

Environmental Materiality in eXtensible Business Reporting Language Disclosures: Evidence from Japan

Surging environmental, social, and governance (ESG) investment drives have increased demand for more information on companies' sustainability performance.¹¹ As a useful instrument for investors to obtain information, ESG ratings are crucial for measuring a company's adherence to sustainability principles. However, the cost of purchasing ESG ratings has made them difficult for the public to access. Furthermore, mixed evidence—including the latest study conducted by Managi, Xie, and Yoshida (2024)—has shown that ESG ratings are not consistent across different rating agencies.¹²

An alternative approach to gathering companies' sustainability-related information is through companies' self-disclosure. In Japan, large, listed companies often report their ESG data through integrated reports or sustainability reports. Meanwhile, annual securities reports—the disclosure of which is compulsory for all listed companies in Japan—also convey companies' ESG information. These reports are published using eXtensible Business Reporting Language (XBRL), a computer language format used in business reporting. The machine-readable nature of XBRL allows for the standardized electronic sharing of business, financial, and nonfinancial information, and improves the accessibility and comparability of the information. The standardized format of XBRL disclosure ensures that ESG information from annual securities reports offers greater transparency and comparability than other company documents, making its use more efficient and effective for investors, regulators, and other stakeholders.

By analyzing the text data from XBRL-disclosed annual securities reports of around 3,800 listed companies in

Japan from 2013 to 2023, this study aims to uncover the trend of Japanese corporate ESG materiality disclosure, particularly the environmental aspects. Furthermore, this research explores the potential of self-disclosed ESG information based on XBRL technology as an alternative source for predicting companies' sustainability and financial performance.

The use of ESG-related keywords in the annual securities reports of Japanese publicly listed firms increased from 2013 to 2023. **Table 3** shows that Japanese corporates' self-disclosure of ESG activities has evolved over the years. A transition from phrases like “raw materials” to “recycling,” “climate change,” and “renewable energy” illustrates a strategic move toward sustainable production, energy solutions, and addressing global warming. At the materiality level, a notable increase in environmental materiality disclosures was observed during the review period (**Figure 21**). This progression highlights a pivotal shift in corporate priorities toward embracing comprehensive sustainability strategies and ethical business practices in response to global environmental challenges.

Meanwhile, ESG materiality disclosures are not isolated incidents but rather are interlinked, revealing a corporate shift toward addressing ESG issues in a holistic manner. The correlation analysis of the frequency of occurrence of corporates' self-disclosure of ESG materialities reveals a nuanced interplay between environmental initiatives and social and governance initiatives. Specifically, there are increasing trends of correlation between disclosure of (i) environmental materiality and social materiality (**Figure 22a**), (ii) environmental materiality

¹¹ This note was written by Jiaqi Yang and Kotaro Takahashi from Sustainable Lab Inc., and by Satoru Yamadera and Shu Tian from the Asian Development Bank. This note is a nontechnical summary of a forthcoming working paper titled “ESG Materiality in XBRL (eXtensible Business Reporting Language) Disclosures and its Performance Predictability: Evidence from Japan” that was written by a joint research team from Sustainable Lab Inc. and the Asian Development Bank.

¹² Managi, Shunsuke, Jun Xie, and Kenichi Yoshida. 2024. “Environmental, Social, and Governance Performance and Its Financial Impacts: A Comparative Analysis of Companies in Asia.” *Asia Bond Monitor March 2024*.

Table 3: Environment-Related Keywords in the Annual Securities Reports of Japanese Listed Firms by Frequency of Occurrence, 2013–2023

Environment-related keywords have increasingly appeared in the annual securities reports of listed Japanese companies since 2013.

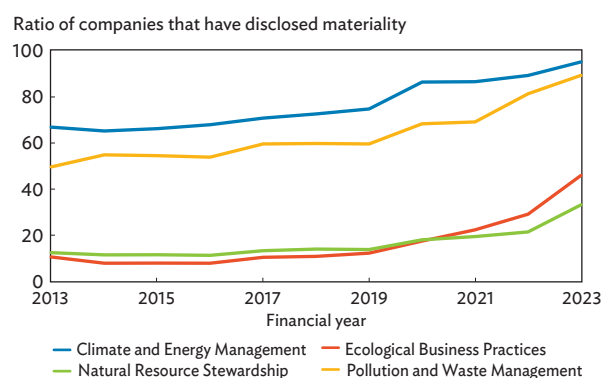
Financial Year	Top 1		Top 2		Top 3		Top 4		Top 5	
	Keyword	FO	Keyword	FO	Keyword	FO	Keyword	FO	Keyword	FO
2013	Raw Materials	269	Natural Disasters	267	Production Base	46	Recycling	30	Water Quality	28
2014	Natural Disasters	3,121	Raw Materials	3,009	Production Base	662	Recycling	512	Energy Conservation	328
2015	Natural Disasters	3,326	Raw Materials	3,120	Production Base	672	Recycling	510	Energy Conservation	319
2016	Natural Disasters	3,655	Raw Materials	3,198	Production Base	676	Recycling	514	Energy Conservation	304
2017	Natural Disasters	3,971	Raw Materials	3,588	Production Base	959	Recycling	685	Renewable Energy	473
2018	Natural Disasters	4,504	Raw Materials	3,939	Production Base	1,000	Recycling	820	Renewable Energy	572
2019	Natural Disasters	4,953	Raw Materials	4,083	Production Base	1,016	Recycling	905	Renewable Energy	649
2020	Natural Disasters	7,324	Raw Materials	6,209	Supply Chain	1,928	Production Base	1,516	Recycling	1,333
2021	Natural Disasters	7,220	Raw Materials	6,868	Climate Change	2,479	Supply Chain	2,404	Renewable Energy	1,667
2022	Raw Materials	11,447	Natural Disasters	7,742	Climate Change	6,006	Supply Chain	4,218	Carbon Neutral	2,256
2023	Climate Change	15,515	Raw Materials	10,888	Natural Disasters	6,811	Supply Chain	4,706	Carbon Neutral	3,986

FO = frequency of occurrence.

Source: Authors' calculations based on annual securities reports from over 3,800 listed companies in Japan released in eXtensible Business Reporting Language format.

Figure 21: Share of Listed Companies in Japan Disclosing Environmental Materiality, 2013–2023

Environmental materiality disclosure of listed Japanese companies has steadily increased since 2014.



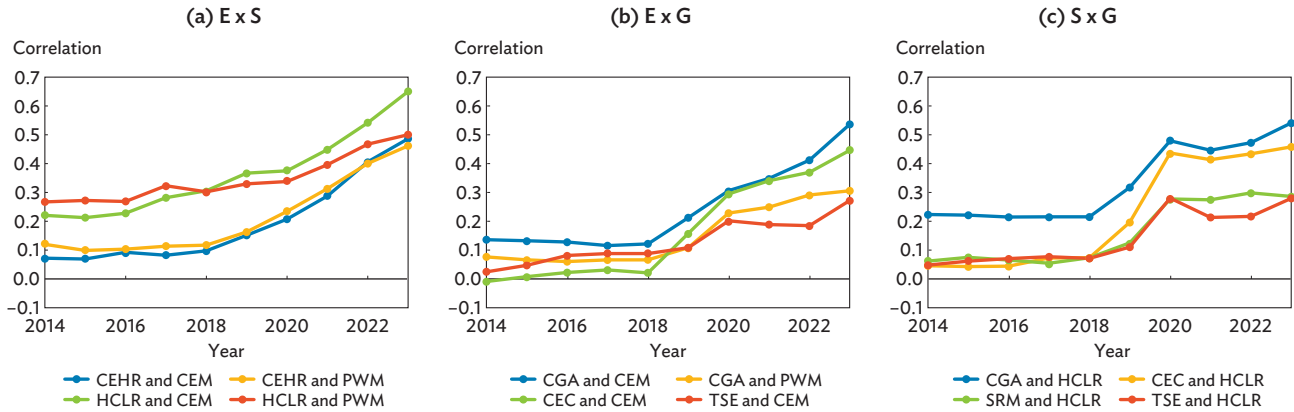
Source: Authors' calculations based on annual securities reports from over 3,800 listed companies in Japan released in eXtensible Business Reporting Language format.

and governance materiality (**Figure 22b**), and (iii) social materiality and governance materiality (**Figure 22c**). Taken together, these findings indicate a proactive shift in corporate strategies toward blending environmental, social, and governance concerns into a unified operational framework.

There is, however, limited evidence to show that ESG materiality in corporate disclosure contains useful information related to corporates' financial or climate performances. A fixed-effects panel regression was conducted to investigate the relationship between four environmental materiality disclosure measures and several proxies measuring corporate financial performance. The results merely show that companies disclosing climate change and energy management are more likely to be financially robust, as evidenced by their significant association with Altman's Z-score,

Figure 22: Correlations among Environmental, Social, and Governance Materiality Disclosure, 2014–2023

The correlations of materiality disclosure between E and S, E and G, and S and G have increased for listed Japanese companies since 2014, implying ESG materiality disclosure is becoming more interlinked.



CEC = corporate ethics and compliance; CEHR = community engagement and human rights; CEM = climate and energy management; CGA = corporate governance and accountability; E = environmental; ESG = environmental, social, and governance; G = governance; HCLR = human capital and labor rights; PWM = pollution and waste management; S = social; SRM = strategic risk management; TSE = transparency and stakeholder engagement.

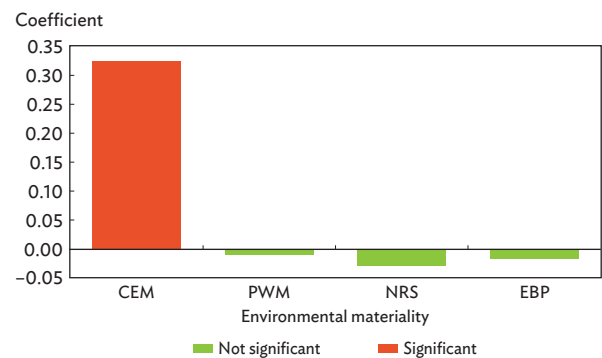
Source: Authors' calculations based on annual securities reports from over 3,800 listed companies in Japan released in eXtensible Business Reporting Language format.

a proxy measuring a company's risk level (Figure 23). Moreover, most of the 12 ESG materiality disclosure measurements are not significantly related to corporate climate performance. One exception is that companies' engagement in strategic risk management is negatively and significantly related to emissions intensity, which is measured by total greenhouse gas emissions per sale (Figure 24a) and per asset (Figure 24b).

This study finds that companies' self-disclosure of ESG materiality alone is insufficient as a standalone measure to evaluate and predict financial profitability and climate performance, despite the increasing trend of disclosure being observed from the text data released in XBRL format. This study offers evidence-based insights for corporations, investors, and regulatory bodies in regional markets on the importance of understanding the informativeness of current ESG disclosure practices, as well as the necessity to explore comparable and cost-efficient ways besides self-disclosed ESG data to gather corporate performance-related information and enhance transparency in ESG finance markets.

Figure 23: Fixed-Effects Panel Regression Results—Impact of Environmental Materiality Disclosure on Corporate Financial Performance

The potential of corporate self-disclosure of environmental materiality to predict corporate financial performance is limited, as only the category of climate and energy management is significantly related to Altman's Z-score.



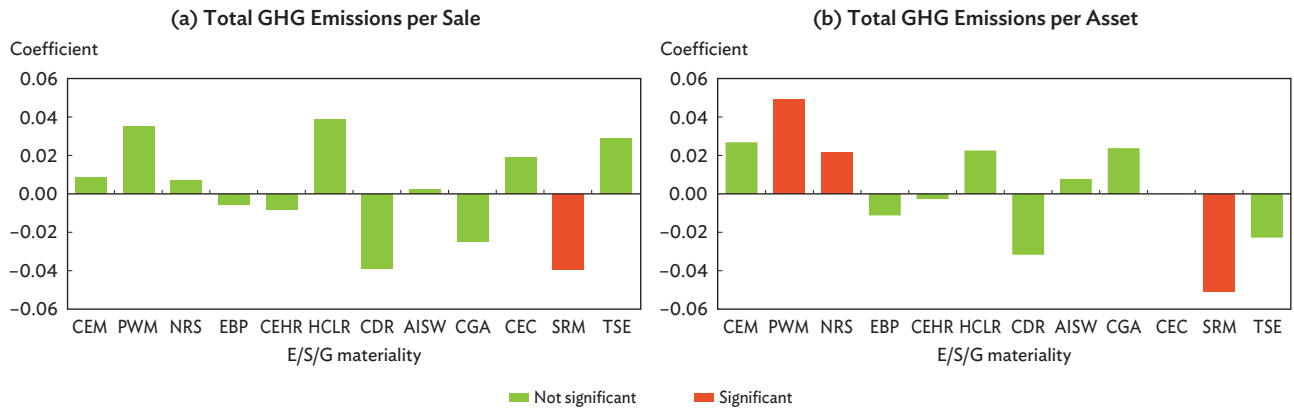
CEM = climate and energy management, EBP = ecological business practices, NRS = natural resource stewardship, PWM = pollution and waste management.

Note: Altman's Z-score is used as a proxy for corporate financial performance.

Source: Authors' calculations based on annual securities reports from over 3,800 listed companies in Japan released in eXtensible Business Reporting Language format.

Figure 24: Fixed-Effects Panel Regression Results—Impact of Environmental, Social, and Governance Materiality Disclosure on Corporate Financial Performance

The potential of corporate self-disclosure of ESG materiality to predict corporate climate performance is limited, as most of the relationships are not statistically significant.



AISW = access inclusivity and social welfare; CDR = customer and digital responsibility; CEC = corporate ethics and compliance; CEHR = community engagement and human rights; CEM = climate and energy management; CGA = corporate governance and accountability; E = environmental; EBP = ecological business practices; ESG = environmental, social, and governance; G = governance; GHG = greenhouse gas; HCLR = human capital and labor rights; NRS = natural resource stewardship; PWM = pollution and waste management; S = social; SRM = strategic risk management; TSE = transparency and stakeholder engagement.

Note: Coefficient is significant if p-value is less than 0.05.

Source: Authors' calculations based on annual securities reports from over 3,800 listed companies in Japan released in eXtensible Business Reporting Language format.