

*Research Article*

## Balancing Transparency and Sustainability: Governance as a Moderator Between Carbon Emissions and Firm Value

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### Abstract

This study aims to analyze the impact of carbon emission disclosure and annual report readability on firm value, while accounting for governance as a moderating variable. This study used companies in the basic materials sector listed on the Indonesia Stock Exchange (IDX) that published annual reports and sustainability reports, and disclosed information on carbon emissions during 2020-2022. The analysis results show that carbon emission disclosure has a significant positive effect on firm value. Conversely, annual report readability does not significantly affect firm value. Governance is shown to weaken the relationship between carbon emission disclosure and firm value. However, it does not moderate the relationship between annual report readability and firm value. The results of this study can inform the government in encouraging greater carbon emission disclosure in the basic materials industry, as disclosure is currently voluntary. Managerial Implications: The results of this study have important implications for company management in the basic materials sector, calling for greater attention to transparency and environmental communication strategies. Comprehensive carbon emission disclosure has been shown to increase firm value, so managers are advised to expand the scope and quality of carbon emission-related information in sustainability reports.

Keywords: Corporate Values; Carbon Emissions Disclosure; Readability of Annual Reports; Governance

JEL Classification: G34, M14, Q56

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### 1. Introduction

Environmental sustainability has become an increasingly vital issue for both regulators and investors as climate change continues to threaten economic stability and corporate performance worldwide. In Indonesia, various industries have begun to incorporate environmentally friendly programs into their operational strategies. For instance, PT Semen Indonesia (Persero) Tbk implemented a green concrete program to reduce waste and natural resource consumption by using 30% substitute materials and 25% recycled water, aligning with the national target to reduce carbon emissions by 29% by 2030 (Busthomi, 2021; Ramli, 2021).

This strategic environmental management demonstrates how companies can integrate sustainability goals with corporate value creation. Previous studies have revealed that firms with stronger environmental management and transparency tend to experience higher investor confidence and stock performance (Nurjamilah, 2021; Hartomo & Adiwibowo, 2023). However, not all firms disclose their environmental impact consistently, particularly regarding carbon emissions, which remain largely voluntary in Indonesia (Afnilia & Astuti, 2023).

Carbon emission disclosure refers to a company's reporting of its carbon footprint as part of its commitment to environmental transparency (Hardiyansah et al., 2021). This disclosure signals to stakeholders that the firm is dedicated to sustainable operations (Kurnia et al., 2021). According to signaling theory, transparent reporting helps reduce information asymmetry and enhances investor trust, thereby potentially increasing firm value (Bae et al., 2018; Machmuddah et al., 2020). However, previous studies have produced mixed results. While research by Rusmana and Purnaman (2020), Alfayerds and Setiawan (2021), and Hardiyansah et al. (2021) indicates a positive relationship between carbon disclosure and firm value, Muhammad and Aryani (2021) observed a negative correlation. Furthermore, other studies found no significant relationship at all (Asyifa & Burhany, 2022; Afnilia & Astuti, 2023). These discrepancies suggest that the impact of carbon disclosure on firm value remains uncertain and may be influenced by additional contextual factors, such as governance mechanisms.

In addition to environmental transparency, the readability of annual reports has emerged as an important factor in corporate communication. Annual reports are the main channel through which firms convey financial and non-financial information to investors (Alfayerds & Setiawan, 2021). Readable reports enable stakeholders to easily understand corporate performance, thereby reducing information asymmetry (Loughran & McDonald, 2014; Alvenia & Rahman, 2022). According to Wahyuni (2018) and Amaliyah (2021), higher report readability positively affects firm value by signaling good transparency and management quality. However, contrary findings by Lim et al. (2018) suggest that highly readable reports can also mask poor performance, leading to a negative relationship with firm value. Moreover, several studies, such as that of Alfayerds and Setiawan (2021), found no significant relationship. This contradictory evidence suggests that readability alone might not be sufficient to influence investor perception without strong governance practices that ensure the reliability of disclosed information.

Governance plays a crucial moderating role in ensuring that transparency and information quality contribute to firm value. According to the ASEAN Corporate Governance Scorecard (ACMF, 2017), good governance enhances accountability, transparency, fairness, and responsibility in corporate decision-making. Firms that implement effective governance frameworks are more likely to disclose credible environmental and financial information (Saputri & Santoso, 2023; Darniaty et al., 2023; Halimah et al., 2020). Prior studies have shown that governance mechanisms strengthen stakeholder trust and, consequently, improve firm performance (Santoso, 2017; Irmalasari et al., 2022). However, governance can also weaken relationships between specific variables when it is implemented merely as a formality rather than as a genuine practice (Zuleika & Koesnugroho, 2022; Putra & Putri, 2022). Thus, it is necessary to test whether governance strengthens or weakens the effect of carbon emission disclosure and report readability on firm value in the Indonesian context.

Research examining the combined influence of carbon emission disclosure, report readability, and governance in a single framework remains limited, particularly in emerging markets such as Indonesia. Previous studies have often investigated these variables separately, yielding inconsistent findings (Muhammad & Aryani, 2021; Blesia et al., 2023). Therefore, this study seeks to fill a research gap by integrating governance as a moderating variable into the relationship between carbon emission disclosure, annual report readability, and firm value. Furthermore, considering that environmental issues have become strategic determinants of investor behavior, understanding how governance influences this relationship is critical to enhancing firm reputation and value creation (Azhari & Hasibuan, 2023; Firmansyah et al., 2021).

Despite growing attention to environmental transparency, the level of carbon-emission disclosure among Indonesian firms remains highly varied, and its impact on firm value remains unclear. Prior studies have shown inconsistent findings some indicating a positive relationship, others showing negative or insignificant effects. Similarly, research on annual report readability has produced contradictory results. Moreover, the role of governance in moderating these relationships has not been fully explored, particularly within the basic materials sector, where carbon-intensive operations are prevalent. These gaps indicate that further empirical investigation is necessary to determine whether transparency through carbon emission disclosure and report readability truly enhances firm value, and how governance mechanisms influence these effects.

## 2. Literature Review and Hypothesis

### Literature Review

#### Carbon Emission Disclosure

According to signaling theory, companies use voluntary disclosures such as environmental and carbon information to reduce information asymmetry between management and investors (Bae et al., 2018). Disclosure of carbon emissions serves as a positive signal that the company is committed to sustainability and responsible operations (Hardiyansah et al., 2021; Kurnia et al., 2021). In addition, legitimacy theory explains that firms disclose environmental performance to obtain public approval and social legitimacy (Dowling & Pfeffer, 1975). Therefore, transparent disclosure can improve a firm's image and increase stakeholder confidence.

#### Annual Report Readability

Annual report readability refers to the ease with which readers can comprehend textual information disclosed by firms (Loughran & McDonald, 2014). According to signaling theory, clear and understandable reports signal managerial transparency and honesty (Wahyuni, 2018). Transparent communication enhances investor confidence, which can positively influence stock prices and firm value (Apriyanti et al., 2024; Amaliyah, 2021).

#### Corporate Governance

Good corporate governance (GCG) refers to a system that ensures accountability, transparency, fairness, and responsibility in corporate management (OECD, 2023). Governance mechanisms such as independent boards, audit committees, and shareholder rights are designed to minimize agency conflicts and ensure the reliability of disclosed information (Angraini & Rahayu, 2025; Halimah et al., 2020; Darniaty et al., 2023).

### Hypothesis

#### The Effect of Carbon Emission Disclosure on Firm Value

Companies that openly disclose their carbon emissions demonstrate a commitment to sustainable business practices and social responsibility. This transparency sends a positive signal to investors about the long-term sustainability and quality of the company's management (Hardiyansah et al., 2021; Kurnia et al., 2021). Research by Rusmana and Purnaman (2020), Alfayerds and Setiawan (2021), and Bahriansyah and Lestari (2022) supports a positive relationship between carbon emission disclosure and firm value. Thus, the higher the level of carbon emission disclosure, the greater the resulting firm value.

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

#### The Effect of Annual Report Readability on Firm Value

The readability of the annual report reflects a company's quality of communication with shareholders. An easy-to-understand report demonstrates management's professionalism and integrity (Wahyuni, 2018). Research by Lo et al. (2017), Lundholm et al. (2014), and Amaliyah (2021) shows that high annual report readability increases investor confidence and strengthens firm value. Based on signaling theory, the higher the annual report's readability, the more positive investor perceptions of the company.

**H2: Annual report readability has a positive effect on firm value.**

### Governance Moderates the Effect of Carbon Emission Disclosure on Firm Value

Governance can strengthen the relationship between carbon emission disclosure and firm value by ensuring the accuracy and credibility of the information provided (Choiriah & Ria, 2020). Companies with good governance tend to be more transparent and responsible in managing environmental issues. Conversely, research by Zuleika and Koesnugroho (2022) shows that governance can weaken this relationship when its implementation is formalized without adequate oversight. Thus, strong governance is expected to strengthen the positive influence of carbon emission disclosure on firm value.

**H3: Governance strengthens the effect of carbon emission disclosure on firm value.**

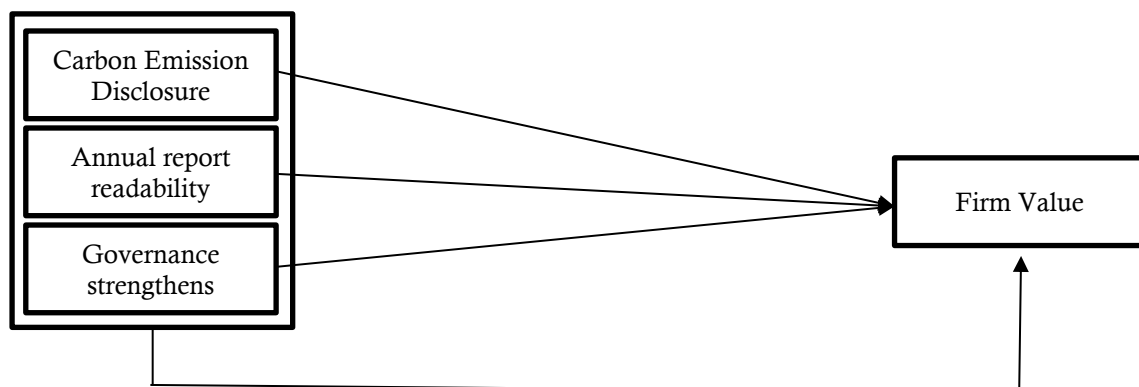
### Governance Moderates the Effect of Annual Report Readability on Firm Value

Companies with good governance ensure that annual reports are prepared transparently, accurately, and easily understood by investors (De Lavanda & Meiden, 2022). Effective governance can strengthen the relationship between annual report readability and firm value by ensuring the quality, clarity, and consistency of the information disclosed. However, research by Darniaty et al. (2023) shows that if governance is merely a formality, this positive effect may be diminished. Thus, good corporate governance is expected to strengthen the influence of annual report readability on firm value.

**H4: Governance strengthens the effect of annual report readability on firm value.**

### Conceptual Framework

Figure 1 shows the research conceptual framework, illustrating the relationships among carbon emission disclosure, annual report readability, and firm value, with governance as a moderating variable. This framework explains that environmental information disclosure, through carbon emissions disclosure and clear communication in annual reports, is expected to increase firm value. However, the influence of these two variables can be strengthened or weakened depending on the effectiveness of good corporate governance implementation in ensuring the transparency and credibility of the information conveyed.



**Figure 1. Conceptual Framework**

### 3. Data and Method

This quantitative research aims to analyze the impact of carbon emissions, information transparency, and annual report readability on firm value, with governance as a moderating variable. This research focuses on the basic materials sector listed on the Indonesia Stock Exchange (IDX) during the 2020-2022 period. The researcher employed purposive sampling with the following criteria: (1) basic materials sector companies listed on the IDX from 2020 to 2022, (2) the companies published annual reports and sustainability reports, and (3) the companies disclosed at least one policy related to carbon emissions during the study period. The dependent variable in this study is firm value, which reflects investors' perceptions of a company's ability to deliver optimal benefits to shareholders, as evidenced by share price increases (Afnilia & Astuti, 2023). Tobin's Q ratio serves as a proxy for firm value, as shown in the research by Blesia et al. (2023) and Hardiyansah et al. (2021).

This study uses two independent variables: carbon emissions disclosure and annual report readability. Blesia et al. (2023) define carbon emission disclosure as a mechanism for presenting data to evaluate companies' carbon emissions and to set emission-reduction targets. The carbon emission disclosure proxy uses the Carbon Disclosure Project (CDP) Checklist by Choi et al. (2013). The CDP instrument consists of 18 disclosure items divided into five categories. The scoring system assigns a 1 to each disclosed item and a 0 to each item not disclosed. The total score is then compared with all CDP items using the methodology described by Choi et al. (2013).

The difficulty of an annual report to be understood and read by users is a definition of readability. The Gunning Fog Index, as used by Lo et al. (2017), Wahyuni (2018), and Alfayerds & Setiawan (2021), is used to measure the readability of annual reports.

The number of words per sentence can be calculated by dividing the total words in the annual report by the total sentences in the analysis. Complex words are words with more than three syllables and require a dictionary search to understand their meaning. Readability indicators include Fog Index greater than 18 ( $\geq 18$ ), which indicates the text is unreadable; 14-18 indicates the text is difficult to read; 12-14 indicates ideal text; 10-12 indicates the text is easy to read; and 8-10 indicates the text is easy to read. Therefore, a higher Fog Index indicates a more difficult-to-read annual report (Cho et al., 2022).

The moderating variable in this study is governance, a structure that manages the relationship between management and stakeholders to achieve company objectives and prevent major mistakes in corporate strategy (Darniaty et al., 2023). Governance is proxied by the ASEAN Corporate Governance Scorecard (ACGS), which comprises 146 disclosure items covering the five principles of the Organization for Economic Cooperation and Development (OECD). A score of 1 is awarded if the answer is disclosed, and a score of 0 if it is not disclosed. Next, the score for each section will be calculated using the ASEAN Corporate Governance Scorecard, developed by Immanuel et al. (2020).

The analytical model in this study employs Moderated Regression Analysis (MRA) to examine the role of governance as a moderating variable in the relationship between carbon emission disclosure, annual report readability, and firm value. MRA is a form of multiple linear regression that incorporates interaction terms between independent and moderating variables to determine whether the relationship between the main variables changes significantly when the moderating variable is included (Ghozali, 2021). The regression model used in this study is formulated as follows:  $FV = \alpha + \beta_1 CED + \beta_2 ARR + \beta_3 G + \beta_4 (CED * G) + \beta_5 (ARR * G) + \varepsilon$ , where FV represents firm value (Tobin's Q), CED is carbon emission disclosure, ARR is annual report readability, and G denotes governance. At the same time, CEDG and ARR G are interaction terms between the independent and moderating variables. This model analyzes both the direct effects of carbon emission disclosure and annual report readability on firm value, and the moderating effect of governance on these relationships. Statistical testing was conducted in EViews 12 at the 5% significance level ( $\alpha = 0.05$ ) to evaluate the significance and direction of each relationship among the variables.

## 4. Results

### Determination Coefficient Test

**Table 1. Results of the Determination Coefficient Test**

R-squared	0.914782
Adjusted R-squared	0.831086

Source: Processed data, 2024

The coefficient of determination test in this study was 0.831086. This value indicates that company value is influenced by carbon emission disclosure and annual report readability, with governance accounting for 83.10%, and 16.9% of the total is from other variables not included in this study.

## Model Feasibility Test

**Table 2. Model Feasibility Test Results**

F-statistic	10.92978
Prob(F-statistic)	0.000000

Source: Processed data, 2024

Table 2 shows the results of the model feasibility test. The probability value for the model feasibility test is 0.000000, which is less than 0.05. Therefore, the regression model proposed in this study is considered feasible.

**Table 3. Results of the Moderated Regression Analysis Test**

Variabel	Coefficient	Std. Error	t-Statistic	Prob.
C	1.612807	0.176897	9.117227	0.0000
CED	4.902819	2.102091	2.332353	0.0233
ARR	-0.201020	0.106195	-1.892941	0.0635
CED*G	-0.062561	0.024446	-2.559134	0.0132
ARR*G	0.002182	0.001206	1.809312	0.0758

Source: Processed data, 2024

Based on the results of the Moderated Regression Analysis (MRA) in Table 3, the Carbon Emission Disclosure (CED) variable has a positive and significant effect on firm value, with a p-value of 0.0233 ( $<0.05$ ). This result indicates that the higher the level of carbon emissions disclosure, the higher the firm value. Meanwhile, the Annual Report Readability (ARR) variable has a p-value of 0.0635 ( $>0.05$ ), indicating that it has no significant effect on firm value.

The interaction between Carbon Emission Disclosure and Governance (CED\*G) shows a negative coefficient value (-0.062561) with a significance level of 0.0132 ( $<0.05$ ), indicating that governance weakens the relationship between carbon emissions disclosure and firm value. Meanwhile, the interaction between Annual Report Readability and Governance (ARR\*G) has a probability value of 0.0758 ( $>0.05$ ), indicating that governance does not moderate the effect of annual report readability on firm value. Thus, these results confirm that corporate governance has not been able to strengthen the positive impact of annual report readability and may even reduce the positive influence of carbon emission disclosure on company value.

## 5. Discussion

### The Effect of Carbon Emission Disclosure on Firm Value

The results of this study indicate that carbon emission disclosure has a positive effect on firm value. This finding supports signaling theory, which states that companies that openly disclose their environmental activities send a positive signal to investors regarding their transparency and social responsibility. The more extensive the carbon emission information presented, the stronger the investor perception that the company is committed to sustainability and environmental risk management.

These results align with research by Rusmana and Purnaman (2020) and Alfayerds and Setiawan (2021), which found that high levels of carbon emission disclosure can increase a company's market value because it is perceived as a positive reputational strategy. Hardiyansah et al. (2021) also emphasized that carbon emission disclosure can be an indicator of competitive advantage in the eyes of investors. Blesia et al. (2023) added that environmental information disclosure has a long-term effect on increasing legitimacy and public trust. Thus, these results confirm that carbon disclosure is not simply an ethical obligation but also a business strategy that can enhance firm value.

### **The Effect of Annual Report Readability on Firm Value**

Contrary to expectations, the study finds that the readability of annual reports does not significantly affect firm value. This finding indicates that the ease or complexity of the language in annual reports is not yet a primary consideration for investors in assessing a company's performance or value. Investors tend to focus more on quantitative and fundamental information, such as profit, cash flow, and financial performance, than on the linguistic aspects of annual reports.

This finding is consistent with the research of Alfayerds and Setiawan (2021), who found that annual report readability does not significantly impact firm value because investors pay more attention to actual financial results. Lim et al. (2018) also stated that readability is not the sole indicator of corporate transparency, as overly simplistic reports can raise suspicions of information manipulation. However, these results differ from those of Wahyuni (2018) and Amaliyah (2021), who found a positive relationship between report readability and investor perceptions. Therefore, it can be concluded that the readability factor remains context-dependent and influenced by market characteristics and investor preferences in Indonesia.

### **Governance as a Moderator between Carbon Emission Disclosure and Firm Value**

This study's findings indicate that governance weakens the effect of carbon emission disclosure on firm value. This result is interesting because it contradicts the theory and initial expectations that predict that good corporate governance will strengthen this relationship. This phenomenon indicates that governance elements in Indonesian companies are not yet well integrated into environmental disclosure policies. As a result, governance practices neutralize the positive signal generated by carbon emission disclosure.

This result aligns with research by Zuleika and Koesnugroho (2022) and Putra and Putri (2022), which found that merely formal governance does not strengthen the impact of sustainability disclosure on firm value. This finding may occur because weak governance prioritizes short-term value creation over long-term value creation. This result contrasts with Choiriah and Ria (2020), who found that strong governance can strengthen this relationship by increasing the credibility of information. Thus, the results of this study imply the need to improve the quality of governance implementation to align with corporate sustainability strategies.

### **Governance as a Moderator between Annual Report Readability and Firm Value**

The results show that governance does not moderate the relationship between annual report readability and firm value. This finding means that corporate governance effectiveness has not strengthened or weakened the impact of report readability on firm value. This finding suggests that governance implementation in many companies remains oriented toward administrative compliance rather than improving the effectiveness of corporate communication.

This finding supports the research of Darniaty et al. (2023) and Azri and Ruslim (2023), which states that in practice, governance in Indonesia is often implemented symbolically and thus has no real impact on reporting quality. Also found that ineffective governance fails to encourage increased information disclosure that can enhance firm value. Who found that strong governance can improve reporting quality and enhance annual report readability. Thus, the results of this study indicate that management commitment is still needed to link governance policies with corporate communication strategies to achieve greater corporate value.

## **6. Conclusion**

The empirical results of this study reveal a positive impact of carbon emissions disclosure on firm value: the more thoroughly a company discloses information about its carbon emissions, the greater its value tends to be. This finding indicates that environmental transparency serves as a favorable signal to investors and stakeholders, reflecting a company's commitment to social responsibility and operational sustainability. Additionally, the study found that the readability of annual reports does not significantly influence firm value, suggesting that the clarity of these documents is less

important to market perceptions than the underlying fundamentals and financial performance of the company.

Interestingly, the research also indicates that governance undermines the impact of carbon emissions disclosure on firm value, implying that corporate governance practices are not yet fully aligned with the principles of transparent environmental disclosure. As a result, the positive effect of carbon emissions disclosure on firm value is diminished. Moreover, governance does not serve as a moderating variable in the relationship between the readability of annual reports and firm value, as its implementation often remains a mere formality to fulfill regulatory requirements rather than a mechanism to enhance the effectiveness of information disclosure.

The managerial implications of this study suggest that corporate management should enhance the integration of sound corporate governance practices with environmental sustainability strategies, ensuring that both elements work together to enhance corporate value. Companies are encouraged to view carbon emissions disclosure not just as an administrative obligation, but as an integral part of their corporate communication strategy that can foster long-term value. Additionally, there is a need for companies to elevate the quality of their annual reports by employing clear and transparent language, while consistently focusing on presenting material information that is pertinent to investors. By improving the alignment between governance policies and environmental disclosure practices, companies can strengthen their corporate reputations, attract greater investor interest, and effectively support the achievement of long-term sustainability objectives.

### Recommendation

Companies are advised to integrate carbon emission disclosure with effective corporate governance practices to strengthen transparency and enhance firm value. Management should ensure that governance mechanisms are not mere formalities but align with sustainability strategies. Regulators are encouraged to establish more straightforward guidelines for environmental disclosure standards, while investors should consider environmental transparency a key indicator in decision-making. Future studies may expand the sample size or use qualitative methods to explore how governance mechanisms interact with environmental and reporting practices to influence firm value.

### Limitations and avenues for future research

This study is limited to secondary data from manufacturing companies listed on the Indonesia Stock Exchange, which may not represent all industries. The analysis period and variables are also restricted, potentially affecting generalizability. Future research could include additional sectors, extend the observation period, or apply qualitative and mixed-methods approaches to understand better the interactions among governance, disclosure practices, and firm value.

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