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TEXTUAL ANALYSIS OF SUSTAINABILITY REPORTS OF INDONESIAN PUBLIC COMPANIES

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sustainability report; textual analysis; text mining; word frequency analysis

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Abstract

This study examines the dominant thematic emphases in the sustainability reports of publicly listed companies in Indonesia using a word frequency analysis approach. A total of 62 sustainability reports for the 2023 fiscal year, published by companies listed on the Indonesia Stock Exchange (IDX), were analyzed. Textual data were processed using Orange Data Mining software to calculate the frequency of sustainability-related terms. These terms were then categorized into four corporate social responsibility (CSR) dimensions: environmental, social–labor, social–human rights, and social–society. The findings show that environmental-related terms are the most frequently represented dimension, accounting for 54.6% of the total sustainability-related terms, followed by social–labor at 28.7%, social–human rights at 9.6%, and social–society at 7.1%. At the sectoral level, energy and basic materials companies show higher frequencies of sustainability-related terms than other sectors. These results indicate that Indonesian public companies give greater textual emphasis to environmental and employee-related issues than to broader human rights and society-related themes. However, the findings should be interpreted as evidence of thematic emphasis rather than as evidence of actual sustainability performance, corporate commitment, or symbolic disclosure.

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1. Introduction

In recent years, demands for corporate transparency and accountability have intensified alongside the growing prominence of sustainability in modern business practices (Feng, 2025; Liu et al., 2023; Shaheen et al., 2024). Companies are now evaluated not only by their financial performance but also by their contributions to environmental preservation and social well-being (Al Amosh et al., 2023; Dwibedi et al., 2024). Within this context, sustainability reports (SRs) have become important disclosure documents through which companies communicate environmental, social, and governance (ESG)-related information to stakeholders. SRs provide information on how companies address environmental and social issues, respond to stakeholder expectations, and demonstrate accountability for their business activities (Hahn & Kühnen, 2013; KPMG, 2022).

SRs can also be understood as corporate communication media. From the perspective of legitimacy theory, organizations seek to align their activities and disclosures with prevailing social values and expectations in order to maintain public acceptance (Suchman, 1995). Stakeholder theory further suggests that companies disclose sustainability-related information in response to the interests and expectations of key stakeholder groups, including regulators, investors, employees, communities, and the wider public (Freeman, 1984). In this regard, the topics and terms emphasized in SRs may provide insight into the sustainability issues that companies consider important to

communicate. However, such textual emphasis should not be directly interpreted as evidence of actual sustainability performance, corporate motives, or symbolic disclosure without additional external validation.

Indonesia provides a relevant context for examining sustainability reporting because SR practices have become increasingly institutionalized following the issuance of Financial Services Authority (OJK) Regulation No. 51/POJK.03/2017 concerning the implementation of sustainable finance for financial institutions, issuers, and public companies. This regulation has increased the importance of sustainability disclosure among Indonesian public companies and has encouraged firms to communicate their environmental and social responsibility more systematically. Despite this regulatory development, studies on sustainability reporting in Indonesia have largely focused on compliance with reporting standards, such as the Global Reporting Initiative (GRI), or on the relationship between ESG disclosure and financial performance (Wahyuningrum et al., 2025). Relatively fewer studies have examined how sustainability-related themes are textually emphasized across corporate SRs, particularly across different industrial sectors.

Textual analysis is appropriate for this study because SRs are not merely formal disclosure documents; they are also written communication instruments through which companies present selected sustainability issues to stakeholders. In the field of accounting and corporate reporting, textual approaches have been increasingly used to examine the content, emphasis, and communication characteristics of corporate documents. Li (2010), for example, used textual analysis to assess communication orientation and information complexity in corporate reports, while Mäkelä and Laine (2011) emphasized that corporate reports may contain moral, social, and institutional messages. Similarly, Cho et al. (2010) showed that the language of corporate environmental disclosure can provide insight into how companies communicate environmental issues in their reports. In sustainability reporting, textual analysis therefore enables researchers to identify which environmental and social themes receive greater attention in corporate disclosures.

Among various textual analysis techniques, word frequency analysis offers a systematic, transparent, and replicable approach for mapping the relative prominence of selected sustainability-related terms. With advances in text-mining tools, word frequency analysis can be used to process multiple reports and classify frequently occurring terms into thematic categories, such as environmental issues, labor practices, human rights, and society-related concerns (Hahn & Lülfs, 2014). This approach is particularly useful as an initial mapping technique because it shows which themes appear more or less prominently across reports, sectors, and corporate social responsibility (CSR) dimensions. Nevertheless, word frequency analysis has clear limitations. It does not capture narrative structure, sentiment, framing, discourse strategies, or the substantive quality of sustainability disclosure. Therefore, the results of word frequency analysis should be interpreted as evidence of textual or thematic emphasis, rather than as evidence of symbolic or substantive sustainability performance.

Previous studies have demonstrated that sustainability reporting is shaped by institutional expectations, stakeholder demands, and sector-specific disclosure pressures. Hahn and Kühnen (2013) showed that sustainability disclosure is influenced by organizational and contextual factors, while Michelon et al. (2015) emphasized that CSR reporting practices vary in terms of disclosure quality and the issues emphasized by companies. In the context of corporate textual analysis, Li (2010) demonstrated that textual characteristics of corporate reports can provide insight into communication orientation and information complexity. However, in Indonesia, existing studies have more commonly examined sustainability reporting from the perspective of regulatory compliance, ESG disclosure, or its relationship with financial performance (Wahyuningrum et al., 2025). Less attention has been given to how sustainability-related terms are distributed across CSR dimensions and industrial sectors. This creates an opportunity to provide an initial thematic mapping of Indonesian sustainability reports using a transparent word frequency approach.

Based on this background, this study aims to identify the dominant thematic emphases in the 2023 SRs of Indonesian public companies using word frequency analysis. Specifically, the study examines the relative prominence of sustainability-related terms across four CSR dimensions: environmental, social–labor, social–human rights, and social–society. It also compares thematic emphasis across industrial sectors to provide an initial overview of sectoral differences in sustainability reporting among Indonesian public companies. By focusing on thematic emphasis rather than narrative construction, this study contributes to the literature on sustainability reporting and corporate textual disclosure in Indonesia. The findings are expected to offer empirical insight for regulators, standard setters, and practitioners seeking to encourage more balanced sustainability disclosure across ESG dimensions.

2. Methods

This study employs a quantitative descriptive approach using text mining to identify the thematic emphasis of sustainability-related terms in SRs of publicly listed companies in Indonesia. The study uses word frequency analysis to measure the occurrence and relative prominence of selected sustainability-related terms across reports, CSR dimensions, and industry sectors. This method is suitable for mapping thematic emphasis in corporate sustainability disclosure. However, it does not capture narrative structure, rhetorical strategy, sentiment, framing, discourse construction, or the substantive quality of sustainability performance. Therefore, the findings are interpreted as evidence of textual emphasis rather than as evidence of narrative construction, corporate motives, symbolic disclosure, or actual sustainability commitment.

The population of this study consisted of publicly listed companies on the Indonesia Stock Exchange (IDX) that published sustainability reports for the 2023 fiscal year. The year 2023 was selected because it represented the most

Table 1. Terms for Sustainability Measurement (Ruiz-Blanco et al., 2022)

Environmental	Social-Labor	Social-Human Rights	Social-Society
○ Material	○ Employment	○ Discrimination	○ Public policy
○ Energy	○ Labor	○ Freedom of association	○ Corruption
○ Water	○ Labor relations	○ Collective bargaining	○ Anticompetitive behavior
○ Biodiversity	○ Labor management	○ Child labor	○ Compliance
○ Emission	○ Employee	○ Forced labor	○ Society
○ Effluent	○ Employee health	○ Compulsory labor	○ Impact society
○ Waste	○ Employee safety	○ Security	○ Local communities
○ Climate	○ Training	○ Indigenous rights	
○ Compliance	○ Education	○ Human rights	
○ Transport	○ Diversity		
○ Environment	○ Equal opportunity		
○ Environmental initiatives	○ Equal remuneration		
○ Environmental assessment	○ Labor practices		
	○ Employee grievance		

recent complete reporting year available at the time of data collection and allowed the study to conduct a cross-sectoral comparison within a consistent reporting period. A purposive sampling approach was applied because the analysis required reports that met specific textual and technical criteria for text-mining processing.

The reports were obtained from the official websites of the respective companies and from the IDX publication portal. Reports were included when they met the following criteria: they were issued by companies listed on the IDX, referred to the 2023 fiscal year, were written in Indonesian, were available in a complete format, followed the GRI framework or a similar sustainability reporting standard, and could be converted into plain text for analysis. Reports were excluded when they were unavailable, incomplete, duplicated, not written in Indonesian, not related to the 2023 fiscal year, or could not be reliably converted into analyzable text. Based on this screening process, 62 sustainability reports from seven industrial sectors were retained for analysis.

The selected reports were downloaded in PDF format and converted into plain text (.txt) to enable processing in Orange Data Mining software. The analysis followed a structured sequence. First, text preprocessing was conducted to standardize the textual data. This stage included removing irrelevant elements such as numbers, punctuation marks, symbols, and non-analytical stopwords, including common Indonesian stopwords such as “dan,” “yang,” “untuk,” and “dengan.” The preprocessing stage also included lowercasing and tokenization, which divided the text into individual word units. All preprocessing tasks were conducted using the Text Preprocess widget in Orange Data Mining to ensure consistency across reports.

The extracted terms were classified according to the CSR framework adapted from Ruiz-Blanco et al. (2022), see **Table 1**. This framework categorizes sustainability-related terms into four dimensions: environmental, social-labor, social-human rights, and social-society. The environmental dimension includes terms related to natural resources, energy, emissions, waste, climate, and environmental conservation initiatives. The social-labor dimension covers terms related to employment, labor relations, training, education, diversity, equal opportunity, occupational health, and employee safety. The social-human rights dimension includes terms related to discrimination, freedom of association, child labor, forced labor, indigenous rights, and human rights. The social-society dimension includes terms related to public policy, corruption, anti-competitive behavior, compliance, local communities, and social impact.

Following this classification, each sustainability-related term identified in the reports was assigned to one of the four CSR dimensions. The classification was conducted manually based on the predefined term categories to ensure consistency with the adopted CSR framework. The results were then aggregated at two levels: by CSR dimension and by industry sector. This enabled the study to examine which sustainability themes were more prominently represented and how thematic emphasis varied across sectors.

The interpretation of the results was deliberately limited to textual and thematic emphasis. For example, a higher frequency of environmental terms is interpreted as greater textual attention to environmental issues, not as direct evidence of stronger environmental performance. Similarly, a higher frequency of social-related terms is interpreted as greater disclosure emphasis on social issues, not as evidence of substantive social responsibility practices. The study does not directly measure impression management, legitimacy strategies, symbolic disclosure, substantive disclosure, or sustainability performance. Assessing these issues would require external validation using additional indicators such as ESG scores, PROPER ratings, emission data, environmental performance indicators, external assurance, or corporate controversy data.

Table 2. Word Frequency by Industry Sector

Industry Sector	Number of Companies	Average Frequency per Company	Sustainability-term Frequency
Energy	8	2,139.9	17,119
Financial	15	1,124.3	16,865
Basic materials	11	1,358.4	14,942
Infrastructure	12	948.1	11,377
Non-cyclical consumer	8	1,163.3	9,306
Property and real estate	4	1,272.8	5,091
Cyclical consumer	4	675.3	2,701

3. Results and Discussions

The analysis of the 2023 sustainability reports shows variation in the frequency of sustainability-related terms across industrial sectors. As shown in **Table 2**, the energy sector recorded the highest frequency of sustainability-related terms, with 17,119 occurrences across eight companies, followed by the financial sector with 16,865 occurrences across fifteen companies and the basic materials sector with 14,942 occurrences across eleven companies. These results indicate that sustainability-related terms are not evenly distributed across sectors. However, because raw word frequency is affected by the number of companies and the length of reports, the findings should be interpreted as an initial indication of textual emphasis rather than as evidence of stronger sustainability commitment or better sustainability performance.

At the sectoral level, the energy sector shows the highest average frequency of sustainability-related terms per company. This finding suggests that energy companies give substantial textual attention to sustainability issues in their reports. This may be related to the sector's higher exposure to environmental issues, including energy consumption, carbon emissions, resource use, and environmental risk. However, this finding does not necessarily imply that energy companies have stronger sustainability performance. Rather, it indicates that sustainability-related issues are more frequently represented in the textual content of their reports.

The financial sector recorded the second-highest raw frequency of sustainability-related terms. However, this result should be interpreted carefully because the financial sector has the largest number of companies in the sample. Its average frequency per company is lower than that of the energy, basic materials, non-cyclical consumer, and property sectors. This suggests that the high total frequency in the financial sector is partly influenced by the number of reports analyzed. Substantively, sustainability-related terms in the financial sector may reflect attention to governance, transparency, inclusion, employee development, and social responsibility, although further analysis is required to determine the specific thematic composition of this sector.

The basic materials sector recorded the third-highest raw frequency and the second-highest average frequency per company after the energy sector. This pattern suggests that companies in this sector give considerable textual emphasis to sustainability issues. This is understandable because basic materials industries, such as cement, chemicals, and metals, are closely associated with environmental impact, energy use, waste, and emissions. The relatively high frequency of sustainability-related terms may therefore reflect the salience of environmental and operational issues within this sector's reporting context.

The infrastructure and non-cyclical consumer sectors occupy middle positions in terms of raw frequency. The infrastructure sector recorded 11,377 occurrences, while the non-cyclical consumer sector recorded 9,306 occurrences. These sectors may emphasize sustainability issues related to community development, public services, consumer responsibility, and social welfare. Nevertheless, without a more detailed comparison of normalized frequency and thematic composition, these results should be interpreted as differences in textual emphasis rather than differences in actual sustainability practices.

The property and real estate sector and the cyclical consumer sector recorded lower raw frequencies than other sectors. The property sector recorded 5,091 occurrences, while the cyclical consumer sector recorded 2,701 occurrences. These lower values may be influenced by the smaller number of companies included in these sectors as well as differences in report length and disclosure style. Therefore, lower raw frequency should not be interpreted as lower sustainability commitment. Instead, it indicates that sustainability-related terms appear less frequently in the reports analyzed for these sectors.

Overall, the sectoral results suggest that sustainability-related textual emphasis varies across industries. Sectors with higher environmental exposure, such as energy and basic materials, tend to show higher frequencies of sustainability-related terms, while sectors with fewer companies in the sample or different disclosure orientations show lower raw frequencies. These findings are consistent with the idea that industry characteristics may shape the emphasis of sustainability reporting. However, because this study is based on word frequency analysis, the results should be interpreted as evidence of thematic prominence in textual disclosure, not as evidence of substantive sustainability performance, legitimacy strategies, or corporate commitment.

3.1. Results by Sustainability Dimensions

Descriptive analysis by sustainability dimension shows that environmental-related terms are the most frequently represented across most sectors. The energy sector records the highest average frequency of environmental terms, with approximately 1,209 occurrences per company. This indicates that environmental issues receive substantial textual attention in the sustainability reports of energy companies. Such emphasis may be related to the sector's direct exposure to environmental issues, including carbon emissions, energy consumption, resource efficiency, and waste management. This pattern is consistent with prior studies suggesting that environmental disclosure is often shaped by institutional, regulatory, and sector-specific pressures (Hahn & Kühnen, 2013; Cho et al., 2010). However, this finding should be interpreted as textual emphasis rather than as direct evidence of stronger environmental commitment or performance.

The property and real estate sector and the basic materials sector also show relatively high frequencies of environmental terms, averaging 819 and 802 occurrences per company, respectively. In the property and real estate sector, this may reflect textual attention to issues such as sustainable building practices, energy-efficient design, and environmentally friendly materials. In the basic materials sector, the high frequency of environmental terms may be associated with the relevance of energy use, emissions, waste, and environmental impact control in production activities. These sectoral differences are consistent with the idea that material sustainability issues vary across industries and may influence the topics emphasized in corporate disclosure (Eccles et al., 2014; Hahn & Kühnen, 2013).

The social-labor dimension emerges as the second most prominent dimension after the environmental dimension. The energy sector again records the highest average frequency, with approximately 526 social-labor terms per company, followed by the financial and infrastructure sectors. In the financial sector, the relatively high frequency of social-labor terms may indicate greater textual emphasis on employee welfare, human capital development, training, workplace diversity, and occupational well-being. This pattern is consistent with CSR reporting literature showing that companies often emphasize employee-related and internally visible social issues in their sustainability disclosures (Michelon et al., 2015).

The social-human rights dimension shows more limited and uneven representation across sectors. The energy sector records the highest average frequency, with approximately 159 occurrences per company, followed by the basic materials sector with approximately 95 occurrences. These results suggest that human rights-related terms receive greater textual attention in sectors with higher operational, labor, and occupational risk exposure. In contrast, lower frequencies in the property and consumer sectors indicate that human rights-related terms are less prominently represented in the reports analyzed. Prior studies have noted that complex or potentially sensitive social issues, including human rights, may receive less explicit attention in corporate reporting than environmental and employee-related issues (Cho et al., 2010; Lauwo & Otusanya, 2014; Hummel & Schlick, 2016). However, the analysis does not determine whether such issues are substantively addressed in corporate practices.

The social-society dimension also appears less frequently than the environmental and social-labor dimensions. The energy sector again records the highest average frequency, with approximately 159 occurrences per company. This suggests that companies in this sector give textual attention to community-related issues, particularly those associated with local communities near operational areas. The financial and property sectors also show some emphasis on social-society themes, including financial education, community development, and local economic empowerment. Meanwhile, the consumer and infrastructure sectors show relatively lower frequencies of social-society terms in the reports analyzed. This pattern is consistent with previous arguments that community-related disclosure is often presented as part of broader CSR communication, although its depth and strategic integration may vary across firms and contexts (Carroll, 1999; Lu & Taylor, 2016).

Overall, the findings indicate that sustainability-related textual emphasis among Indonesian public companies is unevenly distributed across CSR dimensions. Environmental and social-labor terms are more frequently represented, while social-human rights and social-society terms receive comparatively less textual attention. This pattern is consistent with prior sustainability reporting literature suggesting that companies tend to emphasize issues that are more visible, measurable, and closely related to stakeholder expectations (Hahn & Kühnen, 2013; Michelin et al., 2015). However, because this study uses word frequency analysis, these results should not be interpreted as evidence that reporting is compliance-driven, symbolic, or substantive. Such conclusions would require external validation using indicators such as ESG scores, PROPER ratings, emission data, environmental performance measures, external assurance, or corporate controversy data.

3.2. Heatmap Visualization

The heatmap visualization of word frequency, as presented in **Figure 1**, illustrates the distribution of sustainability-related terms across the analyzed sustainability reports. Each column represents a selected sustainability-related term, such as material, energy, emission, labor management, employee health, human rights, and local communities, while each row represents an individual company from different industrial sectors. The color gradient indicates the frequency intensity of each term, with darker colors representing lower frequency and lighter colors representing higher frequency.

Overall, the heatmap shows that environmental-related terms, particularly energy, emission, waste, climate, and environment, appear more frequently than terms associated with human rights and broader society-related issues. This visual pattern is consistent with the descriptive results, which show that the environmental dimension is the most

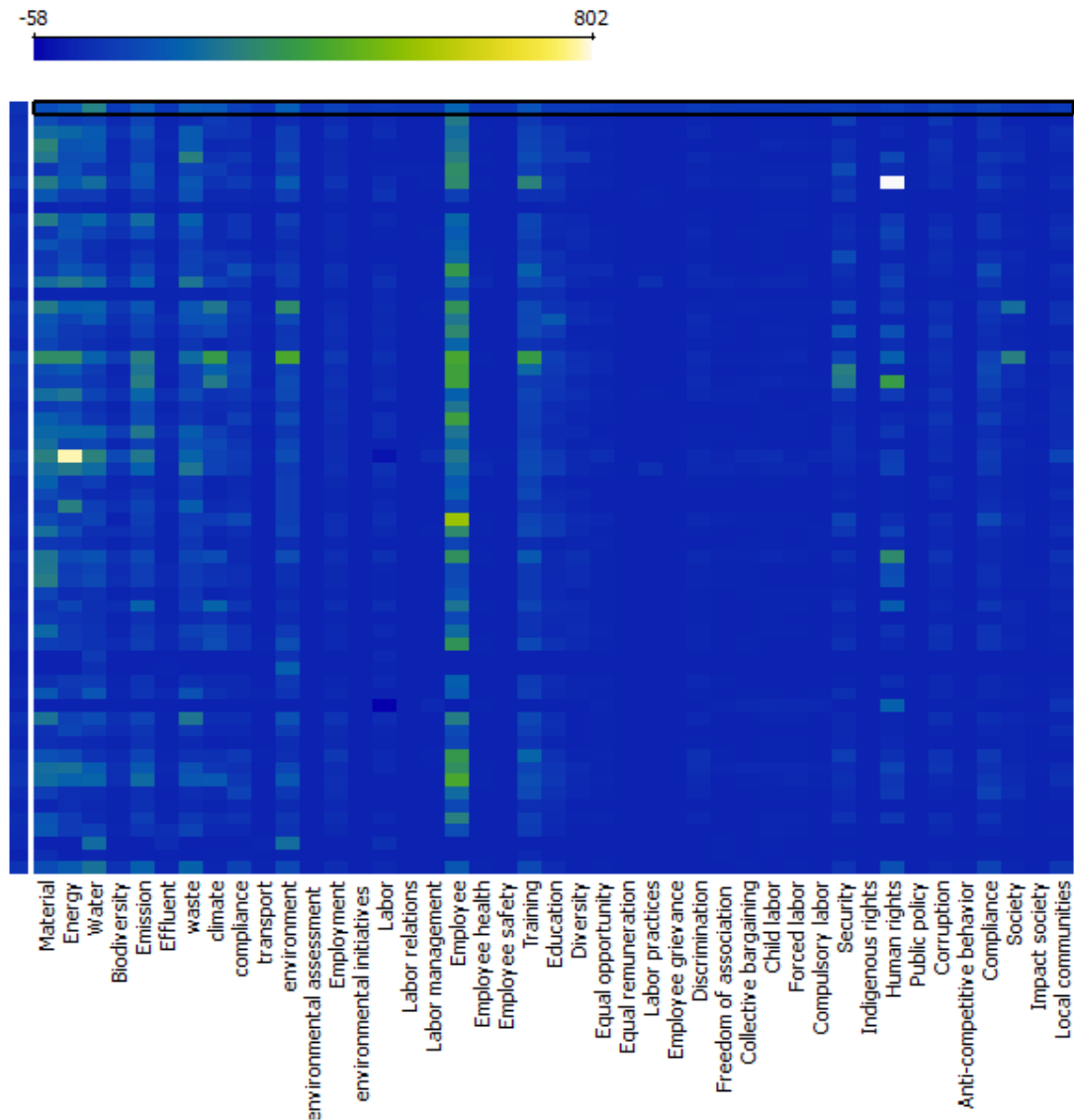


Figure 1. Heatmap Visualization

prominent thematic category in the analyzed reports. Social–labor terms, such as employment, labor practices, training, employee health, and employee safety, also appear across several companies, although their intensity is generally lower and less consistent than environmental terms.

In contrast, terms related to social–human rights, such as human rights, forced labor, indigenous rights, and discrimination, show relatively lower frequency across most reports. Similarly, social–society terms, including local communities, impact on society, public policy, and corruption, appear less prominently than environmental and labor-related terms. This suggests that the analyzed sustainability reports give greater textual emphasis to environmental and employee-related issues than to broader human rights and society-related themes.

The heatmap also shows variation across companies. Some rows display relatively higher frequencies across multiple sustainability-related terms, indicating that certain companies provide broader textual coverage of sustainability issues. These companies are likely to come from sectors with higher environmental or operational exposure, such as energy, basic materials, or other resource-intensive industries. However, this interpretation should be treated cautiously because word frequency can be affected by report length, reporting style, and the number of terms included in each category. Therefore, the heatmap should be understood as a visual representation of thematic emphasis rather than as evidence of reporting quality, actual sustainability performance, or corporate commitment.

3.3. Theoretical and Practical Implications

The findings are consistent with prior studies suggesting that environmental disclosure often receives substantial attention in corporate sustainability reporting. Hahn and Kühnen (2013) noted that sustainability disclosure is shaped by institutional and contextual factors, while Cho et al. (2010) showed that the language of environmental disclosure can provide insight into how companies communicate environmental issues. In this study, the frequent occurrence of

terms related to energy, emissions, waste, and climate suggests that environmental issues receive greater textual emphasis in Indonesian sustainability reports.

The prominence of social–labor terms is also consistent with Michelon et al. (2015), who argued that CSR reporting practices vary in terms of disclosure quality and the issues emphasized by companies. The frequent appearance of terms related to employee welfare, training, occupational safety, and labor practices suggests that employee-related issues form an important part of sustainability disclosure among Indonesian public companies.

From a theoretical perspective, these findings are consistent with legitimacy theory and stakeholder theory, as companies may give greater attention to issues that are more visible, measurable, and relevant to regulatory or stakeholder expectations (Suchman, 1995; Freeman, 1984). However, this study does not directly measure legitimacy strategies, impression management, symbolic disclosure, or substantive disclosure. Therefore, the theoretical interpretation should be understood as contextual explanation rather than direct empirical proof.

From a practical perspective, the findings suggest the need for more balanced sustainability disclosure across CSR dimensions. Regulators such as OJK and IDX may encourage companies to provide more explicit disclosure on human rights, community impact, social risks, and society-related issues. Companies may also improve reporting quality by linking textual disclosure with measurable sustainability performance indicators.

4. Conclusion

This study aimed to identify the dominant thematic emphases in the 2023 sustainability reports of Indonesian public companies using word frequency analysis conducted through Orange Data Mining software. The findings show that environmental-related terms are the most frequently represented, followed by social–labor, social–human rights, and social–society dimensions. This pattern indicates that environmental and employee-related issues receive greater textual attention than broader human rights and society-related themes in the analyzed reports.

The predominance of environmental-related terms suggests that Indonesian public companies give considerable textual emphasis to ecological issues such as emissions, energy, water, waste management, and environmental initiatives. Meanwhile, the relatively high frequency of social–labor terms indicates that issues related to employee welfare, training, occupational safety, and human resource development are also important components of corporate sustainability disclosure. In contrast, the lower representation of social–human rights and social–society terms suggests that these dimensions receive comparatively limited textual attention.

At the sectoral level, companies in the energy and basic materials sectors show higher frequencies of sustainability-related terms than companies in other sectors. This may be associated with their greater exposure to environmental and operational risks. However, these findings should be interpreted as differences in textual emphasis rather than as evidence of stronger sustainability commitment or better sustainability performance. Since word frequency can be influenced by report length, reporting style, and sectoral characteristics, raw frequency should not be understood as a direct measure of disclosure quality or corporate responsibility.

The findings are consistent with legitimacy theory and stakeholder theory, as companies appear to give greater attention to sustainability issues that are more visible, measurable, and relevant to regulatory or stakeholder expectations. Nevertheless, this study does not directly measure legitimacy strategies, impression management, symbolic disclosure, substantive disclosure, or actual sustainability performance. Therefore, the results should be interpreted as an initial mapping of thematic emphasis in sustainability reporting, rather than as evidence of narrative construction, corporate motives, or the substantive quality of sustainability practices.

Practically, this study provides empirical insight into the thematic distribution of sustainability-related terms in Indonesian corporate reporting. The findings suggest that regulators such as OJK and IDX may encourage more balanced sustainability disclosure across ESG dimensions, particularly by strengthening attention to human rights, community impact, and society-related issues. Future research may extend this approach by integrating textual analysis with external validation indicators, such as ESG scores, PROPER ratings, emission data, environmental performance measures, external assurance, or corporate controversy data. Further studies may also employ topic modeling, co-occurrence network analysis, sentiment analysis, semantic clustering, or qualitative discourse analysis to examine the depth, framing, and meaning of sustainability disclosure more comprehensively.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this manuscript, the authors used generative AI and AI-assisted tools to support language refinement, improve sentence clarity, and enhance the overall readability of the manuscript. The AI tools were not used to generate the research data, conduct the analysis, interpret the results, or draw the conclusions. All intellectual content, methodological decisions, data analysis, interpretation, and final revisions remain the sole responsibility of the authors. The authors have reviewed and edited all AI-assisted outputs and take full responsibility for the content of the manuscript.

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