

Environmental disclosure in Indonesia: a study of manufacturing and mining companies

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Abstract

Purpose – This study investigated the environmental disclosure practices in Indonesia’s manufacturing and mining sectors, examining the trends, quality and governance related drivers behind these disclosures.

Design/methodology/approach – Involving a sample of 286 firm-year observations from companies listed on the Indonesia Stock Exchange (IDX) between 2019 and 2022, the study utilizes panel regression and robustness testing to evaluate the determinants of disclosure. It also disaggregates results by sector to validate empirical consistency.

Findings – The research findings indicate that environmental disclosure practices in manufacturing and mining sectors were relatively good, with an average score of 54.94%. Companies favor disclosures related to environmental management, certifications and compliance over operational impacts like pollution. Board independence, audit committee size and affiliation with Big Four accounting firms positively influence disclosure levels. Foreign ownership shows no significant effect.

Research limitations/implications – This study provides critical insights into how environmentally sensitive industries, particularly manufacturing and mining, manage environmental transparency. The research highlights the need for stronger regulatory frameworks to standardize environmental reporting practices in Indonesia. Furthermore, it contributes to agency and stakeholder theories by demonstrating how governance structures affect environmental disclosure.

Originality/value – While many previous studies have focused on general perspectives regarding environmental disclosure practices, the present study offered a sector-specific analysis focusing on industries with high environmental impacts. The novelty of this research lies in its comprehensive assessment of environmental disclosure practices in Indonesia’s manufacturing and mining sectors industries that have been largely underexplored in this context.

Keywords Environmental disclosure, Manufacturing, Mining, GRI, SASB, Corporate governance

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1. Introduction

As reputation and sustainability gain importance (Dintimala and Amril, 2018), companies have started implementing environmental protection to send clear signals to stakeholders (Acar et al., 2021). Nowadays, companies are expected not only to implement environmental and carbon emission protection measures but also to communicate these efforts to the public (Li et al., 2018). Without such reporting, stakeholders cannot access information about a company's environmental performance (Li et al., 2018). Environmental reporting is crucial as it conveys both financial and non-financial information on the social and environmental impacts of corporate operations (Hossain et al., 2017).

Previous studies show that the concept of environmental disclosure still varies in usage and application (Acar et al., 2021; Akhter et al., 2023; Chapman, 2018; Hahn and Lülfs, 2014; Ismail et al., 2018). Some companies see negative environmental information as a threat to their legitimacy (Clarkson et al., 2008), while overly optimistic disclosures may raise stakeholder suspicion (Chapman, 2018). However (Hahn and Lülfs, 2014), reveal that detrimental events do not necessarily diminish a company's credibility in the eyes of stakeholders, particularly regarding environmental incidents. The environmental information disclosed reflects a company's proactive, honest approach and acts as a risk-mitigation strategy. Thus, whether monetary or non-monetary, quantitative or qualitative or positive or negative, environmental disclosure transparently portrays a company's environmental responsibility (Akhter et al., 2023). Although debates continue over its consistency and effectiveness, further research is needed.

This study examined environmental disclosure practices in Indonesia for several reasons. Indonesia is committed to reducing carbon emissions by 29% by 2030 and achieving net zero by 2060 (Prasodjo, 2024). However, its ecosystem remains in poor condition, with an Environmental Performance Index (EPI) score of 28.20, Indonesia ranks 164th out of 180 countries, reflecting low environmental standards (Policy, 2022). This is worsened by issues like deforestation, pollution and land degradation (Forestry, 2023). Second, this study focuses on the industrial and mining sectors, two of Indonesia's most environmentally sensitive sectors. The manufacturing sector contributes 24% of total industrial emissions, including air, water and land pollution (Prihandono and Yuniarti, 2023) and generates hazardous waste that threatens ecosystems and local communities (Abdullah et al., 2020). The mining sector causes about 70% of deforestation in major mining areas, along with soil erosion and water pollution (Acar et al., 2021). These sectors are the largest contributors to environmental degradation, prompting stronger government regulation (Dowling and Pfeffer, 1975). While vital for economic growth, they also significantly impact the environment, making them ideal for studying disclosure practices. Compared to other sectors like agriculture or energy, manufacturing and mining have a more direct impact on natural resources (Hanifa and Cahaya, 2016). Prior studies found environmental disclosure in sectors like agriculture, consumer goods and chemicals remained below 50% (Abdullah et al., 2020) and below 30% in Indonesian non-financial industries between 2017 and 2019 (Wicaksono et al., 2024). Other studies have reported similar findings (Deswanto and Siregar, 2018; Gery Djajadikerta and Trireksani, 2012; Wahyuningrum et al., 2020). For these reasons, a detailed examination of environmental disclosure practices in Indonesia is necessary. The present study sought to answer the following questions: "What is the level of environmental disclosure by Indonesian manufacturing and mining companies?" "What environmental items do companies most frequently disclose, and how these trends are evolving?" and "What drives environmental disclosure practices?"

This study examine environmental disclosure practices in Indonesia using firms from the manufacturing and mining sectors listed on the Indonesia Stock Exchange (IDX) from 2019 to 2022. These sectors are chosen due to their significant environmental impact and close regulatory monitoring. Manufacturing generates high emissions and waste, while mining contributes to deforestation, land degradation and water pollution. Their environmental sensitivity make them relevant for studies on transparency and governance (Papa et al., 2022). Since 2021, IDX sector classifications have shifted based on market exposure rather than core activities, integrating

manufacturing, mining and nature based industries. To address this, the sample was selected based on operational activities relevant to environmental sensitivity, following prior research approaches (Dong *et al.*, 2014; Hatane *et al.*, 2022). Additionally, this study applies a comparative method to analyze factors influencing environmental disclosure in both sectors.

This study adopts environmental disclosure proxies based on prior research (Baalouch *et al.*, 2019; I F S Wahyuningrum and Budihardjo, 2018), with disclosure levels measured using an unweighted scoring method for objectivity. The results indicate steady improvement in disclosure quality. To generate statistically supported insights, interpretive analysis was employed, revealing that environmental management was the most frequently disclosed topic by manufacturing and mining forms. Combined regression analysis shows that board independence, Big Four auditors and audit committee size significantly influenced disclosure practices, consistent across various statistical test.

This study significantly contributes to understanding environmental disclosure practices in Indonesia, especially in the manufacturing and mining sectors that directly affect the environment. It also offers in-depth analysis of companies' preferred disclosure forms and items in sustainability reports – an area rarely explored, particularly in Indonesia. Thus, the study highlights this topic as a potential avenue to strengthen environmental protection efforts.

2. Theoretical framework, literature review and hypothesis development

This study adopts a multi theory framework use by (Baalouch *et al.*, 2019), explaining environmental disclosure through legitimacy, stakeholder and agency theories (Freedman and Jaggi, 2005; Liao *et al.*, 2015). According to legitimacy theory, companies must act responsibly and thoughtfully to meet the expectations of investors and the public to gain legitimacy (Velte, 2022). The theory posits that companies must ensure their operational activities align with societal norms (Acar *et al.*, 2021). In this context, environmental disclosure plays a crucial role in reinforcing a company's legitimacy within the community. Companies can communicate environmental information through various channels, such as annual CSR and sustainability reports, as evidence of their commitment to environmental issues (Gregory *et al.*, 2016; Hahn and Lülfes, 2014). Within the framework of stakeholder theory, environmental disclosure is viewed as a company's responsibility to its stakeholders (Freeman, 1984) and as a means for companies to gain legitimacy from the public for their operations, aligning with legitimacy theory (Dowling and Pfeffer, 1975). Stakeholder theory asserts that stakeholders have the right to both financial and non-financial information related to a company (Freeman and McVea, 2005). Disclosure practices are essential for companies to fulfill their responsibilities to stakeholders (An *et al.*, 2011). Agency theory link voluntary disclosure to managerial decisions balancing costs and benefits (Guidry and Patten, 2012), with corporate governance such as board independence and audit committee size mitigating agency issues (Makri *et al.*, 2024). These theories explain how environmental disclosure informs stakeholders about a company's environmental impact and accountability.

2.1 Indonesian setting: the gray area of environmental disclosure practices

Indonesia has been implementing regulations regarding environmental protection for almost two decades. Long-term environmental goals such as "Indonesia Clean from Waste by 2025," "Net Zero Emissions in the Industrial Sector by 2050" and "Net Zero Carbon by 2060" underpin the government's environmental strategies. Public companies must submit sustainability reports that include social and environmental data, starting with the Capital Market Supervisory Agency (Bapepam) regulations, Law Number 40 of 2007, and, most recently, the Financial Services Authority (OJK) Regulation Number 51/POJK/03/2017 (Wicaksono *et al.*, 2024). However, the lack of detailed implementation recommendations in these rules creates accountability concerns and gives the impression that environmental disclosure is still optional (Abdullah *et al.*, 2020). Furthermore, compared to other ASEAN nations, Indonesia has a more

lax environmental reporting regime, giving businesses a great deal of latitude in choosing the format and caliber of their disclosure. For instance, only 118 of 622 publicly traded corporations released sustainability reports between 2006 and 2019. This circumstance draws attention to ambiguity in the implementation of environmental reporting in Indonesia.

2.1.1 Connection to the focused sectors: manufacturing and mining. Given their importance to Indonesia's economy and close links to environmental issues, the industrial and mining sectors are vulnerable to regulatory uncertainty. Both have significant environmental impacts, from resource extraction to industrial pollution (Sun *et al.*, 2021). However, hard data on these impacts is limited. Approximately 30% of Indonesia's carbon emissions come from manufacturing, which contributes heavily to pollution and resource use (Raihan *et al.*, 2022). This sector tends to focus on visible environmental practices like certification and management systems rather than specific problems. Likewise, mining, scrutinized for deforestation, soil damage and water pollution, accounted for 15% of Indonesia's forest loss in 2020, alongside palm oil plantations as a major deforestation driver (Fergusson and Weiskittel, 2021).

Despite the existence of a regulatory framework, significant gaps persist in enforcement and implementation. Existing regulations, such as Financial Services Authority (OJK) Regulation No. 51/POJK.03/2017, mandate sustainability reporting; however, compliance remains inconsistent, with only 42% of manufacturing and 55% of mining companies adhering to reporting standards in 2022 (Prihandono and Yuniarti, 2023). This regulatory flexibility enables companies in these sectors to selectively disclose information, focusing primarily on aspects that cast them in a favorable light. A thorough regulatory strategy is required that incorporates policy interventions that mandate the disclosure of certain topics, such as waste management procedures and pollutant discharge rates, which are still underreported. As a result, although Indonesia has a framework for environmental reporting, legal gaps have caused disparities in disclosure standards among industries, especially in mining and manufacturing. These inconsistencies stand in contrast to international disclosure frameworks such as the Global Reporting Initiative (GRI) and Sustainability Accounting Standards Board (SASB), which provide detailed itemized guidelines (e.g. GRI 305 for emissions, SASB EM-MM-160a.1 for mining-specific pollutants). In contrast, Indonesia's OJK Regulation No. 51 is principles-based and lacks sector-specific mandates or enforcement mechanisms. This study addresses this regulatory vacuum by analyzing what companies voluntarily report and how that aligns or diverges from global norms.

Unlike global frameworks such as GRI and SASB, which provide sector-specific, itemized guidance (e.g. GRI 305 for emissions and SASB EM-MM-160a.1 for mining-specific effluents), Indonesia's POJK 51 is a principles-based regulation that lacks enforceable metrics or mandatory disclosures tailored to high-impact industries. For example, GRI requires disclosures on Scope 1, 2 and 3 emissions, yet most Indonesian reports provide only qualitative narratives or omit emissions data entirely. Similarly, SASB mandates mining companies to report chemical usage in tailing treatment, a practice largely ignored in the IDX-listed firms analyzed in this study. By systematically comparing local practices with these standards, this study offers a critical appraisal of disclosure sufficiency, positioning itself as a bridge between domestic regulatory realities and global expectations.

Aligning domestic laws with global standards like the SASB and GRI can resolve inconsistencies and improve environmental reporting transparency. To accurately assess disclosure practices in Indonesia's high-impact sectors, a thorough comprehension of their industry-specific norms is essential.

2.2 Hypothesis development

2.2.1 Board independence. Based on agency and stakeholder theories, independent boards provide unbiased judgments free from the representation of stakeholder issues, influence of specific interests and development of beneficial external relationships (Isa and Muhammad, 2015;

Makri *et al.*, 2024; Wahyuningrum *et al.*, 2023). Their function prevents opportunistic behavior by facilitating efficient managerial oversight free from social, familial, or financial relationships (Petra, 2005). Furthermore, independent boards can evaluate whether reporting is acceptable to shareholders and want to improve their professional standing by disclosing more information, including environmental information (Vitolla *et al.*, 2020). According to the Financial Services Authority (OJK) Policy No. 57/POJK.04-2017, public companies in Indonesia must have at least 30% independent board members. In this context, board independence is likely crucial for environmental disclosure. Prior studies have found a positive correlation between board independence and disclosure, including environmental disclosures (Agyemang *et al.*, 2020; Gerged, 2021; Khaireddine *et al.*, 2020). Based on these perspectives, the following hypothesis is proposed:

H1. Board independence has a positive and significant correlation with environmental disclosure in Indonesian manufacturing and mining companies.

2.2.2 *Foreign ownership.* Agency theory suggests that the presence of various entities, including foreign owners as part of corporate governance, places pressure and constraints on the opportunistic behaviors of managers (Rezaee *et al.*, 2021). Foreign ownership, especially those who pay attention to environmental issues, might consider environmental disclosure as they seek to meet the interests of their various stakeholders (Jensen and Meckling, 1976). In Indonesia, particularly among manufacturing companies from 2014 to 2018, foreign ownership averaged 27.39% over five years (Wulandari and Setiawan, 2023). The percentage of foreign ownership in Indonesian companies reached an average of 39.71% in 2014 (Wulandari and Setiawan, 2023). Foreign ownership might dominate multinational companies. Additionally, foreign investors in Indonesia account for 34% of the stock trading value, a significant proportion that can influence companies to disclose information such as environmental reports. In this context, foreign investors are expected to play a significant role in a company's ownership structure, allowing for more intensive company management oversight than local investors. Previous studies have found a positive correlation between foreign ownership and environmental disclosure (Gerged, 2021; Ismail *et al.*, 2018). However (Saini and Singhania, 2019), argue that foreign ownership in a company's structure is primarily profit-oriented rather than focused on environmental protection initiatives. Based on theoretical perspectives, empirical literature and contextual insights, the proposed hypothesis is as follows.

H2. Foreign ownership has a positive and significant correlation with environmental disclosure in Indonesian manufacturing and mining companies.

2.2.3 *Big Four accounting firms.* Companies often employ auditors approved by a general meeting of shareholders, also called external auditors, who actively review reports published by public companies (Dobija, 2015). Over time, the presence of the Big Four accounting firms – PricewaterhouseCoopers (PwC), Klynveld Peat Marwick Goerdeler (KPMG), Deloitte and Ernst and Young (EY) – has made the integrity and reputation of auditors a critical consideration for companies and stakeholders. The Big Four accounting firms are essential as a sign of high-quality audits because they have consistently assured stakeholders of their integrity over the years. In line with their focus on sustainable development goals (SDGs), Big Four accounting firms can provide recommendations for companies to publish environmental disclosures (Iatridis, 2013; Suttipun and Stanton, 2012). However, the correlation between the Big Four accounting firms and environmental disclosures has produced mixed results in various studies. In particular, many public companies employ external auditors primarily for financial or annual reports, with only a few having their sustainability reports reviewed by auditors. In Indonesia, a study by (Handayati *et al.*, 2022) found that fewer than 5% of companies between 2016 and 2020 involved Big Four accounting firms specifically to ensure their sustainability reports. Although previous studies have identified a correlation between the Big Four accounting firms and non-financial disclosures (Bozzolan and Miihkinen, 2021;

[Power and Terziovski, 2007](#); [Trucco et al., 2022](#); [Ismail et al., 2018](#)) revealed that the Big Four accounting firms did not significantly influence environmental disclosure. With these perspectives in mind, the present study proposes the following hypothesis.

H3. Big Four accounting firms have a positive and significant correlation with environmental disclosure in Indonesian manufacturing and mining companies.

2.2.4 Audit committee size. According to agency theory, effective monitoring reduces opportunistic managerial behavior and enhances adherence to governance norms. Consequently, Indonesian firms typically utilize a dual audit structure to ensure operational and reporting integrity. Generally, an audit committee consists of commissioners, members of the board of directors and independent commissioners or members selected to supervise an organization's internal control systems and financial reporting procedures, ensuring compliance with legal and regulatory requirements ([Wang and Sun, 2022](#)). This study defines an audit committee by size or the number of members. According to the policy set by the Chairman of the Indonesian Capital Market and Financial Institutions Supervisory Agency (*Bapepam-LK*), No. KEP-643/BL/2012, public companies in Indonesia are required to have at least three audit committee members. Audit committees are crucial in financial reporting and managing business and financial risks, ensuring compliance with legal requirements, ethical standards and applicable regulations ([Nwafor and Amahalu, 2021](#)). Prior studies have demonstrated that audit committee characteristics, including size, positively affect voluntary disclosure ([Okafor et al., 2022](#); [Wang and Sun, 2022](#)). Given that an audit committee's independence is influential in promoting social and environmental disclosure, the following hypothesis is posited based on existing theory and empirical research.

H4. Audit committee size has a positive and significant correlation with environmental disclosure among Indonesian manufacturing and mining companies.

3. Methodology

3.1 Data collection

Based research utilized secondary data from annual and sustainability reports of mining and manufacturing companies listed on the Indonesia Stock Exchange (IDX) from 2019 to 2022. To ensure data reliability, reports were sourced directly from company websites and the IDX database. A purposive sampling method was used, resulting in a research sample of 288 analytical units. The initial population consisted of 816 firm-years from companies continuously listed during the study period. Firms that did not publish sustainability reports were excluded from the final sample. This exclusion criterion isolates firms with voluntary environmental disclosure. Furthermore, an unbalanced sample was employed to incorporate all companies publishing sustainability reports, irrespective of reporting consistency. [Table I](#), which presents the criteria and process of sample selection, can be accessed at [Supplementary file table 1 \[1\]](#). The research sample spanned various sub-industries, including basic materials, cyclical consumer goods, non-cyclical consumer goods, energy, healthcare and industrial sectors.

Although manufacturing and mining differ in operational processes and environmental risk types, they share high exposure to environmental scrutiny and fall under the umbrella of "environmentally sensitive industries" in many regulatory and academic taxonomies (e.g. GRI's sector standards). Furthermore, both sectors are subject to similar sustainability disclosure obligations under POJK 51 and exhibit parallel governance structures in Indonesian public firms. To validate the robustness of joint analysis, this study also performs sector-specific regressions, confirming that key governance variables (e.g. board independence, audit committee size) influence both sectors similarly. This dual-level design combined and disaggregated ensures analytical precision without sacrificing generalizability.

3.2 Variable measurement and research model

This study collected data on the dependent variable employing a checklist of items based on the research by (Baalouch *et al.*, 2019), which developed 40 items of environmental information. By using an unweighted approach in item scoring, this study avoided the researcher's subjectivity. Baalouch *et al.* (2019) mention that the main point of this measurement lies in the level of disclosure, specifically whether information is provided for each item. Table II displays the items and indicators used to measure environmental disclosures, which can be accessed at [Supplementary file Table 2](#). The researchers utilized varying proxies to measure independent variables. Data on board independence, the presence of Big Four accounting firms, foreign ownership and audit committee size were collected from companies' annual reports and sustainability reports and analyzed using content analysis techniques. The researchers also incorporated control variables focusing on companies' financial and non-financial characteristics. Leverage, profitability, company size and company age were employed as control variables proxied by accounting-based metrics. The measurements used in this research are presented in Table III, accessible at [Supplementary file Table 3](#). The research methods included descriptive statistical analysis, classical assumption tests and panel regression. Additionally, a General Method of Moments (GMM) model was used as a robustness test. The regression model applied in this study is shown in Equation (1). For comparative purposes, the researchers applied two additional regression models for manufacturing and mining companies. The effect of independent variables was examined by considering the *p*-values of the regression results. Descriptive statistical results were also used for interpretative analysis, which were processed into graphs to answer the research questions. Three charts were generated in this study, adopting prior approaches using processed statistical graphs (Akhter *et al.*, 2023) and Microsoft Power BI (Copyright © Microsoft. All Rights Reserved) for visualization.

$$ED = \alpha + \beta_1 \text{BOARD_IND} + \beta_2 \text{AUDITOR} + \beta_3 \text{FOREIGN} + \beta_4 \text{AUDIT_COM} + \beta_5 \text{LEVERAGE} + \beta_6 \text{PROFIT} + \beta_7 \text{SIZE} + \beta_8 \text{AGE} \quad (1)$$

$$ED_{\text{manuf.}} = \alpha + \beta_1 \text{BOARD_IND} + \beta_2 \text{AUDITOR} + \beta_3 \text{FOREIGN} + \beta_4 \text{AUDIT_COM} + \beta_5 \text{LEVERAGE} + \beta_6 \text{PROFIT} + \beta_7 \text{SIZE} + \beta_8 \text{AGE} \quad (2)$$

$$ED_{\text{mining}} = \alpha + \beta_1 \text{BOARD_IND} + \beta_2 \text{AUDITOR} + \beta_3 \text{FOREIGN} + \beta_4 \text{AUDIT_COM} + \beta_5 \text{LEVERAGE} + \beta_6 \text{PROFIT} + \beta_7 \text{SIZE} + \beta_8 \text{AGE} \quad (3)$$

4. Empirical results and discussion

4.1 Descriptive statistical analysis and classical assumption test

Table IV presents the results of descriptive statistical analyses as presented in [Supplementary file Table IV](#). Environmental disclosure, the dependent variable and independent variables such as board independence, audit type, foreign ownership and audit committee size had average values greater than their respective standard deviations, indicating slight variation in the data distribution. To enhance the depth of analysis, the descriptive statistics were further examined for each of the five categories of environmental disclosure: general environmental policy, sustainable use of resources, pollution control, environmental management and compliance with regulations (Baalouch *et al.*, 2019). The findings indicate that environmental management was the most frequently disclosed category, reflecting companies' focus on governance-related environmental initiatives, while pollution control had the lowest disclosure rate, suggesting limited transparency in operational environmental impacts.

The summarized output of the descriptive statistics shows the average environmental disclosure value is 54.97% (0.5497), indicating that many of the sample companies disclosed environmental information in intermediate detail. A category-wise analysis revealed that environmental management information constituted 31.58% of the total disclosures in 2022, followed by sustainable use of resources (19.33%) and general environmental policy (17.76%). The researchers expanded the analysis to provide more detailed descriptive statistical results and to answer the research question: “What is the level of environmental disclosure by Indonesian manufacturing and mining companies?” The collected data was projected onto a graph, as presented in [Figure 1](#), which can be accessed at [Supplementary file Figure I](#). Both overall and separately, the trend of environmental disclosure for manufacturing and mining companies remained stable, with a gradual increase despite a deviation in 2021. However, the level of environmental disclosure in the mining sector reached 0.632 in 2022, higher than that of manufacturing companies, which only reached 0.552 in the same year. A more detailed breakdown by category reveals that mining companies tend to disclose more information related to environmental management and regulatory compliance, while manufacturing companies place a stronger emphasis on resource efficiency.

In response to the second research question, this study also provided an overview of the trends and preferred environmental items disclosed by companies in their sustainability reports. [Figures 2 and 3](#) can be accessed at [Supplementary file Figures 2 and 3](#). [Figure 2](#) shows that all item categories demonstrated an annual increase from 2019 to 2022 despite a deviation in 2021. Moreover, three item categories – general environmental policy, sustainable use of resources and environmental management – exhibited only a slight increase (0.01 point) in 2022 compared to other categories. [Figure 3](#) demonstrates that the top three categories of environmental information most preferred by manufacturing and mining companies from 2019 to 2022 were environmental management (disclosed by 31.58% of companies in 2022), general environmental policy (17.76% in 2022) and sustainable use of resources (19.33% of in 2022). A closer look reveals that the environmental management category included 13 assessment items: company participation, achievement of standards, certifications, awards, compliance with laws and the company’s environmental protection strategy. The environmental policy category comprises eight indicators that focus on the role of financial and human resources in promoting environmental protection. Sustainable resource utilization category pertains to the expenditure of natural capital – such as water, energy and raw materials – and the associated efficiency mandates. Corporate reporting predominantly emphasizes environmental management at a strategic or policy level, rather than elucidating the direct ecological impacts of specific operational processes and technologies. This implies a potential deficiency in corporate awareness concerning the imperative to advance direct environmental performance. Prior studies have found that companies’ mindsets regarding disclosure might still not align with the preferred form ([Ifada and Saleh, 2022](#); [Vesty et al., 2015](#)). An analysis of trends based on the most disclosed items revealed that Indonesian manufacturing and mining companies prioritized the information visible to stakeholders. Information that is more visually accessible emphasizes a company’s environmental concern, as opposed to long-term strategic information ([Vesty et al., 2015](#)). Companies tend to highlight environmental content such as certifications, awards, water recycling initiatives and efficient resource use rather than pollution and waste management efforts, which are perceived as more costly to implement ([Ifada and Saleh, 2022](#)). These companies prioritize environmental measures that effectively manage costs and have the potential to increase revenue ([Ambec and Lanoie, 2008](#)) while also aiming to avoid scrutiny from skeptical investors ([Ganda, 2018](#)). As a result, mining and manufacturing companies often promote their environmental awards to enhance sales, leveraging consumer perceptions of their products as environmentally friendly.

4.2 Regression results

The regression model in this study was tested using classical assumption tests before proceeding to hypothesis testing. The normality test results, employing the Skewness and

Kurtosis test, demonstrated a significance value of 0.200, indicating that the data were normally distributed. Furthermore, the study was free from multicollinearity, as each variable had a VIF of less than 10 and a tolerance greater than 0.10. The regression model was tested using the Breusch–Pagan test for heteroscedasticity and the significance was lower than 0.5, suggesting that the model exhibited homoscedasticity. Thus, robust standard errors were employed to account for this issue. Based on the Hausman test, the probability was not significant, with a score of 0.9997 (greater than 0.5), leading to the selection of random effects regression over fixed effects regression. To provide a more comprehensive understanding, regression analyses were conducted separately for each of the five categories of environmental disclosure: general environmental policy, sustainable use of resources, pollution control, environmental management and compliance with regulations (Baalouch *et al.*, 2019). The category-specific regression analysis enables a more detailed interpretation of the determinants affecting different aspects of environmental reporting.

Table V presents the hypothesis testing results for all sectors and provides the results of a separate test for the manufacturing and mining sectors. Both tables can be accessed at [Supplementary file Table V](#). The adjusted R^2 of 0.41573 indicates that the selected variables explain 41.5% of the changes in environmental information disclosure in sustainability reports, demonstrating high predictive accuracy for environmental disclosure despite acknowledging numerous other potential influencing factors (Giannarakis *et al.*, 2020; Tsang *et al.*, 2023). The regression results demonstrate that board independence, Big Four accounting firms and audit committee size were positively correlated with environmental disclosure. However, foreign ownership had no significant correlation with environmental disclosure. Additionally, all control variables affected environmental disclosure.

4.3 Robustness test results

A series of robustness tests are conducted to ensure the reliability of the results and address potential endogeneity issues, which are common in corporate finance research. One of the main robustness tests applied is the generalized method of moments (GMM) model, which is highly effective in minimizing bias due to unobserved heterogeneity, reverse causality, or simultaneity issues (Shao and He, 2022). By applying the GMM model, the researchers ascertained whether the correlations identified in the main regression analysis were correct when accounting for endogeneity. Each of the five environmental disclosure categories: general environmental policy, sustainable resource use, pollution control, environmental management and regulatory compliance – underwent an additional robustness test to further bolster the study (Baalouch *et al.*, 2019). A deeper understanding of the consistency and dependability of corporate governance determinants across various environmental disclosure features is possible through category-specific robustness tests. The robustness test comparisons are summarized in Table V, which demonstrates that, even when employing various statistical techniques, the results are consistent with the primary findings. The GMM model substantiates the study's results, showing a strong positive correlation between environmental disclosure and three governance factors: audit committee size, board independence and Big Four auditors. At the category level, the first two factors are more strongly linked to management and compliance disclosures but have a weaker association with reports on pollution control and sustainable resource use. These results support the notion that environmental disclosure practices in mining and manufacturing industries are significantly influenced by robust corporate governance frameworks.

Corroborating the primary analysis, robustness tests confirm that foreign ownership has an insignificant effect on environmental disclosure. A nuanced, category-level finding suggests foreign investors may slightly favor high-level policy statements over operational details, though not to a statistically significant degree. The stability of these findings across different methods validates the main conclusions and highlights the necessity of differentiating between disclosure categories in governance research.

4.4 Discussion

Even after robustness tests, audit committee size, Big Four auditors and board independence consistently influence environmental disclosure. Companies with strong governance frameworks tend to adopt transparent reporting, reflecting their commitment to sustainability and compliance. This supports stakeholder theory, which posits that robust governance enhances responsiveness to stakeholder demands for accountability (Freeman and McVea, 2005). The results align with prior studies emphasizing board independence's role in improving disclosure quality (Agyemang *et al.*, 2020; Gerged, 2021; Khairredine *et al.*, 2020). Big Four auditors add credibility by bringing international best practices to environmental reporting. The consistency across tests reinforces the significance of governance in driving disclosure standards (Agyemang *et al.*, 2020; Gerged, 2021; Khairredine *et al.*, 2020). Additionally, audit committees often comprising more than three members in these sectors strengthen CSR efforts, promoting better environmental and social reporting (Nwafor and Amahalu, 2021).

The Big Four accounting companies are also interested in environmental disclosure. According to the findings of this study, the Big Four accounting firms significantly impact environmental disclosure, which is in line with agency theory and earlier research (Huang and Kung, 2010; Suttipun and Stanton, 2012). This result is in line with other research that indicates that multinational audit companies typically implement stricter disclosure requirements to safeguard their brands and guarantee adherence to changing legal requirements. To protect their reputations and lower the risk of future lawsuits, businesses are typically required to reveal more information (Huang and Kung, 2010).

This study challenges the assumption that foreign investors drive transparency, finding no significant link between foreign ownership and environmental disclosure – contrary to agency theory and previous research in emerging markets (Gerged, 2021; Ismail *et al.*, 2018; Saini and Singhania, 2019). Despite Indonesia being a developing country, foreign ownership does not appear to influence disclosure decisions (Wulansari and Adhariani, 2023). With foreign equity averaging only 36% and just 36 firm's majority foreign owned, it suggests that foreign investors may prioritize financial return over environmental concerns or that Indonesia's regulations fail to encourage greater transparency.

The comparative method used highlights sector specific patterns: mining firms disclose more environmental information, focusing on regulatory compliance and pollution control, consistent with prior research on industry driven disclosure differences (Deswanto and Siregar, 2018). Overall, foreign ownership remains insignificant in shaping disclosure across both sectors, indicating the need for further study on the influence of institutional investors and regulatory frameworks in emerging economies.

5. Conclusion

This study examined the level, trend, preferences and determinants of environmental disclosure among Indonesian manufacturing and mining companies. The analysis showed an average disclosure level of 54.97% (56.67% for mining and 52.61% for manufacturing), indicating a relatively good performance. Environmental management emerged as the most preferred disclosure category, as companies tend to favor visible and comprehensive content. In the combined regression analysis, three of the six proposed hypotheses were accepted.

This study makes three significant contributions. First, it addresses a critical empirical gap by offering the first integrated analysis of environmental disclosures across two of Indonesia's most environmentally intensive sectors manufacturing and mining thereby revealing sectoral contrasts and convergence in disclosure behavior. Second, by mapping disclosure practices against the GRI and SASB benchmarks, the study evaluates alignment with global standards and identifies content-level deficiencies in Indonesian reporting. Third, the study provides actionable insights for regulators, demonstrating how governance mechanisms specifically audit committee size and external audit quality can be leveraged to enhance disclosure

transparency and comparability. These insights are valuable for regulators seeking policy reform, investors seeking reliable ESG data and companies aiming to improve stakeholder engagement through enhanced sustainability communication.

This study provides a pioneering overview of environmental disclosure preferences in two key sectors. The findings strengthen corporate governance theory by confirming that board independence and strong audit mechanism such as Big Four auditors and larger audit committees significantly influence disclosure practices. These results support agency and stakeholder theories, showing that governance structures reduce managerial opportunism and meet stakeholder demands for transparency. However, the study challenges legitimacy theory, as foreign ownership showed no significant impact on environmental reporting in the Indonesian context. This outcome warrants further research.

The panel regression results support the perspective that board independence positively affected disclosure practices, further highlighting the role of the Big Four accounting firms and confirming the number of audit committee size matters. The empirical evidence validates agency and stakeholder theories, showing that strong corporate governance mechanisms contributed to transparency and accountability in environmental reporting. Furthermore, foreign ownership was not found to affect environmental disclosure. This study also demonstrates that mining and manufacturing organizations can be examined alone or in combination. Then, the endogeneity issue in the regression model is addressed. Based on common policies and industry traits, this study provides a comprehensive research model that integrates two or more industries using a single empirical test. This study advances prior research by highlighting how sector-specific governance factors such as audit committee size and Big Four auditors contribute to environmental disclosure outcomes. The results offer actionable insights for regulatory authorities aiming to align Indonesian ESG practices with global norms and for investors interpreting board structures as signals of transparency. This study offers practical implications for regulators and corporate management. First, managers should apply varied disclosure techniques, including discussing unfavorable issues, by highlighting mitigation efforts within their organizations. Strong governance, such as independent board and reputable audit firms, can also enhance disclosure quality and transparency. Second, Indonesian policymakers need to establish clear, uniform guidelines to direct environmental disclosure, as current practices are inconsistent due to the lack of clear regulations. Stronger laws will enable more comparable reporting aligned with international standards. This study also highlights the vital role of audit committees and public accounting firms in promoting transparent reporting. However, the study's focus on mining and manufacturing limits its generalizability. Future research should expand to other industries and further examine foreign ownership influences in different regulatory contexts. Additionally, because disclosure is assessed mainly by the presence or absence of information not by its quality of value future studies should develop better indicators to evaluate disclosure quality and link it to actual environmental outcomes.

Note

1. All figures and tables are provided in the [Supplementary file](#).

Supplementary material

The supplementary material for this article can be found online.

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