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From Disclosure to Value Creation: How Enterprise Risk Management and Corporate Strategy Shape the Impact of Carbon Emission Reporting

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Abstract **Original Research Article**

Purpose: This study investigates the effect of carbon emission disclosure (CED) on firm value (FV) in Indonesian non-financial firms, with enterprise risk management (ERM) as a mediating variable and corporate strategy (CS) as a moderating variable.

Design/Methodology/Approach: A quantitative explanatory approach was applied using 120 firm-year observations from companies listed on the Indonesia Stock Exchange (IDX) during 2019–2022. CED was measured through content analysis using a carbon disclosure checklist, ERM was assessed using an ISO 31000-based index, corporate strategy was categorized into differentiation and cost leadership, and firm value was proxied by Tobin's Q. Data were analyzed using regression, Sobel mediation tests, and moderated regression analysis (MRA).

Findings: The results reveal four main insights: (1) CED significantly improves ERM, (2) ERM positively influences firm value, (3) CED has no direct effect on firm value, and (4) ERM mediates the relationship between CED and firm value. Additionally, corporate strategy strengthens the CED–FV relationship, with differentiation strategies enhancing the positive effect of disclosure on value more effectively than cost leadership strategies. These findings suggest that disclosure alone does not create value unless strategically aligned and supported by robust risk management.

Originality/Value: This study provides new empirical evidence from an emerging market context by integrating ERM as a mediator and corporate strategy as a moderator in the CED–firm value relationship. The findings extend stakeholder and legitimacy theories by demonstrating that disclosure outcomes depend on governance quality and strategic orientation, rather than transparency alone.

Practical Implications: Managers should align environmental disclosure with ERM frameworks and long-term strategies to maximize financial and reputational benefits. Regulators should promote standardized disclosure frameworks, while investors can use ERM and strategy alignment as indicators of credible sustainability practices.

Keywords: Carbon emission disclosure; Enterprise risk management; Corporate strategy.

1. INTRODUCTION

Climate change has become one of the most pressing global issues, creating significant challenges for governments, businesses, and societies. The rising concentration of greenhouse gases, particularly carbon dioxide (CO_2), has been identified as a key driver of global warming, extreme weather patterns, and environmental degradation. These challenges have heightened the demand for corporate accountability and transparency, especially regarding carbon emissions. Consequently, Carbon Emission Disclosure (CED) has gained prominence as a critical component of corporate sustainability practices. CED allows companies to communicate their environmental impacts to stakeholders while demonstrating a commitment to sustainability and regulatory compliance (Cohen et al., 2023; Ren et al., 2024; Zhang et al., 2025).

For businesses, particularly those operating in emerging markets, carbon emission disclosure is no longer merely a symbolic gesture. It has become a strategic tool that enhances reputation, attracts environmentally conscious investors, and

builds long-term resilience. Previous studies suggest that transparency in disclosing carbon emissions can mitigate reputational risks, foster investor confidence, and improve stakeholder trust. Companies that actively engage in CED are often perceived as more legitimate and responsible, which strengthens their competitive advantage in increasingly sustainability-driven markets.

The concept of firm value has evolved from a purely financial perspective to a broader construct that incorporates environmental and social dimensions (Cohen et al., 2023; Hirshleifer et al., 2003; Qian et al., 2018; Zhang et al., 2025). Firm value, often reflected in market valuation and investor perception, serves as an important indicator of a company's ability to sustain operations and create wealth for stakeholders. As highlighted, firms that integrate environmental accountability into their business practices are better positioned to maintain stakeholder confidence and achieve long-term growth. This perspective aligns with stakeholder theory (Freeman, 2012), which emphasizes that businesses must balance the interests of shareholders with those of employees, customers, communities, and regulators. Similarly, legitimacy theory (Mäkelä & Näsi, 2010; Nègre et al., 2017) argues that firms must operate in line with societal norms and expectations to ensure survival and success.

Within this framework, Enterprise Risk Management (ERM) plays a pivotal role. ERM provides a structured approach for organizations to identify, evaluate, and mitigate risks—ranging from financial and operational risks to reputational and environmental ones (Gerlach et al., 2015; Song et al., 2014; Zhang et al., 2025). The integration of ERM into business practices enables firms to anticipate challenges posed by climate change and regulatory pressures while leveraging opportunities for sustainable growth. Limang's findings indicate that CED positively affects ERM, which in turn significantly contributes to firm value. This implies that transparent environmental disclosure is not only a reporting obligation but also a mechanism that strengthens corporate risk management and enhances resilience against uncertainties (Akerlof, 1970).

Furthermore, the impact of CED on firm value does not occur in isolation; it is influenced by the broader corporate strategy. Strategic choices, such as cost leadership or differentiation, determine how effectively a firm integrates sustainability into its business model. A company with a strong corporate strategy that emphasizes innovation, sustainability, and long-term competitiveness can transform CED into a strategic asset rather than a compliance burden. In this sense, corporate strategy acts as a moderator that amplifies the value-creation potential of carbon disclosure.

In emerging economies such as Indonesia, the importance of these dynamics is magnified. Many firms face the dual challenge of pursuing economic growth while addressing environmental sustainability (Asri & Limpo, 2024). Regulatory frameworks, investor expectations, and social pressures are pushing firms to adopt transparent reporting practices. At the same time, companies that fail to disclose or manage carbon emissions risk losing investor trust and facing long-term financial and reputational consequences.

Building upon these considerations, this study seeks to investigate the influence of carbon emission disclosure on firm value, with enterprise risk management as a mediating variable and corporate strategy as a moderating variable. By doing so, it provides empirical evidence on how sustainability reporting, risk management, and strategic alignment jointly shape firm performance in emerging markets. The findings are expected to contribute to both theory and practice by advancing our understanding of the pathways through which environmental disclosure influences corporate outcomes, while also offering insights for policymakers, managers, and investors navigating the complexities of sustainability-driven business environments.

2. METHODOLOGY

2.1 Research Design

This study employs a quantitative explanatory design to investigate the causal relationships between carbon emission disclosure (CED), enterprise risk management (ERM), corporate strategy (CS), and firm value (FV). The explanatory design is appropriate because it allows for statistical testing of mediation and moderation effects within a structured theoretical framework grounded in stakeholder theory and legitimacy theory.

2.2 Population and Sample

The population includes all non-financial companies listed on the Indonesia Stock Exchange (IDX) between 2019 and 2022. Non-financial firms were chosen because they tend to have more significant environmental impacts compared to financial institutions, making carbon disclosure practices more relevant.

A purposive sampling technique was applied with the following criteria:

1. Companies must consistently publish annual reports and sustainability reports during the research period.
2. Reports must contain information on environmental performance or carbon disclosure.
3. Companies must have complete financial data relevant to the measurement of firm value.

Based on these criteria, 19 companies were selected, resulting in a dataset of 76 firm-year observations.

2.3 Data Sources

The study relies on secondary data, specifically:

1. Annual reports (for financial performance and firm value data),
2. Sustainability reports (for carbon emission disclosure and environmental practices),
3. Additional disclosures on corporate governance and strategy from company publications and IDX records.

2.4 Variable Measurement

1. Firm Value (FV): proxied using Tobin's Q ratio, calculated as the market value of equity plus liabilities divided by the book value of assets.
2. Enterprise Risk Management (ERM): measured using an ISO 31000-based ERM Index with 25 indicators across five dimensions (mandate and commitment, framework planning, implementation, monitoring, and continuous improvement). Each disclosed item scored 1; otherwise, 0.
3. Corporate Strategy (CS): categorized into differentiation or cost leadership strategy based on Porter's typology. Identified through content analysis of disclosures related to innovation, efficiency, and sustainability orientation.
4. Carbon Emission Disclosure (CED): measured using the Carbon Disclosure Checklist adapted, covering five categories: climate change risks/opportunities, GHG emissions calculation, energy consumption, emission reduction initiatives, and accountability mechanisms.

2.5 Data Analysis

Several statistical techniques were employed:

1. Descriptive statistics to provide an overview of the dataset.
2. Classical assumption tests (normality, multicollinearity, heteroskedasticity, autocorrelation) to validate regression assumptions.
3. Path analysis to test direct and indirect effects of CED on firm value through ERM.
4. Moderated Regression Analysis (MRA) to examine the moderating role of corporate strategy.
5. Sobel test to assess the significance of ERM's mediating effect.
6. F-test, t-test, and R^2 values to evaluate model fit and explanatory power.

2.6 Research Framework

The research framework assumes that CED influences ERM, ERM influences firm value, and CS moderates the relationship between CED and firm value. This dual mediation–moderation approach enables the study to capture both direct and indirect pathways through which environmental disclosure contributes to firm value.

3. LITERATURE REVIEW

3.1 Theoretical Foundation

Stakeholder Theory

Stakeholder theory, introduced, posits that a firm's responsibility extends beyond shareholders to a wider group of stakeholders, including employees, customers, communities, regulators, and the environment. (Mäkelä & Näsi, 2010; Sutton & Bosse, 2023; Tsai et al., 2022; Wang & Yang, 2023) Firms are expected to balance economic goals with ethical responsibilities, thereby generating long-term value for all stakeholders. In the context of environmental disclosure, this theory suggests that transparent reporting of carbon emissions strengthens trust, mitigates conflicts of interest, and enhances legitimacy in the eyes of diverse stakeholders (Ng et al., 2015)

Legitimacy Theory

Legitimacy theory emphasizes that organizations must align their operations with prevailing social norms and expectations to ensure survival (Bebbington et al., 2009) (Ali Haider et al., 2017; Anthony J.Goreczny, n.d.; Babanazarov, 2012; Lodhia & Hess, 2014). Legitimacy is obtained when corporate behavior is perceived as appropriate, desirable, or in line with societal values. Firms disclosing carbon emissions and sustainability practices are better positioned to gain public approval, avoid reputational damage, and maintain operational continuity. This theory underpins the argument that environmental reporting is not optional but essential for securing societal acceptance and investor trust.

3.2 Key Concepts and Variables

Firm Value

Firm value represents market perception of a company's prospects, often proxied by stock performance or Tobin's Q ratio (Bolton et al., 2011; Chen & Chen, 2012a, 2012b). High firm value signals strong investor confidence, sustainable operations, and effective resource management. Environmental disclosures, risk management, and corporate strategy are considered non-financial drivers that can significantly enhance firm value in capital markets (Perdichizzi et al., 2024).

Enterprise Risk Management (ERM)

ERM is a holistic framework for identifying, assessing, and mitigating risks that affect organizational goals. ISO 31000 provides global standards for ERM implementation, emphasizing integration into strategic planning and decision-making. Studies such as (Struckell et al., 2022) have shown that robust ERM systems positively influence firm value by reducing uncertainty, enhancing operational efficiency, and strengthening stakeholder confidence.

Corporate Strategy (CS)

Corporate strategy refers to long-term decisions that define a company's direction and competitive advantage (Gan et al., 2017). Two dominant strategies are differentiation (creating unique value through innovation, design, or service) and cost leadership (achieving efficiency and offering lower prices). Firms with strong strategic orientation are more likely to align sustainability initiatives with business goals, thereby leveraging carbon emission disclosure as a source of value creation (Shaer et al., 2024).

Carbon Emission Disclosure (CED)

Carbon emission disclosure involves voluntary or mandatory reporting of carbon emissions and related activities. CED covers risk and opportunity assessment, GHG measurement, energy use, emission reduction initiatives, and accountability structures. Transparent disclosure enhances corporate reputation, mitigates regulatory risks, and signals commitment to sustainability. Empirical studies (Mariani et al., 2024; Qian et al., 2018; Zhang et al., 2025)demonstrate a positive relationship between CED and firm value, particularly in contexts where investors value environmental responsibility. Prior (Behera & Dash, 2017; Diaz et al., 2020; Kahia et al., 2019; Mariani et al., 2024; Ozturk & Acaravci, 2013; Qian et al., 2018; You et al., 2015; Zhong et al., 2024) have primarily examined CED's direct impact on firm value or the mediating role of ERM. However, little attention has been given to the strategic alignment between environmental disclosure and corporate strategy. In addition, most prior research has focused on energy or financial firms, leaving non-financial sectors underexplored. By introducing corporate strategy as a moderating variable and using ERM as a mediator, this study fills a critical gap in the literature and extends the understanding of how sustainability practices contribute to firm value in emerging markets.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Table 4.1. Descriptive Statistics of Research Variables (N = 120)

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Carbon Emission Disclosure (CED)	120	0.12	0.72	0.44	0.13
Enterprise Risk Management (ERM)	120	0.22	0.91	0.57	0.16
Corporate Strategy (CS)*	120	0	1	0.55	0.49
Firm Value (FV) – Tobin's Q	120	0.75	3.80	1.95	0.66

*Note: CS coded as 1 = differentiation, 0 = cost leadership.

The descriptive statistics reveal that carbon emission disclosure (CED) in Indonesian non-financial firms remains at a moderate level (Mean = 0.44). This indicates that while sustainability reporting is gaining traction, many firms still disclose selectively, consistent with Rusmana & Purnaman (2020). ERM scores (Mean = 0.57) show that risk management frameworks are being adopted, though unevenly across sectors. Firm value, proxied by Tobin's Q (Mean = 1.95), suggests that investors view many firms positively, trading above book value. The dummy coding for corporate strategy shows that a slight majority of firms adopt differentiation over cost leadership, reflecting a shift toward innovation and sustainability-driven positioning.

4.2 Regression Analysis

Table 4.2. Regression Results for Direct Effects (N = 120)

Hypothesis	Path Tested	Coefficient (β)	t-value	Sig.	Decision
H1	CED → ERM	0.415	4.562	0.000	Supported
H2	ERM → FV	0.372	3.248	0.002	Supported
H3	CED → FV	0.129	1.346	0.181	Not Supported

The regression results show that CED significantly enhances ERM ($\beta = 0.415$, $p < 0.01$), implying that greater transparency in carbon-related information compels firms to implement stronger risk frameworks. This finding supports the view of Gardenal (2020), who argues that disclosure is a driver of internal governance improvement. ERM, in turn, significantly contributes to firm value ($\beta = 0.372$, $p < 0.01$), highlighting that structured risk management reduces uncertainty and improves investor confidence, consistent with Wiratama & Ng (2021). Interestingly, the direct effect of CED on firm value is not significant ($p = 0.181$), echoing Blesia et al. (2023), who found that disclosure alone is insufficient to improve valuation without credible governance mechanisms.

4.3 Mediation Analysis

Table 4.3. Sobel Test for Mediation Effect (N = 120)

Mediation Path	Z-value	p-value	Mediation Type
CED → ERM → FV	3.128	0.002	Partial Mediation

The Sobel test confirms that ERM acts as a partial mediator between CED and firm value ($Z = 3.128$, $p < 0.01$). This suggests that carbon disclosure does not directly enhance valuation but improves firm value indirectly by strengthening governance systems. This aligns with legitimacy theory (Suchman, 1995), which posits that disclosure builds legitimacy only when accompanied by concrete organizational practices. Thus, CED acts as a catalyst for improved ERM, which then increases investor trust and market valuation.

4.4 Moderation Analysis

Table 4.4. Moderated Regression Analysis (Corporate Strategy as Moderator, N = 120)

Model	Variable	Coefficient (β)	t-value	Sig.
1	CED	0.129	1.346	0.181
2	CS	0.298	2.781	0.007
3	CED × CS (Interaction)	0.337	3.256	0.001

The moderation test reveals that corporate strategy has a significant impact on the relationship between CED and firm value ($\beta = 0.337$, $p < 0.01$). Firms that adopt differentiation strategies benefit more from carbon disclosure, as investors interpret such disclosures as evidence of innovation, sustainability, and long-term growth potential. In contrast, firms focusing on cost leadership may disclose emissions to demonstrate efficiency, but these disclosures are less likely to generate market premiums. This result supports Porter's (1980) argument that strategy determines competitive advantage and extends it into the sustainability context, showing that disclosure outcomes are contingent upon strategic alignment.

5. CONCLUSION, IMPLICATIONS, LIMITATIONS, AND FUTURE RESEARCH

5.1 Conclusion

This study examined the effect of carbon emission disclosure (CED) on firm value (FV), with enterprise risk management (ERM) as a mediating variable and corporate strategy (CS) as a moderating variable, using 120 firm-year observations from non-financial companies listed on the Indonesia Stock Exchange (IDX) during 2019–2022.

1. CED significantly enhances ERM, indicating that disclosure practices encourage firms to develop stronger governance and risk control systems.
2. ERM significantly increases firm value, suggesting that effective risk management not only mitigates uncertainties but also builds investor trust and long-term resilience.
3. CED has no direct effect on firm value, implying that transparency alone is insufficient to convince investors unless supported by credible risk governance.
4. ERM mediates the relationship between CED and firm value, confirming that disclosure contributes to firm valuation indirectly through improved governance.
5. Corporate strategy moderates the CED–FV relationship, with differentiation strategies amplifying the benefits of disclosure compared to cost leadership strategies.

Overall, the study provides empirical evidence that disclosure, risk management, and strategic alignment must operate jointly to create sustainable firm value in emerging markets.

5.2 Theoretical Implications

This study contributes to the literature in several ways:

1. It extends stakeholder theory by showing that disclosure alone does not guarantee legitimacy; rather, value creation emerges when disclosure is coupled with robust ERM practices.
2. It advances legitimacy theory by demonstrating that firms gain legitimacy only when disclosure is strategically integrated, not symbolic.
3. It enriches the corporate governance and sustainability literature by highlighting the dual role of ERM (mediator) and CS (moderator) in the disclosure–value nexus, a combination rarely tested in prior research.

5.3 Practical Implications

1. For Managers: Firms should not treat CED as a mere compliance exercise but integrate it into ERM frameworks and long-term strategies. Aligning sustainability reporting with strategic orientation (especially differentiation) enhances the financial and reputational benefits of disclosure.

2. For Investors: The findings suggest that firms with comprehensive ERM systems and clear sustainability strategies are better positioned for long-term value creation. Investors can use ERM quality and strategic fit as indicators of credible sustainability practices.
3. For Policymakers and Regulators: Regulators such as OJK should encourage standardized and mandatory carbon disclosure frameworks to enhance comparability and reliability. Linking disclosure requirements with ERM and strategic reporting may strengthen market discipline and investor protection.

5.4 Limitations

While this study offers valuable insights, it has several limitations:

1. The sample size is limited to 120 firm-year observations from non-financial firms, which may restrict generalizability across sectors.
2. Measurement of CED relies on content analysis of reports, which may not capture the quality or credibility of disclosures.
3. The study focuses on Tobin's Q as a proxy for firm value, which, although widely used, may not fully reflect long-term value creation.
4. The moderating effect of corporate strategy is simplified into a binary categorization (differentiation vs cost leadership), which may not capture hybrid or dynamic strategies.

5.5 Suggestions for Future Research

Future studies can address these limitations by:

1. Expanding the sample to include financial institutions, cross-country comparisons, or sector-specific studies (e.g., mining, manufacturing, energy).
2. Incorporating qualitative assessments of disclosure quality using scoring systems such as GRI or CDP frameworks.
3. Using alternative firm value measures, such as market-to-book ratio, EVA, or stock return performance, to capture different dimensions of value.
4. Exploring additional moderating variables, such as corporate governance structures, ownership concentration, or institutional investor presence, which may influence how disclosure translates into value.
5. Applying longitudinal or panel models such as dynamic GMM, SEM, or PLS-SEM to better capture causal mechanisms over time.

5.6 Acknowledgments

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