performance control systems (Appannan et al., 2022; Dzeraviaha, 2023; Gunarathne et al., 2023; Swalih et al., 2024). This perspective shifts the analysis away from disclosure as a standalone signal and toward disclosure as part of a broader accounting and governance infrastructure.

Against this background, the present study examines the effects of carbon emission disclosure, debt financing, and firm size on firm value in publicly listed Indonesian energy and mining firms during 2018 to 2024. The study seeks to clarify whether market valuation in this context is primarily shaped by external sustainability signals, financial structure, or internal capabilities that support credible governance and reporting. This focus is important because prior studies often examine these factors separately or assume that disclosure effects observed in stronger institutional environments can be generalized to other contexts. That assumption remains open to question in emerging markets, where sustainability expectations are rising faster than assurance quality and regulatory enforcement.

The study is expected to add value in several respects. It sharpens the current debate on carbon emission disclosure by showing that its market relevance depends not only on disclosure itself but also on the institutional and organizational conditions that support credibility. It also places carbon disclosure, debt financing, and firm size within a single analytical framework, making their relationship to firm value more transparent. Finally, it provides evidence from Indonesia's energy and mining sector to inform wider discussions across Asian markets facing similar tensions between sustainability reforms, investor expectations, and uneven governance capacity. In this way, the study explains

why firm value in sustainability-sensitive sectors cannot be understood solely in terms of disclosure volume, but must also be interpreted through legitimacy, financial discipline, and managerial capability.

THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

This study draws on Signaling Theory, Legitimacy Theory, and the Resource-Based View to explain how carbon emission disclosure, debt financing, and firm size relate to firm value in Indonesia's energy and mining sector. These three perspectives are used together because market valuation in sustainability-sensitive industries is not determined solely by financial indicators. It is also shaped by how firms communicate environmental accountability, how stakeholders assess the credibility of that communication, and whether firms have the internal capacity to sustain it over time. In this setting, carbon disclosure, financing policy, and organizational scale should therefore be understood as connected elements of corporate value formation rather than as isolated variables (Connelly et al., 2024; Crossley et al., 2021; El Nemar et al., 2025).

Signaling Theory is relevant because sustainability disclosure is intended to reduce information asymmetry and influence investor judgment. Yet signaling only works when the information is viewed as credible (Connelly et al., 2024). In settings where disclosure remains largely voluntary and verification is limited, carbon information may not be interpreted as a reliable sign of future performance. Legitimacy Theory complements this logic by showing that firms disclose environmental information not only to inform the market, but also to secure social approval and respond to stakeholder expectations. In carbon-intensive industries, however, legitimacy may remain symbolic when disclosure is not supported by visible operational discipline (Zhu et al., 2025). The Resource-Based View adds a further layer by explaining that sustainability-related value depends on internal capability (Ortiz-Avram et al., 2024). Firms are more likely to generate value from disclosure and financial strategy when they possess the resources, routines, and control systems needed to sustain credible action. This is why firm size matters in this study, not merely as a scale indicator, but as a proxy for resource depth, governance infrastructure, and managerial capacity (Dzeraviaha, 2023; França et al., 2021; Juusola & Srouji, 2023).

This integrated framework also clarifies the role of managerial accounting in the study. Carbon disclosure does not begin at the reporting stage. It depends on internal measurement, classification, control, and evaluation routines. Debt financing likewise requires planning discipline, monitoring, and accountability if it is to support long-term value rather than increase vulnerability. Firm size becomes important because larger firms are generally better positioned to institutionalize such routines through environmental cost accounting, sustainability budgeting, and more developed management control systems. In this sense, the present model links firm value to signaling quality, legitimacy alignment, and organizational capability simultaneously.

Carbon Emission Disclosure and Firm Value

Carbon emission disclosure reflects the extent to which firms communicate their emissions, carbon management practices, and environmental accountability to external stakeholders (Ding et al., 2023). From a signaling perspective, such disclosure should improve firm value by reducing uncertainty and signaling that management is willing to be transparent about environmental risks. Prior studies report that environmental disclosure may strengthen reputation, improve investor confidence, and support market valuation when the information is perceived as credible and relevant to future performance (Friske et al., 2023; Rohani et al., 2023; Setiawan et al., 2025).

That expectation, however, is not universal. Evidence remains mixed because disclosure can also reveal environmental liabilities, operational weakness, or high compliance exposure. Some studies find that carbon disclosure is associated with higher firm value when reporting is viewed as authentic and decision useful, while others show that disclosure may fail to generate value when stakeholders doubt its substance or interpret it as a response to reputational pressure rather than real operational change (Ellimäki et al., 2021; Shi et al., 2025; Sun et al., 2022).

That tension is particularly relevant in Indonesia's energy and mining sector. These firms operate under intense environmental scrutiny, yet institutional assurance remains uneven. Under such conditions, carbon disclosure may help firms maintain legitimacy. However, it may not be sufficient to affect valuation unless investors believe that credible internal systems and consistent environmental performance support the reported information. From a managerial accounting standpoint, this means that disclosure quality depends on whether firms can trace environmental costs, monitor emissions, and integrate such information into planning and control. Even so, the theoretical expectation remains that more extensive carbon disclosure should be associated with stronger firm value because it signals transparency and accountability. Accordingly, the first hypothesis is stated as follows:

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

Debt Financing and Firm Value

Debt financing is a major strategic issue in the energy and mining sector because firms in this industry require substantial capital to support long-term assets, operational continuity, and regulatory obligations. In theory, debt can enhance firm value when investors interpret borrowing as evidence of growth capacity, confidence, and financial discipline. Debt may also improve managerial discipline by increasing monitoring pressure and reducing inefficient resource use. Under this logic, financing policy can operate as a signal of strategic intent (Ding et al., 2022; Tang et al., 2025).

However, the effect of debt on firm value is highly context dependent. When leverage becomes excessive, it may increase perceived risk, heighten financial pressure, and weaken investor confidence (Kalash, 2023). This concern is more pronounced in capital-intensive sectors where high leverage is often treated as a structural necessity rather than as a sign of

superior strategy. In such contexts, debt may lose its signaling value because investors no longer read borrowing as a distinctive marker of quality. Prior evidence, therefore, remains divided. While moderate leverage may support discipline, higher debt can reduce valuation when future returns are uncertain or when firms fail to show how borrowed funds support productive and credible long-term outcomes (Ali & Shaik, 2022).

Legitimacy Theory further suggests that debt contributes to valuation only when external financing is aligned with accountability and stakeholder expectations (Akhter et al., 2023). If firms cannot communicate how debt supports sustainability investments, operational resilience, or governance quality, leverage may appear as a source of vulnerability rather than a source of credibility. This issue also has direct managerial accounting implications, as financing decisions require planning, monitoring, and performance evaluation to maintain strategic discipline in capital commitments. In the Indonesian energy and mining sector, where borrowing is common and environmental pressure is high, the more plausible expectation is that greater debt financing will weaken firm value. The second hypothesis is therefore formulated as follows:

H2 Higher debt financing reduces firm value.

Firm Size and Firm Value

Firm size is commonly associated with broader resources, stronger governance infrastructure, and greater capacity to respond to stakeholder expectations. Larger firms generally have better access to capital, more stable administrative systems, and greater ability to absorb the costs of compliance, assurance, and sustainability implementation (Mensah et al., 2026). From the Resource-Based View, these features matter because they reflect the resource base through which firms build strategic resilience and sustain long-term value creation (El Nemar et al., 2025; Liu, 2025; Seroka-Stolka & Fijorek, 2020).

Prior studies also show that larger firms tend to exhibit stronger firm value because they are more likely to institutionalize governance systems, support sustainability reporting, and maintain stronger stakeholder confidence (Azimli & Çek, 2023; Younis & Sundarakani, 2020). In the present study, size is therefore interpreted not merely as a control variable but as an indicator of whether the firm has the internal capacity to make environmental accountability credible and financially meaningful. This is also where managerial accounting becomes especially relevant. Larger firms are more likely to implement environmental management accounting, life-cycle costing, and sustainability-based budgeting, which help convert scale into operational discipline and more credible reporting (Amoako et al., 2021; Dzeraviaha, 2023; Zatini et al., 2025).

To be sure, size does not guarantee superior value in every case. Large organizations may also face agency problems, reputational exposure, and coordination inefficiencies. Even so, in sustainability-sensitive sectors such as energy and mining, the balance of theory and prior evidence suggests a positive expectation, as larger firms are better equipped to sustain governance credibility, withstand environmental

Table 1. Variables operationalization

No	Variable	Definition	Proxy	Scale
1	Carbon emission disclosure	Transparency in reporting carbon emissions under GRI 305 (Choi & Luo, 2021)	GRI 305 disclosure index	Ratio
2	Debt financing	External funds obtained through borrowing (Ali & Shaik, 2022)	Total debt to total equity ratio	Ratio
3	Firm size	Organizational capacity and resources (Amimakmur et al., 2024)	Natural logarithm of total assets	Ratio
4	Firm value	Market value relative to asset replacement cost (Dang et al., 2019)	Tobin's Q	Ratio

Source: Authors' compilation from previous studies, 2025

scrutiny, and align financial and non-financial control systems. The third hypothesis is therefore stated as follows:

H3 Firm size has a positive effect on firm value.

The three hypotheses in this study reflect a single analytical logic. Carbon emission disclosure enhances transparency in environmental accountability. Debt financing reflects how firms manage external capital under conditions of risk and stakeholder pressure. Firm size represents the organizational capacity needed to sustain credible governance and reporting. For that reason, their relationship with firm value should not be read as a set of isolated effects. In Indonesia's energy and mining sector, market valuation is more likely to depend on whether disclosure is supported by financial discipline and internal capability than on disclosure alone.

RESEARCH METHODOLOGY

This study uses a quantitative explanatory design to examine whether carbon emission disclosure, debt financing, and firm size influence firm value in Indonesia's energy and mining sector. The sector was deliberately selected because it combines strategic economic importance with substantial environmental exposure, making it an appropriate setting for assessing whether sustainability-related mechanisms are reflected in market valuation under uneven institutional conditions. The analysis covers firms listed on the Indonesia Stock Exchange from 2018 to 2024.

The sample was determined through purposive sampling. Firms were included only when they consistently published financial and sustainability reports during the observation period, showed sufficiently comparable reporting practices, and provided complete data suitable for panel estimation. Applying these criteria produced a balanced panel of 10 firms and 70 firm-year observations. This sampling approach was chosen because the study does not aim to generalize across all industries. Instead, it focuses on firms that actively engage in sustainability reporting and provide stable and comparable data, which is more appropriate for testing the proposed explanatory model in an emerging-market context (Al Amosh et al., 2024; Appannan et al., 2022).

The study includes one dependent variable and three independent variables. Their operational definitions, proxies, and measurement scales are presented in **Table 1**. Carbon emission disclosure is measured using the GRI 305 disclosure standard, which provides a structured basis for assessing emissions-related transparency (Choi & Luo, 2021). Debt financing is proxied by the debt-to-equity ratio, reflecting the extent to which firms rely on external borrowing in a capital-

intensive sector (Ali & Shaik, 2022). Firm size is measured by the natural logarithm of total assets, following prior work that treats size as a proxy for organizational capacity and resource depth (Amimakmur et al., 2024). Firm value is measured by Tobin's Q, calculated as the ratio of the market value of equity plus liabilities to the book value of assets (Dang et al., 2019). Tobin's Q is retained because this study is concerned with how investors value firms under environmental risk, financing pressure, and uneven institutional assurance. Compared with purely accounting-based measures, Tobin's Q is more suitable here because it captures forward-looking market expectations rather than historical accounting performance alone (Dang et al., 2019).

The final model was expressed as a multiple linear panel regression of firm value on the three explanatory variables, with firm-specific and temporal effects explicitly controlled. The equation can be written as:

$$FV_{it} = \alpha + \beta_1 CED_{it} + \beta_2 DF_{it} + \beta_3 FS_{it} + \epsilon_{it} \quad (1)$$

where FV_{it} denotes firm value for firm i in year t , CED_{it} denotes carbon emission disclosure, DF_{it} denotes debt financing, FS_{it} denotes firm size, and ϵ_{it} denotes the error term. This model tests whether sustainability disclosure, financing structure, and organizational capacity explain variation in firm value across firms and over time.

The analytical procedure follows a structured sequence. First, descriptive statistics are used to summarize the central tendency, dispersion, and distributional characteristics of each variable. This step is useful for identifying variation across firms and providing an initial understanding of the dataset. Second, panel regression analysis is applied because the dataset combines cross-sectional and time-series observations. This approach is appropriate because it captures both inter-firm heterogeneity and intra-firm dynamics over time. Third, model selection is conducted using the Chow, Hausman, and Lagrange Multiplier tests. The Chow test is used to compare common-effects and fixed-effects specifications. The Hausman test then evaluates whether fixed effects or random effects are more appropriate. When relevant, the Lagrange Multiplier test is used to distinguish between common and random effects. In this study, the test sequence supports the use of the random-effects model, which accommodates firm-level heterogeneity while remaining efficient under the observed specification results.

After model selection, diagnostic procedures are applied to assess the reliability of the regression estimates. Multicollinearity is examined to ensure that the independent variables do not show problematic overlap. Heteroskedasticity is assessed to determine whether the residuals' variance remains stable across observations. These procedures are

Table 2. Descriptive statistics

Variable	Mean	Std. dev.	Minimum	Maximum
Firm value	0.989	0.277	0.098	1.602
Carbon emission disclosure	0.660	0.241	0.000	0.890
Debt financing	1.610	1.672	0.050	7.618
Firm size	30.790	1.106	28.632	32.357

Source: Processed data, 2025

Table 3. Model testing

Testing	Prob.	Model
Chow test	0.0000	Fixed effect model
Hausman test	0.1299	Random effect model
Lagrange multiplier test	0.0000	Random effect model

Source: Processed data, 2025

necessary because the study seeks not only statistical significance but also dependable inference. Hypothesis testing is then conducted using the F-test for overall model significance and t-tests for individual coefficient significance. The coefficient of determination is also reported to show the proportion of variation in firm value explained by the model.

This methodological design also supports the study's managerial accounting perspective. Carbon emission disclosure is treated not merely as an external reporting output, but as a visible result of internal measurement and control capability. Debt financing is treated not only as a capital-structure ratio, but also as an indicator of how firms manage externally sourced funds under strategic and legitimacy pressure. Firm size is included not simply as a descriptive characteristic, but as a proxy for the capacity to sustain governance routines, environmental measurement, and management control infrastructure. This framing aligns the empirical model with the broader argument that firm value in sustainability-sensitive sectors depends on the credibility of both disclosure and internal capability.

RESULT

Descriptive Statistics

Table 2 presents the descriptive statistics for firm value, carbon emission disclosure, debt financing, and firm size. The figures provide an initial picture of the sample before the regression model is estimated. The mean value of firm value, measured by Tobin's Q, is 0.989, with a minimum of 0.098 and a maximum of 1.602. This indicates that the market valuations of the sampled firms vary, although the average remains close to book value. Carbon emission disclosure has a mean of 0.660 and a range of 0.000 to 0.890, indicating that disclosure levels differ considerably across firms. Debt financing records the highest dispersion, with a mean of 1.610 and a standard deviation of 1.672, suggesting substantial variation in capital structure across the sampled companies. Firm size shows the smallest spread, with a mean of 30.790 and a standard deviation of 1.106, indicating that the firms are relatively comparable in scale.

These descriptive results show two broad patterns. First, disclosure practices are not uniform, as reflected in the zero minimum value for carbon emission disclosure. Second,

Table 4. Classical assumption test result

	CED	DF	FS	Prob. value
CED	1.000000	0.050284	0.327367	0.6606
DF	0.050284	1.000000	0.404992	0.2518
FS	0.327367	0.404992	1.000000	0.3192

Source: Processed data, 2025

leverage differs more widely than firm size across the sample. This combination suggests that the firms operate within a relatively comparable industrial setting but still differ in reporting intensity and financing structure. At this stage, descriptive statistics are useful for identifying variation in the data, but, by themselves, they do not indicate the direction or significance of the causal relationships tested in the regression model.

Model Selection

To determine the most appropriate panel-data specification, the study applied the Chow, Hausman, and Lagrange Multiplier tests. The Chow test yielded a p-value of 0.0000, indicating that the common-effects model should be rejected in favor of a model that accounts for firm-specific effects. The Hausman test yielded a p-value of 0.1299, which is above the 0.05 threshold, indicating that the random-effects model is preferable to the fixed-effects model. The Lagrange Multiplier test further supported this result, with a p-value of 0.0000, confirming that the random-effects specification is more appropriate than the common-effects model. Based on this sequence, the regression analysis proceeds using the random-effects model as shown in **Table 3**.

Classical Assumption Test Results

After selecting the random-effects model, diagnostic tests were conducted to assess the reliability of the regression estimates. The correlation values among the independent variables are all below 0.90, which indicates that multicollinearity is not a serious concern in the model. The Glejser test also shows probability values above 0.05 for carbon emission disclosure, debt financing, and firm size, indicating that heteroskedasticity is not detected. These results support the suitability of the selected model for hypothesis testing as shown in **Table 4**.

Table 5. F-test results

R-squared	Adjusted R-squared	F-statistic	Prob (F-statistic)
0.186785	0.143220	4.287503	0.008566

Source: Processed data, 2025

Table 6. Regression test result

Variable	Coefficient	Std. error	t-statistic	Prob.
FV	-4.579326	1.601158	-2.860008	0.0059
CED	0.046391	0.096423	0.481118	0.6323
DF	-0.012808	0.019674	-0.650999	0.5177
FS	0.001807	0.000525	3.443400	0.0011

Source: Processed data, 2025

Regression Results

Table 5 reports the overall model fit. The F-statistic is 4.287503, with a p-value of 0.008566, which is below 0.05. This indicates that carbon emission disclosure, debt financing, and firm size jointly explain variation in firm value. The adjusted R-squared value is 0.143220, meaning that the model explains 14.32 percent of the variation in firm value, while the remaining variation is associated with other factors outside the model.

Table 6 presents the individual regression coefficients. Carbon emission disclosure has a positive coefficient of 0.046391 but is not statistically significant, with a probability value of 0.6323. Debt financing has a negative coefficient of -0.012808 and is not statistically significant (p-value = 0.5177). Firm size, by contrast, shows a positive coefficient of 0.001807 and is statistically significant at the 1 percent level, with a probability value of 0.0011. These results indicate that, within the sampled firms, only firm size has a significant direct association with firm value.

Based on these coefficients, the estimated regression equation of this study can be written as follows:

$$FirmValue = -4.5793 + 0.0463 CED - 0.0128 DF + 0.0018 FS + \varepsilon \quad (2)$$

Regarding the hypothesis outcomes, the results do not support H1 or H2. Carbon emission disclosure and debt financing do not have a significant effect on firm value. H3 is supported, as firm size has a positive, statistically significant effect on firm value. These findings establish the empirical pattern that will be interpreted in the following discussion section.

DISCUSSION

The findings reveal a pattern that is difficult to dismiss as incidental. Carbon emission disclosure and debt financing are not statistically significantly associated with firm value, whereas firm size is. In the context of Indonesia's energy and mining sector, this pattern suggests that market valuation is not shaped primarily by the formal presence of sustainability disclosure or by leverage in isolation. What seems to matter more is whether firms possess the organizational depth to make disclosure credible, governance durable, and financial commitments manageable over time. This is why firm value in the present setting appears to depend more on organizational

capacity than on symbolic environmental communication or capital-structure signaling.

The result for carbon emission disclosure requires careful interpretation. Its coefficient is positive, but the relationship is not statistically significant. This means that broader disclosure does not translate into a measurable valuation premium within the sampled firms. The result remains consistent with the core insight of Signaling Theory. A signal matters only when the market treats it as credible. In settings where disclosure quality is uneven and assurance remains limited, carbon information may be visible without becoming persuasive. Firms may attempt to signal environmental accountability, yet the market does not necessarily translate those disclosures into measurable value creation. Earlier studies report similarly mixed evidence. Environmental disclosure can strengthen valuation when stakeholders regard it as reliable and decision-useful, but the effect weakens when disclosure is read mainly as compliance, image management, or reputational defence rather than as evidence of substantive operational commitment (Choi & Luo, 2021; Shi et al., 2021; Uyar et al., 2024).

This point is particularly relevant to the Indonesian setting. The finding does not imply that carbon emission disclosure is irrelevant. It shows, rather, that disclosure alone is not enough. In a sector with high environmental exposure, investors question whether reported sustainability claims are supported by stronger internal discipline. That is where managerial accounting becomes central. Carbon disclosure is more likely to be trusted when firms can trace environmental costs, monitor emissions consistently, connect non-financial data to planning, and embed sustainability targets in performance evaluation. Without that internal foundation, disclosure remains more communicative than evidentiary. The present study, therefore, adds to the development of carbon emission disclosure research in Indonesia by showing that the central issue is no longer only whether firms disclose, but whether disclosure is supported by the accounting infrastructure and governance quality needed to make it credible. This reading also aligns with the theoretical argument developed earlier. Disclosure becomes value-relevant only when signaling, legitimacy, and internal capability reinforce one another.

Debt financing also shows no statistically significant relationship with firm value, although its coefficient is negative. This result suggests that investors do not interpret leverage as a decisive signal of value in this sector. In theory, debt can indicate growth intent, strategic confidence, and financing discipline. In practice, however, energy and mining firms operate in a capital-intensive environment where borrowing is often routine. Once leverage is treated as normal, it loses much of its distinct signaling value. Investors may then view debt less as evidence of strategic strength and more as a structural feature of the business. The negative sign remains informative because it suggests that leverage is more closely associated with vulnerability than with valuation gains when firms cannot demonstrate that external financing supports productive investment, operational resilience, or credible sustainability commitments. This interpretation is consistent with earlier work showing that the effect of debt on firm value depends heavily on context, governance quality, and the

discipline with which capital is deployed, rather than on leverage levels alone (Ali & Shaik, 2022; Tan et al., 2025; Tripathy & Uzma, 2021).

The managerial accounting relevance of this result is also clear. Financing policy is not merely a matter of balance-sheet composition. It is a question of planning, monitoring, and control. Borrowed funds need to be tied to measurable outcomes if they are to strengthen confidence. In sustainability-sensitive sectors, that requirement becomes more demanding because investors increasingly expect firms to show how financing supports environmental compliance, operational transition, or long-horizon strategic discipline. Where those links remain unclear, debt is unlikely to improve valuation. The non-significant result should therefore not be read as evidence that financing decisions do not matter. It should be read as evidence that financing structure alone is too thin a signal unless it is supported by stronger governance and more credible accounting routines.

Firm size is the only variable that shows a positive and statistically significant effect on firm value. This result is theoretically coherent and empirically important. From a Resource-Based View perspective, larger firms generally command broader resources, more developed reporting systems, and stronger governance infrastructures. Those advantages matter in sustainability-sensitive sectors because they make it easier to absorb compliance costs, sustain reporting continuity, engage assurance, and respond more consistently to stakeholder scrutiny. Investors appear to recognize those differences. They seem to treat organizational capacity and scale as strong indicators of resilience, efficiency, and long-term competitiveness. Earlier studies point in the same direction, showing that larger firms often enjoy stronger valuation because scale is associated with visibility, institutional capacity, and strategic resilience rather than with size alone (Amimakmur et al., 2024; Azimli & Çek, 2023; Younis & Sundarakani, 2020).

In sustainability-sensitive sectors, the significance of firm size extends beyond resource availability. Larger firms are often better able to sustain internal controls and governance structures that reinforce organizational resilience and strengthen institutional credibility over time. Under such conditions, scale supports not only operational continuity but also disciplined reporting and accountability routines as part of internal control and good corporate governance, which shape stakeholder confidence, including higher employee engagement (Haryanto et al., 2022, 2023).

This result also clarifies how the three explanatory variables relate to one another. Carbon disclosure and debt financing do not become irrelevant simply because they are statistically insignificant. Their limited direct effect becomes more intelligible once firm size is considered. Size appears to capture the organizational conditions under which disclosure and financing become credible. Larger firms are more likely to possess the systems needed to turn environmental reporting into a meaningful signal and to make leverage appear manageable rather than precarious. In that sense, the market may not be directly rewarding disclosure or debt. It may be rewarding the underlying capability that allows both practices to be interpreted as credible. This is precisely where the three theoretical lenses converge. Signaling Theory explains why

disclosure and financing might matter. Legitimacy Theory explains why both must align with broader stakeholder expectations. The Resource-Based View explains why internal capability ultimately determines whether that alignment is convincing enough to influence firm value.

The adjusted R-squared of 0.143 should be understood in that same context. The value is modest, but it is not surprising. Firm value is a multidimensional outcome. It is shaped not only by disclosure, leverage, and scale, but also by commodity price movements, governance quality, ownership structure, macroeconomic conditions, regulatory uncertainty, assurance practices, and broader market sentiment. In emerging-market settings, these influences are often uneven and difficult to isolate. A relatively low adjusted R-squared, therefore, does not indicate that the model lacks relevance. It shows that the present variables explain only part of a more complex valuation process. That is still informative. Even within a fragmented valuation environment, firm size remains salient, whereas carbon disclosure and debt financing do not yet command strong pricing power. In this sense, the low explanatory power should be read as contextual evidence of the uneven translation of sustainability-related mechanisms into market value, not as evidence that the theoretical model is misplaced.

The sample size also needs to be acknowledged directly. The analysis is based on a balanced panel of 70 firm-year observations drawn from 10 listed firms. This design improves comparability because the model is estimated on firms with relatively stable reporting availability across the entire observation period. At the same time, it narrows the breadth of inference. The findings should therefore be read as sector-specific evidence rather than as a universal pattern for all Indonesian firms or all emerging markets. That limitation is important, but it does not diminish the study's value. It clarifies the argument's scope. The study shows how valuation works in a setting where environmental pressure is high, disclosure remains uneven, and organizational capability matters more than formal transparency alone. Future research can extend this line of inquiry by including broader sectoral coverage, richer governance and assurance variables, or mixed-method designs that capture managerial intent and reporting quality more directly.

The broader implications extend beyond Indonesia. Many Asian markets are moving toward more demanding sustainability-reporting regimes, yet assurance quality, enforcement, and governance maturity remain uneven. The present findings suggest that regulatory expansion alone may not be sufficient to render sustainability disclosure value-relevant in high-emission sectors. Market response depends on whether firms can support disclosure with reliable data, internal control, and credible implementation. This point is especially relevant for the energy and mining sector, where sustainability pressure is rising quickly, but investors may still privilege capability over narrative. The study, therefore, contributes not only to the Indonesian literature but also to a wider regional discussion about how sustainability disclosure becomes economically meaningful when institutional reform advances faster than verification capacity.

CONCLUSION

This study examined whether carbon emission disclosure, debt financing, and firm size influence firm value in publicly listed energy and mining firms in Indonesia during 2018 to 2024. The findings show a clear pattern. Carbon emission disclosure does not have a significant effect on firm value. Debt financing also has little effect. Firm size, by contrast, shows a positive and statistically significant relationship with firm value. These results indicate that, in this setting, market valuation is shaped less by disclosure alone or by leverage in isolation than by the organizational capacity that makes governance, reporting, and strategic discipline credible.

This conclusion is important for the sustainability accounting literature because it challenges the assumption that the market will automatically reward broader carbon disclosure. In the Indonesian energy and mining sector, disclosure appears to matter only when it is supported by stronger internal capability and governance quality. The study, therefore, contributes to the development of carbon emission disclosure research in Indonesia by showing that the main issue is not simply whether firms disclose environmental information, but whether that disclosure is supported by internal controls, reliable measurement, and disciplined implementation. The findings also reinforce the value of combining Signaling Theory, Legitimacy Theory, and the Resource-Based View, because disclosure, financing, and firm value are better understood as connected outcomes of credibility, legitimacy, and organizational capability rather than as separate statistical relationships.

The study should also be read within its limits. The analysis is based on a balanced panel of 70 firm-year observations from 10 listed firms, which improves comparability but narrows the breadth of inference. The findings are therefore best read as sector-specific evidence rather than as a universal pattern across all firms or markets. The adjusted R-squared is also modest, indicating that firm value in this context is shaped by many factors beyond the current model, including governance conditions, ownership structure, market sentiment, regulatory uncertainty, and sectoral volatility. This does not weaken the study's relevance. It shows that sustainability-related valuation remains complex in emerging-market settings and that organizational capacity currently has more visible pricing power than disclosure alone.

Managerial and Policy implications

For managers, the findings suggest that carbon disclosure should not be treated as a stand-alone reporting exercise. Disclosure is more likely to become credible when it is supported by internal measurement systems, environmental cost tracking, disciplined planning, and performance controls that connect sustainability commitments to operational practice. The same logic applies to financing decisions. Debt is unlikely to strengthen market confidence when it is presented only as a capital-structure outcome. Managers need to show how external financing supports resilience, regulatory readiness, and long-term strategic discipline. In this respect, managerial accounting becomes central because it provides the routines through which environmental accountability,

capital allocation, and governance discipline can be made visible and credible.

For regulators and policymakers, the findings suggest that expanding reporting requirements alone may not be sufficient to strengthen firm value effects in high-emission sectors. Carbon disclosure is unlikely to command a stronger market response when assurance quality, comparability, and internal implementation remain uneven. Policy development should therefore move beyond encouraging disclosure volume and place greater emphasis on reporting quality, verification mechanisms, and stronger internal accountability practices. This implication is relevant not only for Indonesia but also for other Asian markets where sustainability reporting reform is advancing faster than enforcement and assurance capacity. In such settings, the market is likely to respond more strongly to credible implementation than to disclosure form alone.

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REFERENCES

- Akhter, F., Hossain, M. R., Elrehail, H., Rehman, S. U., & Almansour, B. (2023). Environmental disclosures and corporate attributes, from the lens of legitimacy theory: A longitudinal analysis on a developing country. *European Journal of Management and Business Economics*, 32(3), 342-369. <https://doi.org/10.1108/EJMBE-01-2021-0008>
- Al Amosh, H., Khatib, S. F. A., Alkurdi, A., & Bazhair, A. H. (2024). Capital structure decisions and environmental, social, and governance performance: Insights from Jordan. *Journal of Financial Reporting and Accounting*, 22(4), 972-989. <https://doi.org/10.1108/JFRA-12-2021-0453>

- Ali, A., & Shaik, A. R. (2022). Effect of debt financing on firm performance: A study on the energy sector of Saudi Arabia. *International Journal of Energy Economics and Policy*, 12(6), 10-15. <https://doi.org/10.32479/ijeep.13677>
- Amimakmur, S. A., Saifi, M., Damayanti, C. R., & Hutahayan, B. (2024). Assessing the moderating effect of IT innovation on the interplay among company size, financial performance, and company value. *Journal of Open Innovation: Technology, Market, and Complexity*, 10(3), Article 100318. <https://doi.org/10.1016/j.joitmc.2024.100318>
- Amoako, G. K., Adam, A. M., Arthur, C. L., & Tackie, G. (2021). Institutional isomorphism, environmental management accounting and environmental accountability: A review. *Environment, Development and Sustainability*, 23(8), 11201-11216. <https://doi.org/10.1007/s10668-020-01140-y>
- Appannan, J. S., Mohd Said, R., Ong, T. S., & Senik, R. (2022). Promoting sustainable development through strategies, environmental management accounting, and environmental performance. *Business Strategy and the Environment*, 32(4), 1914-1930. <https://doi.org/10.1002/bse.3227>
- Azimli, A., & Çek, K. (2023). Can sustainability performance mitigate the negative effect of policy uncertainty on the firm valuation? *Sustainability Accounting Management and Policy Journal*, 15(3), 752-775. <https://doi.org/10.1108/sampj-09-2022-0464>
- Baier, C., Götttsche, M., Hellmann, A., & Schiemann, F. (2022). Too good to be true: Influencing credibility perceptions with signaling reference explicitness and assurance depth. *Journal of Business Ethics*, 178(3), 695-714. <https://doi.org/10.1007/s10551-020-04719-7>
- Boateng, R. N., Tawiah, V., & Tackie, G. (2022). Corporate governance and voluntary disclosures in annual reports: A post-International Financial Reporting Standard adoption evidence from an emerging capital market. *International Journal of Accounting & Information Management*, 30(2), 252-276. <https://doi.org/10.1108/IJAIM-10-2021-0220>
- Choi, B., & Luo, L. (2021). Does the market value greenhouse gas emissions? Evidence from multi-country firm data. *The British Accounting Review*, 53(1), Article 100909. <https://doi.org/10.1016/j.bar.2020.100909>
- Christensen, H. B., Hail, L., & Leuz, C. (2021). Mandatory CSR and sustainability reporting: Economic analysis and literature review. *Review of Accounting Studies*, 26(3), 1176-1248. <https://doi.org/10.1007/s11142-021-09609-5>
- Connelly, B. L., Certo, S. T., Reutzel, C. R., DesJardine, M. R., & Zhou, Y. S. (2024). Signaling theory: State of the theory and its future. *Journal of Management*, 51(1), 24-61. <https://doi.org/10.1177/01492063241268459>
- Crossley, R. M., Elmagrhi, M. H., & Ntim, C. G. (2021). Sustainability and legitimacy theory: The case of sustainable social and environmental practices of small and medium-sized enterprises. *Business Strategy and the Environment*, 30(8), 3740-3762. <https://doi.org/10.1002/bse.2837>
- Dang, H. N., Vu, V. T. T., Ngo, X. T., & Hoang, H. T. V. (2019). Study the impact of growth, firm size, capital structure, and profitability on enterprise value: Evidence of enterprises in Vietnam. *Journal of Corporate Accounting & Finance*, 30(1), 144-160. <https://doi.org/10.1002/jcaf.22371>
- Ding, D., Liu, B., & Chang, M. (2023). Carbon emissions and TCFD aligned climate-related information disclosures. *Journal of Business Ethics*, 182(4), 967-1001. <https://doi.org/10.1007/s10551-022-05292-x>
- Ding, X., Appolloni, A., & Shahzad, M. (2022). Environmental administrative penalty, corporate environmental disclosures and the cost of debt. *Journal of Cleaner Production*, 332, Article 129919. <https://doi.org/10.1016/j.jclepro.2021.129919>
- Dzeraviaha, I. (2023). The impact of firm size on environmental sustainability: The assessment based on the analysis of cost structure. *Business Strategy & Development*, 6(1), 20-32. <https://doi.org/10.1002/bsd2.221>
- El Nemar, S., El-Chaarani, H., Dandachi, I., & Castellano, S. (2025). Resource-based view and sustainable advantage: A framework for SMEs. *Journal of Strategic Marketing*, 33(6), 798-821. <https://doi.org/10.1080/0965254X.2022.2160486>
- Ellimäki, P., Gómez-Bolaños, E., Hurtado-Torres, N., & Aragón-Correa, J. A. (2021). Do global firms increase their environmental disclosure and performance? Symbolic versus effective operations and the moderating role of liability of origin. Legitimation implications. *Industrial Marketing Management*, 92, 354-363. <https://doi.org/10.1016/j.indmarman.2019.10.015>
- França, W. T., Barros, M. V., Salvador, R., de Francisco, A. C., Moreira, M. T., & Piekarski, C. M. (2021). Integrating life cycle assessment and life cycle cost: A review of environmental-economic studies. *The International Journal of Life Cycle Assessment*, 26(2), 244-274. <https://doi.org/10.1007/s11367-020-01857-y>
- Friske, W., Hoelscher, S. A., & Nikolov, A. N. (2023). The impact of voluntary sustainability reporting on firm value: Insights from signaling theory. *Journal of the Academy of Marketing Science*, 51(2), 372-392. <https://doi.org/10.1007/s11747-022-00879-2>
- Gunarathne, N., Lee, K.-H., & Hitigala Kaluarachchilage, P. K. (2023). Tackling the integration challenge between environmental strategy and environmental management accounting. *Accounting, Auditing & Accountability Journal*, 36(1), 63-95. <https://doi.org/10.1108/AAAJ-03-2020-4452>
- Hamrouni, A., Bouattour, M., Ben Farhat Toumi, N., & Boussaada, R. (2022). Corporate social responsibility disclosure and information asymmetry: Does boardroom attributes matter? *Journal of Applied Accounting Research*, 23(5), 897-920. <https://doi.org/10.1108/JAAR-03-2021-0056>
- Haryanto, H., Suharman, H., Koeswayo, P. S., & Umar, H. (2022). Enhancing employee engagement in Indonesian logistics and forwarders industry: The moderating role of a democratic leadership style. *Economies*, 10(11), Article 284. <https://doi.org/10.3390/economies10110284>

- Haryanto, H., Suharman, H., Koeswayo, P. S., & Umar, H. (2023). Does internal control promote employee engagement drivers? A systematic literature review. *Australasian Accounting Business & Finance Journal*, 17(4), 192-203. <https://doi.org/10.14453/aabfj.v17i4.12>
- Juusola, K., & Srouji, R. (2023). Challenges associated with sustainability accounting and reporting practices: A legitimacy perspective. *International Journal of Law and Management*, 65(1), 64-87. <https://doi.org/10.1108/IJLMA-06-2022-0113>
- Kalash, I. (2023). The financial leverage–financial performance relationship in the emerging market of Turkey: The role of financial distress risk and currency crisis. *EuroMed Journal of Business*, 18(1), 1-20. <https://doi.org/10.1108/EMJB-04-2021-0056>
- Liu, S. (2025). Green management promotes long-term business competitive advantage through the resource-based view. *Total Quality Management & Business Excellence*, 36(9-10), 946-973. <https://doi.org/10.1080/14783363.2025.2499142>
- Mensah, L., Arhinful, R., Obeng, H. A., & Gyamfi, B. A. (2026). Analyzing the impact of operating leverage on sustainable performance in Japanese firms using contingency theory. *Sustainable Development*, 34(S1), 1267-1281. <https://doi.org/10.1002/sd.70238>
- Ortiz-Avram, D., Ovcharova, N., & Engelmann, A. (2024). Dynamic capabilities for sustainability: Toward a typology based on dimensions of sustainability-oriented innovation and stakeholder integration. *Business Strategy and the Environment*, 33(4), 2969-3004. <https://doi.org/10.1002/bse.3630>
- Qian, W., Dissanayake, D., Leong, S., Kuruppu, S., & Tilt, C. (2025). Sustainability reporting in Indo-Pacific countries: An integrative response to local and global frameworks. *Meditari Accountancy Research*, 33(7), 157-198. <https://doi.org/10.1108/MEDAR-06-2024-2540>
- Rohani, A., Jabbour, M., & Aliyu, S. (2023). Corporate incentives for obtaining higher level of carbon assurance: Seeking legitimacy or improving performance? *Journal of Applied Accounting Research*, 24(4), 701-725. <https://doi.org/10.1108/JAAR-03-2022-0055>
- Seroka-Stolka, O., & Fijorek, K. (2020). Enhancing corporate sustainable development: Proactive environmental strategy, stakeholder pressure and the moderating effect of firm size. *Business Strategy and the Environment*, 29(6), 2338-2354. <https://doi.org/10.1002/bse.2506>
- Setiawan, A., Haryanto, H., Soedibyo, A. N., Wirawan, S., Djajadikerta, H., Faninda, S., & Mardiana, M. (2025). Institutional translation and sectoral readiness: Localizing IFRS S1 and S2 in Indonesia. *International Research Journal of Multidisciplinary Scope*, 6(4), 410-421. <https://doi.org/10.47857/irjms.2025.v06i04.06292>
- Shi, D., Bu, C., & Xue, H. (2021). Deterrence effects of disclosure: The impact of environmental information disclosure on emission reduction of firms. *Energy Economics*, 104, Article 105680. <https://doi.org/10.1016/j.eneco.2021.105680>
- Shi, Y., Tang, C. S., & Wu, J. (2025). Are firms voluntarily disclosing emissions greener? *Production and Operations Management*, 34(8), 2363-2377. <https://doi.org/10.1177/10591478251318917>
- Sun, Z.-Y., Wang, S.-N., & Li, D. (2022). The impacts of carbon emissions and voluntary carbon disclosure on firm value. *Environmental Science and Pollution Research*, 29(40), 60189-60197. <https://doi.org/10.1007/s11356-022-20006-6>
- Swalih, M. M., Ram, R., & Tew, E. (2024). Environmental management accounting for strategic decision-making: A systematic literature review. *Business Strategy and the Environment*, 33(7), 6335-6367. <https://doi.org/10.1002/bse.3828>
- Tan, W., Liu, Y., Shen, M., Xu, C., & Sun, Y. (2025). ESG reputation risk and corporate investment and financing maturity mismatch: Evidence from ESG news sentiment. *Journal of Accounting Literature*, Vol. ahead-of-print(No. ahead-of-print). <https://doi.org/10.1108/JAL-07-2024-0166>
- Tang, L., Wen, Y., & Jiang, Y. (2025). Can digital finance foster green innovation in short-term debt for long-term investment firms? *Pacific-Basin Finance Journal*, 93, Article 102849. <https://doi.org/10.1016/j.pacfin.2025.102849>
- Tripathy, A., & Uzma, S. H. (2021). Does debt heterogeneity impact firm value? Evidence from an emerging context. *South Asian Journal of Business Studies*, 11(4), 471-488. <https://doi.org/10.1108/sajbs-06-2020-0179>
- Uyar, A., Ben Arfa, N., Kuzey, C., & Karaman, A. S. (2024). Do creditors appreciate CSR transparency and credibility in emerging markets? *Journal of Accounting Literature*, 48(1), 1-26. <https://doi.org/10.1108/JAL-07-2023-0137>
- Younis, H., & Sundarakani, B. (2020). The impact of firm size, firm age and environmental management certification on the relationship between green supply chain practices and corporate performance. *Benchmarking: An International Journal*, 27(1), 319-346. <https://doi.org/10.1108/BIJ-11-2018-0363>
- Yuan, S., Huang, W., & Goodell, J. W. (2025). The facade of accountability: Symbolic assurance and earnings management. *Journal of Accounting Literature*, 1-19. <https://doi.org/10.1108/JAL-04-2025-0188>
- Zatini, G., Della Porta, A., & Za, S. (2025). Deciphering barriers and strategies in environmental management accounting (EMA) adoption: A comprehensive two-decade analysis. *Corporate Social Responsibility and Environmental Management*, 32(3), 3355-3370. <https://doi.org/10.1002/csr.3130>
- Zhu, G., Ong, T. S., & Hassan, A. F. S. (2025). Legitimization tools or governance tools? A systematic literature review of corporate governance and carbon disclosure quality. *Business Strategy & Development*, 8(2), Article e70117. <https://doi.org/10.1002/bsd2.70117>