

Internal Governance Mechanisms and Corporate Carbon Transparency: Evidence from Indonesian Mining Companies

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Abstract: Climate change has increased expectations for companies to be transparent about their environmental impact, particularly carbon emissions. Carbon disclosure enables stakeholders to assess how firms manage environmental and climate-related risks, yet transparency remains uneven, especially in high-impact industries such as mining. This study examines the influence of internal governance mechanisms: board size, independent commissioners, and performance-based executive compensation on carbon emission disclosure among mining companies listed on the Indonesia Stock Exchange during 2022–2024. Using panel data from 53 firms and a fixed-effects regression model, the results show that board size has a significant negative effect on carbon transparency, independent commissioners have no significant influence, and executive compensation has a positive but relatively weak effect. These findings highlight the complex role of governance structures in shaping environmental reporting and provide insights for policymakers and managers seeking to improve climate-related disclosure.

Keywords: Carbon Emission Disclosure; Corporate Governance; Environmental Transparency; Indonesia; Mining Companies

1. Introduction

Climate change has become a critical global challenge that significantly influences corporate environmental accountability. Industries with high environmental impact, particularly the mining sector, are increasingly required to demonstrate transparency regarding their environmental performance and carbon emissions. Mining activities contribute substantially to greenhouse gas emissions due to energy-intensive extraction processes and land-use changes. Consequently, stakeholders including regulators, investors, and the public demand greater transparency in corporate environmental reporting (Datt et al., 2023; Tang et al., 2022).

Carbon emission disclosure has emerged as an essential component of corporate sustainability reporting. Through transparent disclosure, companies communicate their environmental risks, climate strategies, and emission reduction initiatives to stakeholders. Effective carbon transparency can reduce information asymmetry between corporate management and stakeholders while strengthening corporate accountability in addressing environmental challenges (García-Sánchez et al., 2023; Lee & Min, 2023). However, despite

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growing awareness of climate change issues, the level of carbon disclosure among firms remains inconsistent, particularly in developing economies.

Corporate governance mechanisms play a crucial role in shaping corporate transparency and sustainability practices. Governance structures determine how corporate decisions are monitored, controlled, and aligned with stakeholder interests. Prior studies suggest that effective governance systems can encourage firms to improve environmental disclosure and sustainability reporting practices (Al-Shaer & Zaman, 2022; Buallay, 2023).

Several internal governance mechanisms may influence corporate carbon transparency. Board size reflects the monitoring capacity and diversity of expertise within the board of directors. Larger boards may provide broader perspectives that support environmental oversight, although excessive board size may reduce decision-making efficiency (Ben-Amar & McIlkenny, 2022; Velte, 2023). Similarly, independent commissioners play an important role in strengthening governance oversight and promoting transparency, as their independence allows them to evaluate management decisions more objectively (Haque, 2023).

Executive compensation represents another governance mechanism that may influence managerial behavior. Performance-based incentives may encourage executives to adopt long-term sustainability strategies, including environmental reporting and carbon disclosure initiatives (Zhang et al., 2024; Bose et al., 2023). When executive rewards are aligned with sustainability objectives, managers may be more motivated to improve environmental transparency and corporate reputation.

In addition to regulatory pressure, investors and financial institutions increasingly incorporate environmental transparency into their evaluation of corporate performance. Environmental, social, and governance (ESG) considerations have become an important component of investment decision-making processes. Companies that disclose detailed environmental information may benefit from improved investor confidence and stronger corporate reputation.

Carbon emission disclosure is therefore not only a regulatory requirement but also a strategic communication tool that enables firms to demonstrate accountability in managing climate-related risks. Transparent reporting practices allow stakeholders to evaluate corporate commitments toward emission reduction, environmental protection, and sustainable development goals.

For industries with high environmental impact, such as mining, the importance of environmental transparency is even more significant. Mining operations often involve large-scale resource extraction, extensive land use, and energy-intensive production processes. These activities contribute significantly to greenhouse gas emissions and environmental degradation if not managed properly.

Despite growing global attention to sustainability reporting, the level of carbon emission disclosure remains uneven across companies and countries. Firms operating in emerging economies often face institutional and regulatory challenges in implementing transparent environmental reporting systems. Differences in governance quality, regulatory enforcement, and organizational culture may influence the extent to which firms disclose environmental information.

Although previous research has examined the relationship between corporate governance and environmental disclosure, several research gaps remain. First, many studies focus on general sustainability reporting or ESG disclosure rather than specifically examining carbon emission transparency. Second, empirical evidence from emerging economies remains limited compared to developed markets. Third, industries with high environmental impact, such as mining, have received relatively limited attention in governance-related carbon disclosure studies.

Indonesia provides an important research context because the mining sector plays a significant role in national economic development while simultaneously contributing to environmental challenges. Therefore, examining how governance mechanisms influence carbon transparency in Indonesian mining companies can provide valuable insights for regulators, investors, and corporate stakeholders.

Based on this background, this study investigates the influence of internal governance mechanisms, board size, independent commissioners, and executive compensation on corporate carbon transparency in mining companies listed on the Indonesia Stock Exchange during the period 2022–2024.

2. Literature Review and Hypothesis Development

2.1 Agency Theory

Agency theory explains the relationship between shareholders (principals) and managers (agents), where conflicts of interest may arise due to information asymmetry and differing objectives. Corporate governance mechanisms such as board oversight and independent commissioners help reduce agency problems by monitoring managerial behavior. In this context, stronger governance structures can encourage managers to disclose environmental information, including carbon emissions, to improve transparency and accountability (Jensen & Meckling, 1976).

2.2 Legitimacy Theory

Legitimacy theory suggests that companies seek to align their operations with societal norms and expectations to maintain legitimacy. Environmental disclosure, including carbon emission reporting, serves as a strategy for companies to demonstrate responsibility and maintain public trust. Firms in environmentally sensitive industries are more likely to disclose environmental information to legitimize their activities and reduce potential criticism from society (Suchman, 1995).

2.3 Stakeholder Theory

Stakeholder theory emphasizes that companies must consider the interests of various stakeholders, including investors, regulators, and the community. Carbon emission disclosure is one way firms respond to stakeholder demands for greater environmental transparency. By providing such information, companies demonstrate accountability and strengthen relationships with stakeholders concerned about environmental sustainability (Freeman, 1984).

Corporate Governance and Environmental Transparency

Corporate governance refers to the institutional mechanisms that guide and control corporate decision-making processes. Effective governance structures are essential for ensuring transparency, accountability, and responsible corporate behavior. In the context of sustainability reporting, governance quality plays an important role in determining the extent of environmental disclosure provided by companies (Gerged et al., 2023; Zhang et al., 2024).

Environmental transparency allows stakeholders to evaluate how companies manage environmental risks and climate change challenges. Firms that disclose detailed carbon information demonstrate greater accountability and commitment to sustainability objectives (Tang et al., 2022).

Previous research has highlighted the importance of governance structures in shaping corporate sustainability practices. Strong governance mechanisms can enhance monitoring processes, improve managerial accountability, and encourage firms to adopt transparent reporting practices.

Board characteristics are frequently examined as important determinants of sustainability disclosure. Boards of directors are responsible for overseeing corporate strategy, monitoring management behavior, and ensuring that corporate activities align with stakeholder interests. Boards with diverse expertise and experience may be better equipped to address complex sustainability issues, including climate change risks and environmental reporting requirements.

Another important aspect of governance is board independence. Independent board members are expected to provide objective oversight and reduce potential conflicts of interest between managers and shareholders. Because independent commissioners are not directly involved in day-to-day management activities, they may play a more effective role in ensuring transparency and accountability in corporate reporting practices.

Executive compensation also represents a critical governance mechanism that can influence managerial decision-making. Compensation structures that reward long-term performance may encourage managers to adopt sustainability-oriented strategies and improve environmental disclosure practices.

However, empirical findings regarding the relationship between governance mechanisms and environmental disclosure remain mixed. Differences in institutional environments, regulatory frameworks, and industry characteristics may influence how governance structures affect sustainability reporting practices.

Board Size and Carbon Disclosure

Board size represents the number of directors responsible for overseeing corporate strategy and management performance. A larger board may contribute diverse expertise, experience, and perspectives that enhance environmental oversight. Research suggests that board diversity and expertise can support sustainability initiatives and environmental reporting (Velte, 2023).

However, excessively large boards may also reduce efficiency in decision-making due to coordination difficulties and communication challenges. As board size increases, consensus building may become more complex, potentially reducing the board's effectiveness in addressing sustainability issues (Ben-Amar & McIlkenny, 2022).

H1: Board size influences corporate carbon emission disclosure.

Independent Commissioners and Carbon Disclosure

Independent commissioners are board members who do not have direct relationships with corporate management. Their role is to provide objective oversight and ensure that management decisions align with shareholder and stakeholder interests.

Independent board members may encourage companies to adopt transparent reporting practices because they strengthen monitoring mechanisms and reduce managerial opportunism (Haque, 2023). Previous research indicates that board independence can improve corporate transparency and sustainability reporting quality (García-Sánchez et al., 2023).

H2: Independent commissioners positively influence carbon emission disclosure.

Executive Compensation and Carbon Disclosure

Executive compensation represents financial incentives provided to senior managers for achieving corporate performance objectives. Compensation structures may influence managerial decisions, including sustainability initiatives and environmental reporting practices.

Studies suggest that linking executive compensation to sustainability performance can encourage managers to prioritize long-term environmental strategies and climate-related transparency (Zhang et al., 2024; Bose et al., 2023).

H3: Executive compensation positively influences carbon emission disclosure.

3. Research Methodology

3.1 Research Design

This study adopts a quantitative research approach using panel data regression analysis to examine the relationship between corporate governance mechanisms and carbon transparency.

3.2 Sample and Data Collection

The study focuses on mining companies listed on the Indonesia Stock Exchange. Using purposive sampling, 53 companies were selected for the observation period 2022–2024, resulting in 159 firm-year observations. Secondary data were collected from annual reports and sustainability reports published by the companies.

3.3 Regression Model

The empirical model used in this study is expressed as:

$$CED_{it} = \beta_0 + \beta_1 BS_{it} + \beta_2 IC_{it} + \beta_3 PBC_{it} + \epsilon$$

Where:

CED = Carbon emission disclosure

BS = Board size

IC = Independent commissioners

PBC = Executive compensation

ϵ = represents the error term

A **fixed-effects panel regression model** is used for estimation.

4. Results and Discussion

Descriptive Statistics

Table 1 presents the descriptive statistics of the research variables.

Table 1. Descriptive Statistics

Variable	N	Min	Max	Mean	Std.Dev
Board size	159	2	10	4	2
Independent Commissioners	159	0	1	0.42	0.49
Executive Compensation	159	1,770,000	1,094,928,065,048	80,442,463,640	154,497,282,766

Source: Data output from EViews 12

Regression Results

Table 2. Fixed Effects Regression Results

Variable	Coefficient	T-Statistic	p-value
Constant	0.0869	11.69	0.000
Independent Commissioners	-0.1328	-1.17	0.245
Executive Compensation	2.24E-13	1.73	0.087*
Board size	-0.0274	-2.57	0.012**

Source: Data output from EViews 12

Model Statistics

Indicator	Value
R ²	0.970
Adjusted R ²	0.955
F-Statistic	61.99
Prob(F)	0.000
Durbin-Watson	2.02
Observations	159

Source: Data output from EViews 12

Note:

** : $p < 0.05$

* : $p < 0.10$

The high R² value may reflect the use of firm fixed effects, which capture unobserved firm-specific characteristics. The model demonstrates strong explanatory power, with an R² of 0.97, indicating that governance variables explain a substantial proportion of variation in carbon disclosure. The Durbin-Watson statistic (2.02) suggests no serious autocorrelation issue.

Hypothesis Testing Discussion

The regression results indicate that board size has a negative and statistically significant effect on carbon emission disclosure ($p = 0.012$). This finding suggests that larger boards may reduce decision-making efficiency in addressing environmental reporting issues. Although larger boards provide diverse expertise and perspectives, excessive board size may create coordination challenges that slow down decision-making processes. As a result, the board may become less effective in responding to sustainability-related issues such as carbon disclosure. This finding supports previous studies suggesting that overly large boards may weaken governance effectiveness and reduce the efficiency of corporate monitoring mechanisms.

Independent commissioners show no statistically significant effect on corporate carbon transparency. Although board independence is theoretically expected to strengthen governance oversight, the empirical results suggest that the presence of independent commissioners alone may not be sufficient to encourage greater environmental disclosure. One possible explanation is that independent commissioners may focus primarily on financial monitoring rather than environmental reporting issues. This finding is consistent with prior research indicating that formal governance structures do not always translate into effective sustainability oversight.

Executive compensation demonstrates a positive but relatively weak relationship with carbon disclosure. Although the coefficient is positive, the statistical significance is relatively low, indicating that managerial incentives may have a limited influence on environmental transparency. This suggests that financial incentives alone may not strongly motivate executives to prioritize climate-related disclosure practices. Managers may focus more heavily on short-term financial performance targets if environmental performance indicators are not explicitly incorporated into compensation schemes.

The negative relationship between board size and carbon disclosure further indicates that excessively large boards may face communication and coordination difficulties when addressing complex sustainability challenges. Larger boards may require more time to reach consensus on strategic decisions, which can reduce their responsiveness to emerging environmental reporting expectations.

Conversely, smaller boards may facilitate more efficient decision-making processes and allow directors to engage more actively in monitoring corporate sustainability practices. A more compact board structure may improve communication among board members and enhance the board's ability to address environmental issues effectively.

The insignificant effect of independent commissioners may also reflect limitations in the practical implementation of board independence within corporate governance systems. Although independent commissioners are expected to provide objective oversight, their effectiveness may depend on factors such as professional expertise, experience in sustainability issues, and the level of authority granted within the board structure.

Furthermore, the relatively weak influence of executive compensation suggests that financial incentives alone may not be sufficient to drive environmental transparency. Managers may prioritize financial performance indicators when compensation systems are primarily linked to short-term financial outcomes rather than long-term sustainability objectives.

Overall, these findings highlight the importance of integrating sustainability considerations more explicitly into corporate governance frameworks. Companies may need to strengthen governance mechanisms that support environmental accountability, such as incorporating sustainability expertise within boards, establishing environmental committees, and linking executive incentives to sustainability performance indicators.

5. Conclusion

This study examines the influence of internal governance mechanisms on corporate carbon transparency in Indonesian mining companies. Using panel data from 53 firms during the period 2022–2024, the study evaluates the role of board size, independent commissioners, and executive compensation in shaping carbon emission disclosure.

The results indicate that board size has a significant negative effect on carbon disclosure, suggesting that larger boards may reduce governance effectiveness in addressing environmental reporting issues. Independent commissioners do not demonstrate a significant relationship with carbon transparency, while executive compensation shows a weak positive influence.

The findings of this study also provide important implications for policymakers and regulators. Strengthening environmental reporting standards and encouraging firms to adopt transparent carbon disclosure practices may improve the quality of sustainability reporting among Indonesian companies.

From a corporate governance perspective, companies may benefit from integrating sustainability considerations into board oversight structures. Establishing dedicated sustainability committees or appointing board members with environmental expertise could enhance the effectiveness of governance mechanisms in addressing climate-related risks.

For investors, improved carbon transparency provides valuable information for evaluating corporate environmental performance and long-term sustainability strategies. Transparent disclosure practices may therefore contribute to more informed investment decisions and encourage firms to adopt responsible environmental management practices.

These findings contribute to the growing literature on corporate governance and environmental transparency by providing evidence from an emerging market context. The study highlights the importance of governance structures in shaping corporate sustainability reporting practices.

From a practical perspective, policymakers and regulators may consider strengthening governance frameworks and sustainability reporting guidelines to encourage greater environmental transparency among mining companies.

Future research may explore additional governance variables, such as board diversity, ownership structure, or sustainability committees, to provide a more comprehensive understanding of corporate carbon disclosure practices.

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