SDG disclosure in the mining sector: Trends, regional differences, and sub-industry variation

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Evgenia Anagnostopoulou

Department of Business Administration, University of Macedonia, Egnatia 156, 54636, Thessaloniki, Greece.
Email: eanagno@uom.edu.gr

ABSTRACT

This study investigates the disclosure of alignment with the Sustainable Development Goals (SDGs) by mining firms and assesses whether disclosure patterns differ over time, across regions, and among sub-industries. Drawing on 3,048 firm-year observations from global mining companies between 2019 and 2024, the analysis maps references to all 17 SDGs across seven mining sub-industries. Descriptive statistics, Kruskal–Wallis tests, paired Wilcoxon signed-rank tests, two-way ANOVA, and correlation analysis are employed to identify patterns of SDG adoption and their association with selected firm characteristics. The results indicate that SDG disclosure in the mining sector is selective rather than comprehensive. SDG 8, SDG 13, SDG 3, and SDG 12 are most frequently referenced, while SDG 2 and SDG 14 are comparatively marginal. The most prominent trend is a substantial increase in SDG disclosure over time, reflecting the widespread adoption of SDG-related reporting across the sector. Although regional and sub-industry differences are present, they are generally less pronounced than the temporal trend. Significant interaction effects between region and sub-industry suggest that disclosure patterns are shaped by both institutional context and mining specialization. Larger firms are more likely to disclose a broader SDG profile. These findings provide evidence to help policymakers and managers benchmark disclosure practices and enhance the quality and comparability of SDG-related reporting in the mining sector.

Keywords: *Corporate reporting, Mining sector, Regional variation, Sub-industry variation, Sustainability disclosure, Sustainable development goals.*

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Highlights of this paper

- This research presents a global, multi-year analysis of Sustainable Development Goal (SDG) disclosure in the mining sector, utilizing 3,048 firm-year observations from 2019 to 2024.
- The results indicate that mining firms prioritize a limited subset of SDGs, with the greatest emphasis on SDGs 8, 13, 3, and 12.
- SDG disclosure increased substantially over the study period. Although regional and sub-industry differences were secondary, they interacted significantly to influence reporting patterns.

1. INTRODUCTION

The mining industry holds a central yet contested role within the global sustainability agenda. It provides essential minerals for infrastructure, manufacturing, urbanization, digital technologies, electrification, and the low-carbon transition. However, mining is also linked to land disturbance, waste generation, water stress, biodiversity loss, occupational hazards, community conflict, and governance challenges. This dual role makes mining particularly important for examining corporate engagement with the Sustainable Development Goals (SDGs).

The mining sector did not approach the SDG agenda without prior experience. Prior to 2015, it had already emerged as a prominent arena for debates on sustainable development, indicator development, and voluntary self-regulation. Previous research developed mining-specific sustainability indicator frameworks and demonstrated how major firms increasingly adopted the language of sustainable development, stakeholder engagement, and corporate responsibility (Azapagic, 2004; Dashwood, 2014; Hilson, 2000; Hilson & Murck, 2000). This historical context helps explain why mining companies were comparatively well-positioned to integrate the SDGs into their disclosure practices following the launch of the 2030 Agenda.

The SDGs also changed the terms of the sustainability debate. They prompted companies not only to recognize sustainability concerns but also to align their activities with a comprehensive, interconnected set of 17 goals and 169 targets. While this framework theoretically enables a more holistic evaluation of corporate contributions to sustainable development, empirical studies increasingly indicate that SDG adoption is often selective, inconsistent, and difficult to compare across firms, sectors, and countries. Moreover, the impact of reported SDG adoption remains unclear, as corporate reporting may demonstrate SDG awareness without ensuring strategic integration, measurable objectives, or tangible outcomes (Calabrese, Costa, Gastaldi, Ghiron, & Montalvan, 2021; Diaz-Sarachaga, 2021; Heras-Saizarbitoria, Urbieta, & Boiral, 2022; Lashitew, 2021; Lodhia, Kaur, & Kuruppu, 2023; Van der Waal & Thijssens, 2020).

These tensions are especially pronounced within the mining sector. An expanding body of research connects mining to the SDGs through themes such as decent work, climate action, responsible production, water management, gender inclusion, critical minerals, local development, and territorial governance (Bansal, Singh, Nangia, Chanaliya, & Sala, 2024; Dou, Xu, Zhu, & Keenan, 2023; Fraser, 2019; Hodgkinson & Smith, 2021; Janikowska & Kulczycka, 2021). Some studies portray mining as a sector capable of supporting the SDGs through innovation, infrastructure, employment, and low-carbon transition pathways. In contrast, other research adopts a more critical viewpoint, contending that mining's sustainability discourse often minimizes trade-offs, environmental harm, and the inherent contradiction between extractive growth and broader sustainable development objectives (Frederiksen & Banks, 2023; Mvile & Bishoge, 2024). Consequently, the literature is increasingly comprehensive, yet fragmented across goals, thematic areas, regions, and methodological approaches.

Recent research in mining has advanced in three key areas. First, several studies identify which SDGs or specific targets are most pertinent to mining and propose indicator frameworks for assessing sectoral alignment (Deveci, Brito-Parada, Pamucar, & Varouchakis, 2022; Mahmoudi Kouhi et al., 2024; Omotehinse & De Tomi,

2023). Second, a smaller but growing body of report-based studies examines how mining firms communicate their SDG commitments through sustainability and integrated reporting (Haywood, Oelofse, Khan, Pelders, & Maphalala, 2026; Pactwa, 2021; Papafloratos, Markidis, Pantazi, & Vlachos, 2023; Ramírez-Van stralhen, Romero-Perdomo, & González-Curbelo, 2026). Third, broader research on corporate SDG disclosure reveals that companies across sectors frequently rely on symbolic references, selective goal emphasis, and weak performance metrics, raising concerns about SDG-washing and comparability (del Río, González-Álvarez, & López-Arceiz, 2024; Heras-Saizarbitoria et al., 2022; Manes-Rossi & Nicolo', 2022). Collectively, these research streams indicate that disclosure-based SDG adoption warrants scrutiny, particularly in environmentally sensitive sectors such as mining.

Despite these developments, three significant gaps persist. First, research on mining and the SDGs remains dominated by conceptual studies, policy analyses, single-country case studies, or thematic investigations focused on individual goals or issues. Second, while some studies analyze mining disclosures, most are geographically limited and do not offer a comprehensive multi-year perspective across regions and sub-industries. Third, the literature provides limited evidence regarding whether temporal factors, institutional context, or mining specialization primarily influence variation in SDG adoption. Addressing these questions is essential for distinguishing between broad sector-wide diffusion of SDG discourse and more structured differences associated with geography, governance, and subsector characteristics.

This study addresses these gaps by mapping SDG adoption in global mining disclosures from 2019 to 2024. Drawing on 3,048 firm-year observations across seven mining sub-industries, the analysis identifies which SDGs are most frequently referenced, tracks the evolution of disclosure patterns over time, assesses differences in adoption across regions and sub-industries, and examines associations between broader SDG adoption and selected firm characteristics. The research adopts a comparative empirical approach. The objective is not to infer causality or equate disclosure with actual SDG performance, but rather to provide a systematic overview of how mining firms frame SDG engagement in their reporting.

The study offers three principal contributions. First, it delivers a comprehensive sectoral mapping of SDG adoption across all 17 goals within a large international mining sample. Second, it incorporates temporal, regional, and sub-industry comparisons within a unified analytical framework, enabling the identification of whether disclosure dynamics are primarily longitudinal or cross-sectional. Third, it situates mining-specific evidence within the broader literature on corporate SDG reporting quality, thereby clarifying whether increased SDG visibility in mining reflects substantive integration or a more selective and symbolic adoption pattern.

The remainder of the paper is organized as follows. Section 2 reviews the literature on mining, SDGs, and corporate SDG disclosure. Section 3 outlines the data and methodology. Section 4 presents the results. Section 5 discusses the findings and their implications. Section 6 concludes the paper.

2. LITERATURE REVIEW

Although the literature on mining and the Sustainable Development Goals (SDGs) has grown rapidly, it remains conceptually and empirically fragmented. Some studies analyze mining within broad sustainable development and governance frameworks; others focus on prioritizing specific SDGs. A rising stream examines how firms communicate alignment via sustainability and integrated reporting. However, the SDG disclosure literature highlights concerns about selective uptake, limited comparability, and the possibility that SDG references are symbolic rather than substantive. To clarify the analytical scope of this review, the section organizes existing work around the paper's core dimensions: SDG prioritization, changes in disclosure over time, regional and sub-

industry differences, the effect of firm characteristics on disclosure, and the difference between disclosure breadth and quality.

2.1. SDG Adoption in Mining: Which Goals Matter Most?

A central analytical question in the mining-SDG literature is not just whether mining relates to the SDGs, but which specific goals are deemed most material. Research consistently shows that the sector does not engage with all SDGs equally. Instead, firms, experts, and analysts tend to focus on a narrower set of goals involving employment, industrial development, climate action, production, and selected social concerns. This selective prioritization frames the first key analytical dimension and structures the review's assessment of SDG adoption patterns.

One of the clearest studies of this hierarchy is provided by Deveci et al. (2022), who asked international experts to assess the relative importance of all 17 SDGs in the context of sustainable mining. Their results identified SDG 8 as the most important goal and SDG 14 as the least important, pointing to a strong material logic in the sector's interpretation of the SDG agenda. This idea of selective salience is also visible in broader review work. Bansal et al. (2024) for example, show that mining-related CSR research is increasingly concentrated on SDG 8, SDG 12, and SDG 13, while other goals receive less attention. Similarly, Papafloratos et al. (2023) find that major mining companies in Europe and North America emphasize health, poverty, and decent work themes much more strongly than environmental goals in their sustainability reporting.

Recent disclosure-based mining studies reinforce this pattern of uneven goal prioritization. Haywood et al. (2026) using text mining on South African mining reports, find the strongest emphasis on SDG 13, SDG 12, and SDG 8, with weaker treatment of goals such as SDG 6 and SDG 15. (Ramírez-Van stralhen et al., 2026) similarly show that South American mining companies concentrate on a subset of goals, with the strongest attention to SDG 6, SDG 8, SDG 4, and SDG 13, while SDG 2, SDG 14, and SDG 16 remain much less visible. This selective pattern is not unique to mining. Broader corporate evidence also suggests that firms tend to cluster around a limited set of goals, such as SDG 8, SDG 9, SDG 12, and SDG 13, while goals such as SDG 1, SDG 2, SDG 14, and SDG 15 often remain marginal (Gutiérrez-Ponce, 2023; Lenort, Wicher, & Zapletal, 2023).

Collectively, these studies demonstrate an important distinction: SDG adoption is unlikely to be evenly distributed across all 17 goals within the mining sector. Rather, disclosure tends to reflect a sector-specific hierarchy of materiality, shaped by operational relevance, reputational considerations, and established reporting practices. This sector hierarchy provides the basis for exploring how SDG disclosure patterns evolve across regions and within sub-industries in the following sections.

2.2. Time Trends and the Diffusion of SDG Disclosure

The second analytical focus examines how SDG disclosure in mining has changed over time. Core questions include whether references to the SDGs have increased since the adoption of the 2030 Agenda and whether this trend reflects substantive integration or the spread of sustainability language.

Cross-sector evidence indicates clear growth in SDG-related disclosure after 2015. Bose and Khan (2022), using company-year data from 30 countries, show that corporate SDG reporting remained extremely limited in the early years after adoption of the SDGs but increased noticeably by 2019. Whittingham, Earle, Leyva-de la Hiz, and Argiolas (2023) using computer-aided text analysis of large-company sustainability reports, similarly find a post-2015 increase in overall SDG alignment language, especially for SDG 13. However, the magnitude of change varies by sector, resource intensity, and region. Gunawan, Permatasari, and Tilt (2020) also identify a rise in SDG disclosure in Indonesian corporate reporting, though they note that growth is uneven across goals.

Sector-specific evidence suggests a similar dynamic in environmentally sensitive industries. Manes-Rossi and Nicolo' (2022) find an increase in mentions of the SDGs over time in European energy and utility reports, but also show that most firms rely more on symbolic than on substantive forms of SDG integration. In mining, Haywood et al. (2026) report steady growth in SDG references in South African mining reports over the period 2020–2023, while Ramírez-Van stralhen et al. (2026) show that South American mining firms increasingly adopted SDG language. However, their findings also suggest fragmentation and unevenness in later years.

These studies support the expectation that SDG disclosure in mining has been increasing over time. However, they also highlight that a higher frequency of SDG references does not necessarily indicate deep organizational integration. For instance, Heras-Saizarbitoria et al. (2022) demonstrate that only a small minority of organizations clearly explain their SDG prioritization, map SDGs to strategy, or employ key performance indicators to track progress. Thus, when evaluating time trends, it is essential to distinguish between surface-level reporting and actual integration, a distinction that resonates with the review's broader analytical framework and informs the discussion in later sections.

2.3. Regional and Institutional Variation in SDG Adoption

A third analytical dimension considers how institutional and regional contexts shape SDG disclosure. Practices evolve in response to regulations, governance systems, stakeholder demands, sustainability expectations, and wider institutional environments.

This argument is well established in the general SDG disclosure literature. Rosati and Faria (2019) show that whether firms address the SDGs in sustainability reports is associated with institutional and cultural conditions, including national CSR performance and selected cultural dimensions. Bose and Khan (2022) similarly find that companies in countries with stronger sustainability regulation and better national SDG performance disclose more SDG content. García-Sánchez, Aibar-Guzmán, Aibar-Guzmán, and Somohano-Rodríguez (2022) extend this logic by showing that country-level institutional pressures are among the strongest predictors of SDG Compass integration into non-financial information systems.

These institutional arguments are also relevant in extractive settings. Arévalo, González, Guzmán, and Trujillo (2025) find that environmental disclosure in Latin American mining and energy firms is shaped by governance quality, board independence, board diversity, and ownership structure. Janikowska and Kulczycka (2021) show that minerals policy and sustainable development outcomes vary across European countries, while Bergamini et al. (2025) demonstrate how Chilean mining policy can be translated into measurable indicators of sustainable mining progress. More broadly, De Sa (2019) argues that mining sustainability outcomes depend heavily on territorial governance and coordination, rather than solely on firm-level initiatives.

This body of research indicates that regional differences in SDG adoption are to be expected within the mining sector. However, it is important to distinguish the influence of institutionalized sustainability environments from other contextual factors. Firms operating in more institutionalized settings are more likely to adopt broader SDG language, whereas weaker governance contexts may lead to less frequent or more uneven disclosure. Furthermore, the literature suggests that regional patterns emerge not only from regulation but also from differences in social expectations, governance traditions, and policy capacity, emphasizing the multiple sources of variation. These factors interact with those discussed previously, creating a layered understanding of regional and institutional variation that complements both sector- and time-based analyses.

2.4. Sub-Industry Differences Within Mining

Although often treated as a single sector, mining comprises diverse sub-industries with significant differences in production, environmental impacts, waste, water and energy use, community interactions, and supply chains. These operational contrasts indicate that SDG priorities may diverge across mining subsectors, requiring analytical attention to intra-sectoral variation.

Direct evidence on sub-industry heterogeneity remains limited, but several studies suggest why such variation should exist. Papafloratos et al. (2023) show that material topics disclosed by major mining firms vary in ways that imply different emphasis across issue areas. Ramírez-Van stralhen et al. (2026) similarly suggest that SDG adoption in mining reports is uneven and may vary across firms' operational and geographic profiles. Broader mining studies also indicate differentiated sustainability pressures across issue domains, including water governance, health, biodiversity, renewable energy, gender inclusion, and critical minerals (Arthur-Holmes, Busia, Yakovleva, & Vazquez-Brust, 2022; Brown, Boyd, & Kara, 2022; Pimpa, 2024; Pouresmaieli, Qarahasanlou, & Barabadi, 2025).

Studies on critical minerals and low-carbon transition pathways reinforce this point. Hodgkinson and Smith (2021) argue that mineral supply chains are positioned differently within the climate transition, while Dou et al. (2023) show that governance challenges vary across critical-mineral systems. In the same vein, Mahmoudi Kouhi et al. (2024) find uneven SDG performance across five mining complexes, suggesting that operational context matters even within mining-oriented samples.

Accordingly, the literature supports the expectation that mining sub-industries will exhibit distinct SDG disclosure profiles. However, as this issue has received less direct empirical attention than country- or firm-level differences, sub-industry variation remains a relatively underdeveloped area in the existing literature.

2.5. Firm-Level Characteristics and Disclosure Capacity

A fifth theme addresses the influence of firm-level characteristics on SDG adoption. Across the broader sustainable development and SDG literature, larger firms tend to disclose more information, adopt broader reporting frameworks, and experience greater pressure from investors, regulators, and civil society. This pattern suggests that disclosure breadth may reflect organizational capacity and visibility, as well as a commitment to sustainability.

This pattern appears clearly in the SDG literature. García-Sánchez et al. (2022) find that firm size helps explain SDG Compass integration, while Khaled, Ali, and Mohamed (2021) show that firm size and profitability are positively associated with ESG-based SDG performance proxies. Lee (2023) similarly finds that market capitalization is positively associated with total SDG performance, along with corporate network centrality. Nishitani, Nguyen, Trinh, Wu, and Kokubu (2021) add that top-management commitment and stakeholder pressure are important drivers of business targets for the SDGs.

Taken together, this literature indicates that broader SDG adoption is likely associated with organizational scale, governance quality, visibility, and reporting capacity. This association is particularly relevant in mining, where firms differ substantially in size, ownership structures, and levels of external scrutiny.

2.6. From Disclosure Breadth to Disclosure Quality

A final, particularly significant theme in the literature is the distinction between the breadth of SDG disclosure and its quality. An expanding body of research cautions that merely counting SDG references may overstate the extent of genuine SDG integration.

Heras-Saizarbitoria et al. (2022) show that only a small minority of reporting organizations explain why they selected specific SDGs, link them to strategy, or support them with KPIs. Lodhia et al. (2023) similarly find that many firms appear to understand and prioritize SDGs, but far fewer translate them into concrete targets and measurements. Nicolò, Zanellato, Tiron-Tudor, and Tartaglia Polcini (2023) distinguish between substantive and symbolic disclosure pathways, showing that some firms embed SDGs into governance and value creation, while others use them largely as reputational camouflage. Van der Waal and Thijssens (2020) reach a similar conclusion, arguing that SDGs are frequently used for impression management rather than operational embedding.

The comparability problem is equally important. Diaz-Sarachaga (2021) argues that current SDG reporting instruments are marked by qualitative bias, omission of negative impacts, and weak standardization, making cross-company benchmarking difficult. Calabrese et al. (2021) respond by proposing more refined measures of SDG coverage and commitment at the indicator level, while Kücükgül, Cerin, and Liu (2022) propose stronger alignment methodologies across reporting guides. Lu et al. (2021) likewise argue that existing CSR and SDG frameworks remain too selective and fragmented to support robust cross-sector comparison.

Recent studies also point directly to SDG-washing. Manes-Rossi and Nicolo' (2022) show that most energy firms use symbolic rather than substantive SDG legitimacy strategies, while del Río et al. (2024) identify significant divergence between firms' self-reported SDG integration and external compliance measures. Lashitew (2021) conceptualizes this broader problem as a gap between SDG rhetoric, internal governance, and verified external reporting. This body of literature is especially relevant to the present study. As the analysis measures whether firms reference SDGs in their disclosures, it primarily captures visibility rather than verified contributions. The value of this mapping lies in identifying which goals are emphasized, how disclosure evolves, and where variation is concentrated. However, the literature clearly indicates that broader adoption should not be equated with deeper or more substantive commitment.

2.7. Research Gap and Contribution of the Present Study

In summary, the literature suggests that SDG adoption in mining is likely to be selective across goals, increase over time, be influenced by regional institutions, differ across sub-industries, and be associated with firm-level reporting capacity. It also emphasizes that broader disclosure does not necessarily indicate substantive SDG integration.

Nevertheless, the evidence remains fragmented. Mining-specific studies are frequently conceptual, country-specific, or focused on a limited set of goals or issues. Although report-based mining studies are increasing in number, they remain constrained in their geographical scope and comparative breadth. Simultaneously, the broader corporate literature offers valuable insights into SDG-washing, comparability, and institutional drivers, but these perspectives are not consistently integrated with evidence from the mining sector.

The present study fills this gap by offering a multi-year, multi-region, and multi-sub-industry mapping of SDG adoption in mining disclosures. This approach contributes to the literature by directly engaging with the main analytical dimensions identified above: goal prioritization, temporal trends, regional variation, sub-industry heterogeneity, firm-level characteristics, and the distinction between disclosure breadth and disclosure quality.

3. DATA AND METHODOLOGY

3.1. Sample and Analytical Scope

This study examines the adoption of SDGs in global mining disclosures from 2019 to 2024. The dataset includes 3,048 firm-year observations from seven mining sub-industries: Aluminum, Copper, Diversified Metals &

Mining, Gold, Precious Metals & Minerals, Silver, and Steel. The analysis uses firm-year observations to capture how often firms reference each of the 17 SDGs in their disclosures.

The sample design enables comparison across major world regions. For regional analysis, observations are grouped into North America & Caribbean, Europe, Asia-Pacific, Latin America, and the Middle East & Africa. This structure facilitates examination of whether differences in SDG adoption are primarily attributable to temporal change, institutional and geographic heterogeneity, or variation related to mining specialization.

3.2. Variables

The primary dependent variables are 17 binary SDG indicators, each denoting whether a firm-year disclosure references a specific SDG. This means the analysis captures only the presence or absence of explicit SDG mentions, not the depth, intensity, or effectiveness of implementation. It is important to distinguish between referencing an SDG in disclosure and actually pursuing that goal operationally. Thus, this study should be interpreted strictly as an assessment of SDG adoption in corporate disclosures, without inferring operational SDG performance.

In addition to the 17 SDG indicators, the dataset incorporates three principal grouping variables: year, region, and sub-industry. The year variable captures the temporal dimension from 2019 to 2024. The region variable reflects the broad institutional and geographic context. The sub-industry variable represents heterogeneity in production structure and mining specialization across the seven mining segments.

To assess links between firm characteristics and disclosure, the analysis includes firm size and return on assets. These are used as correlates rather than causal variables, indicating whether broader SDG adoption occurs among larger or more profitable firms.

3.3. Empirical Strategy

The empirical strategy consists of several sequential steps. First, descriptive statistics are employed to determine the overall frequency with which each SDG is referenced across the full sample. This approach produces a ranked profile of the most and least visible goals in mining disclosures.

Second, to build on this overview, differences over time, across regions, and within sub-industries are analyzed using Kruskal–Wallis tests. This non-parametric method is appropriate for the binary and non-normal SDG variables. Effect sizes, reported as epsilon-squared, help distinguish minor from substantial patterns. When omnibus differences emerge, Holm-adjusted Dunn's post hoc tests highlight the most pronounced pairwise differences.

Third, to strengthen the analysis, chi-square tests and Cramér's V are used to assess the association between each SDG and the main grouping variables. This approach provides a robust, descriptive view of the strength of association in categorical terms.

Fourth, the analysis turns to the dynamics over time using two approaches. The first involves yearly comparisons across the pooled sample. The second employs paired Wilcoxon signed-rank tests for firms observed in both 2019 and 2024. This matched-firm analysis is particularly informative, as it reveals whether temporal changes persist when the comparison is limited to the same companies. The matched sample comprises 508 firms with observations in both endpoint years.

Fifth, the study examines the joint influence of region and sub-industry using two-way ANOVA models. While these models do not support strict causal interpretation, they facilitate assessment of whether observed differences are additive or whether regional and subsector conditions interact. Finally, the study examines the association between SDG adoption and two firm-level characteristics, size and profitability, using Pearson correlations. Given

the paper's descriptive aims, these correlations are interpreted cautiously as patterns of association rather than as evidence of causal effects.

4. RESULTS

4.1. Overall SDG Adoption Profile

The results show that SDG adoption in mining disclosures is unevenly distributed across the 17 goals. As shown in Table 1, the most frequently referenced goals are SDG 8 (35.4%), SDG 13 (33.7%), SDG 3 (33.5%), and SDG 12 (31.6%). These are followed by SDG 5 (29.3%), SDG 6 (28.6%), SDG 4 (27.7%), and SDG 9 (26.9%). At the lower end of the ranking, SDG 1 is referenced in 18.1% of firm-years, while SDG 2 (11.6%) and SDG 14 (11.2%) are the least visible goals in the sample.

This pattern underscores that mining firms particularly emphasize disclosure on goals related to employment, labor conditions, climate action, health and safety, responsible production, and resource management. On the other hand, goals such as zero hunger and life below water are considerably less central to the sector's disclosure profile. Thus, the evidence in Table 1 demonstrates that SDG communication in mining is selective, focusing on a limited set of highly material goals.

Table 1. Overall SDG adoption in mining disclosures (2019–2024).

Rank	SDG	SDG title	Adoption (%)
1	SDG 8	Decent Work and Economic Growth	35.4
2	SDG 13	Climate Action	33.7
3	SDG 3	Good Health and Well-Being	33.5
4	SDG 12	Responsible Consumption and Production	31.6
5	SDG 5	Gender Equality	29.3
6	SDG 6	Clean Water and Sanitation	28.6
7	SDG 4	Quality Education	27.7
8	SDG 9	Industry, Innovation and Infrastructure	26.9
9	SDG 15	Life on Land	25.4
10	SDG 7	Affordable and Clean Energy	24.4
11	SDG 10	Reduced Inequalities	23.2
12	SDG 16	Peace, Justice and Strong Institutions	22.8
13	SDG 11	Sustainable Cities and Communities	22.3
14	SDG 17	Partnerships for the Goals	21.6
15	SDG 1	No Poverty	18.1
16	SDG 2	Zero Hunger	11.6
17	SDG 14	Life Below Water	11.2

Note: Percentages refer to the share of firm-year observations referencing each SDG.

4.2. Time Trends in SDG Adoption

Building on the previous section, time emerges as the strongest source of variation in the dataset. Kruskal–Wallis tests show statistically significant year differences for all 17 SDGs, and the corresponding effect sizes indicate that temporal variation is not only statistically significant but also substantively meaningful for a large share of the goals. As reported in Table 2, the strongest year-related effects are observed for SDG 13 ($\varepsilon^2(H)$ = 16.2%), SDG 8 (15.4%), SDG 12 (14.3%), and SDG 3 (14.0%). Additional moderate effects are recorded for SDG 5, SDG 6, SDG 7, and SDG 9, whereas SDG 2 and SDG 14 exhibit much smaller time effects.

Table 2. Year-based variation in SDG adoption: Kruskal–Wallis effect sizes.

Rank	SDG	SDG title	$\varepsilon^2(H)$ (%)	Magnitude
1	SDG 13	Climate Action	16.2	Large
2	SDG 8	Decent Work and Economic Growth	15.4	Large
3	SDG 12	Responsible Consumption and Production	14.3	Large
4	SDG 3	Good Health and Well-Being	14.0	Large
5	SDG 5	Gender Equality	12.5	Moderate
6	SDG 6	Clean Water and Sanitation	11.4	Moderate
7	SDG 7	Affordable and Clean Energy	11.0	Moderate
8	SDG 9	Industry, Innovation and Infrastructure	10.9	Moderate
9	SDG 4	Quality Education	10.1	Moderate
10	SDG 15	Life on Land	9.9	Moderate
11	SDG 11	Sustainable Cities and Communities	9.4	Moderate
12	SDG 10	Reduced Inequalities	9.4	Moderate
13	SDG 17	Partnerships for the Goals	8.3	Moderate
14	SDG 16	Peace, Justice and Strong Institutions	8.3	Moderate
15	SDG 1	No Poverty	6.4	Moderate
16	SDG 2	Zero Hunger	3.3	Small
17	SDG 14	Life Below Water	3.1	Small

Note: All SDGs show statistically significant year differences; the strongest temporal effects are observed for SDG 13, SDG 8, SDG 12, and SDG 3.

Supporting these findings and further detailing time trends, the matched-firm analysis confirms that this upward pattern is not simply an artifact of changing sample composition. Among the 508 firms observed in both 2019 and 2024, paired Wilcoxon tests show statistically significant increases for all 17 SDGs. The largest absolute changes are reported in Table 3, where SDG 13 rises from 3.1% in 2019 to 57.7% in 2024, followed by SDG 8 from 3.7% to 58.1%, SDG 3 from 3.7% to 54.7%, and SDG 12 from 2.6% to 52.6%. Strong increases are also visible for SDG 5, SDG 6, SDG 9, SDG 4, and SDG 7. Even the least frequently referenced goals show positive movement over time, although they remain comparatively marginal in overall adoption.

Table 3. Matched-firm change in SDG adoption between 2019 and 2024.

Rank	SDG	SDG title	2019 (%)	2024 (%)	Change (pp)
1	SDG 13	Climate Action	3.1	57.7	54.5
2	SDG 8	Decent Work and Economic Growth	3.7	58.1	54.3
3	SDG 3	Good Health and Well-Being	3.7	54.7	51.0
4	SDG 12	Responsible Consumption and Production	2.6	52.6	50.0
5	SDG 5	Gender Equality	3.0	49.0	46.1
6	SDG 6	Clean Water and Sanitation	2.8	48.2	45.5
7	SDG 9	Industry, Innovation and Infrastructure	2.8	44.9	42.1
8	SDG 4	Quality Education	3.1	44.9	41.7
9	SDG 7	Affordable and Clean Energy	2.0	42.5	40.6
10	SDG 15	Life on Land	2.6	42.7	40.2
11	SDG 11	Sustainable Cities and Communities	1.6	38.0	36.4
12	SDG 10	Reduced Inequalities	1.8	37.8	36.0
13	SDG 16	Peace, Justice and Strong Institutions	2.6	37.2	34.6
14	SDG 17	Partnerships for the Goals	1.6	35.4	33.9
15	SDG 1	No Poverty	2.4	30.7	28.3
16	SDG 2	Zero Hunger	1.4	18.5	17.1
17	SDG 14	Life Below Water	1.4	17.7	16.3

Note: Based on paired Wilcoxon comparisons for 508 matched firms. All changes are positive and statistically significant after Holm adjustment. Percentages represent the share of matched firms that referenced each SDG in 2019 and 2024.

Taken together, Tables 2 and 3 indicate that the dominant pattern in the data is a broad longitudinal expansion in SDG disclosure. The mining sector increased SDG referencing over time, particularly in climate-, labor-, health-, and production-related goals. Rather than simply shifting emphasis among a static set of firms, the sector demonstrates comprehensive growth in SDG reporting.

4.3. Regional Differences

Regional heterogeneity is also present, though its substantive magnitude is smaller than that of the temporal pattern. The descriptive results in Table 4 show that Europe records the highest adoption levels across many of the most visible goals, including SDG 3 (46.0%), SDG 8 (51.5%), SDG 12 (46.7%), and SDG 13 (51.0%). Latin America also performs strongly, particularly on environmentally oriented goals such as SDG 6 (46.6%), SDG 13 (44.8%), and SDG 15 (34.5%). The Middle East and Africa occupy an intermediate position, while Asia-Pacific generally shows moderate adoption across the selected goals. North America and the Caribbean tend to record the lowest values for a large share of the SDGs shown in the table.

Table 4. Mean SDG adoption by region for all SDGs (%).

SDG	SDG title	NAC	EUR	APAC	LATAM	MEA
SDG 1	No Poverty	16.67	17.42	18.52	16.67	23.66
SDG 2	Zero Hunger	11.68	6.06	12.93	12.07	11.83
SDG 3	Good Health and Well-Being	29.81	45.96	31.45	37.93	34.95
SDG 4	Quality Education	20.56	39.14	26.00	37.36	38.71
SDG 5	Gender Equality	25.30	35.35	28.66	37.36	32.26
SDG 6	Clean Water and Sanitation	25.18	39.90	24.71	46.55	34.41
SDG 7	Affordable and Clean Energy	14.36	34.85	25.46	36.21	27.96
SDG 8	Decent Work and Economic Growth	29.68	51.52	32.40	44.83	41.40
SDG 9	Industry, Innovation and Infrastructure	17.88	43.94	25.73	36.21	31.72
SDG 10	Reduced Inequalities	16.91	24.75	24.71	35.63	23.66
SDG 11	Sustainable Cities and Communities	14.23	26.26	24.37	32.76	23.66
SDG 12	Responsible Consumption and Production	22.02	46.72	31.18	39.08	37.63
SDG 13	Climate Action	24.82	51.01	31.79	44.83	40.32
SDG 14	Life Below Water	8.39	11.62	11.64	21.84	9.68
SDG 15	Life on Land	21.53	32.07	24.37	34.48	27.42
SDG 16	Peace, Justice and Strong Institutions	14.96	31.57	23.55	32.76	23.12
SDG 17	Partnerships for the Goals	15.21	34.09	20.01	27.01	30.11

Note: Region abbreviations are as follows: NAC = North America & Caribbean (n = 822); EUR = Europe (n = 396); APAC = Asia-Pacific (n = 1,469); LATAM = Latin America (n = 174); MEA = Middle East & Africa (n = 187). Values are mean adoption rates (%) and indicate the share of firm-year observations referencing each SDG within the respective region.

These results indicate that while all regions adopt the SDGs, the levels of adoption and focus areas differ markedly. Europe exhibits the highest overall levels, particularly in core SDGs such as SDG 8 (Decent Work and Economic Growth) and SDG 13 (Climate Action), underscoring its leadership. In contrast, Latin America excels in environmental and resource-oriented goals, such as SDG 6 (Clean Water and Sanitation) and SDG 15 (Life on Land). Meanwhile, North America and the Caribbean trail other regions in most SDGs. The regional comparisons in Table 4 thus confirm that both institutional context and regional priorities distinctly shape SDG adoption patterns in mining.

4.4. Sub-Industry Differences

Shifting the focus from geographic to sub-industry patterns, differences across sub-industries are statistically significant for most SDGs, although the substantive magnitudes are generally modest. The mean values reported in Table 5 nonetheless show a consistent pattern of heterogeneity across mining segments. For example, Aluminum displays comparatively high adoption across many key goals, including SDG 4 (43.7%), SDG 8 (48.9%), SDG 12 (48.3%), and SDG 13 (48.9%), while Steel and Diversified Metals & Mining tend to record lower adoption across several goals, especially for SDG 4, SDG 8, and SDG 15. Precious Metals & Minerals also performs relatively strongly on selected dimensions, particularly SDG 15 (37.3%), and Gold reports comparatively high values for SDG 8 (40.1%) and SDG 13 (34.9%).

Table 5. Mean SDG adoption by sub-industry for all SDGs (%).

SDG	SDG title	ALU	COP	DMM	GLD	PMM	SIL	STL
SDG 1	No Poverty	18.39	28.21	16.23	25.17	27.78	16.67	13.01
SDG 2	Zero Hunger	16.09	16.67	9.26	17.52	17.46	6.25	8.29
SDG 3	Good Health and Well-Being	41.95	39.74	29.96	39.46	43.65	43.75	29.09
SDG 4	Quality Education	43.68	34.62	22.88	32.31	38.89	35.42	23.80
SDG 5	Gender Equality	37.36	35.90	26.25	35.03	37.30	22.92	25.82
SDG 6	Clean Water and Sanitation	35.06	32.69	25.16	34.35	41.27	35.42	24.95
SDG 7	Affordable and Clean Energy	41.38	30.13	22.33	20.24	17.46	16.67	26.20
SDG 8	Decent Work and Economic Growth	48.85	39.74	33.33	40.14	43.65	43.75	30.25
SDG 9	Industry, Innovation and Infrastructure	44.25	28.85	25.27	24.49	22.22	8.33	28.03
SDG 10	Reduced Inequalities	35.63	30.77	22.98	24.32	27.78	8.33	19.56
SDG 11	Sustainable Cities and Communities	30.46	28.21	20.15	22.28	19.05	8.33	23.03
SDG 12	Responsible Consumption and Production	48.28	37.82	30.50	28.91	32.54	8.33	31.21
SDG 13	Climate Action	48.85	30.13	30.50	34.86	36.51	31.25	33.53
SDG 14	Life Below Water	20.69	10.90	9.26	10.37	3.17	8.33	13.01
SDG 15	Life on Land	30.46	34.62	26.14	28.74	37.30	31.25	18.79
SDG 16	Peace, Justice and Strong Institutions	29.89	26.92	21.02	23.64	19.84	16.67	22.64
SDG 17	Partnerships for the Goals	34.48	23.72	17.97	23.64	26.98	8.33	21.00

Note: Sub-industry abbreviations are as follows: ALU = Aluminum (n = 174); COP = Copper (n = 156); DMM = Diversified Metals & Mining (n = 918); GLD = Gold (n = 588); PMM = Precious Metals & Minerals (n = 126); SIL = Silver (n = 48); STL = Steel (n = 1,038). Values are mean adoption rates (%) and indicate the share of firm-year observations referencing each SDG within the respective sub-industry.

Altogether, these results indicate that, although sub-industry effects are not as strong as year effects, mining should not be considered a completely homogeneous sector. For example, segments such as Aluminum and Precious Metals & Minerals are more advanced in articulating SDG-related commitments—particularly in labor-, production-, and climate-related goals—than Steel and Diversified Metals & Mining, which tend to lag in adoption.

4.5. Joint Effects of Region and Sub-Industry

To further explore whether regional differences vary across mining segments, a two-way ANOVA was conducted for each Sustainable Development Goal (SDG), with region and sub-industry as factors and their interaction. The results, presented in Table 6, indicate that region is statistically significant for all 17 SDGs, while sub-industry is significant for 16 of the 17 goals. The only exception is SDG 16, where the sub-industry's main effect is not statistically significant ($p = 0.114$). Notably, the interaction between region and sub-industry is statistically significant for all 17 SDGs. These findings suggest that regional variation in SDG disclosure is not consistent across mining segments, but rather depends on the specific combination of institutional context and sub-industry specialization.

The data further show that the most pronounced regional effects are found for SDG 13 (F = 26.80), SDG 9 (F = 23.80), SDG 4 (F = 23.60), SDG 8 (F = 23.00), SDG 6 (F = 21.30), and SDG 12 (F = 19.00). The strongest sub-industry effects are observed for SDG 4 (F = 10.60), SDG 1 (F = 10.30), SDG 2 (F = 8.51), SDG 15 (F = 8.20), and SDG 7 (F = 7.76). Collectively, these results support the earlier descriptive findings by demonstrating that both geographic location and mining specialization are influential, and that their effects are interdependent rather than simply additive.

Table 6. Two-way ANOVA results for SDG adoption by region and sub-industry.

SDG	Region F	Region p	Sub-industry F	Sub-industry p	Interaction F	Interaction p
SDG 1	4.75	0.0008	10.30	<0.0001	4.89	<0.0001
SDG 2	6.06	0.0001	8.51	<0.0001	4.27	<0.0001
SDG 3	13.10	<0.0001	6.93	<0.0001	3.44	<0.0001
SDG 4	23.60	<0.0001	10.60	<0.0001	3.57	<0.0001
SDG 5	8.11	<0.0001	5.69	<0.0001	3.76	<0.0001
SDG 6	21.30	<0.0001	6.52	<0.0001	2.85	<0.0001
SDG 7	19.00	<0.0001	7.76	<0.0001	3.77	<0.0001
SDG 8	23.00	<0.0001	6.98	<0.0001	3.20	<0.0001
SDG 9	23.80	<0.0001	7.08	<0.0001	2.93	<0.0001
SDG 10	11.60	<0.0001	6.18	<0.0001	3.27	<0.0001
SDG 11	13.10	<0.0001	3.24	0.0036	3.94	<0.0001
SDG 12	19.00	<0.0001	6.97	<0.0001	3.57	<0.0001
SDG 13	26.80	<0.0001	4.21	0.0003	4.03	<0.0001
SDG 14	6.12	<0.0001	5.38	<0.0001	2.45	0.0004
SDG 15	10.50	<0.0001	8.20	<0.0001	2.90	<0.0001
SDG 16	16.30	<0.0001	1.71	0.1140	2.29	0.0012
SDG 17	17.80	<0.0001	5.83	<0.0001	3.67	<0.0001

Note: Two-way ANOVA models include region, sub-industry, and their interaction. Region is statistically significant for all 17 SDGs; sub-industry is significant for all except SDG 16; and the interaction term is significant for all 17 SDGs. These results indicate that regional differences in SDG adoption vary across mining segments.

4.6. Firm Characteristics and SDG Adoption

Finally, regarding the relationship between firm characteristics and SDG adoption, the correlation analysis shows a clear positive association between firm size and SDG adoption. As shown in Table 7, all 17 SDGs are positively correlated with firm size, with the strongest coefficients observed for SDG 12 (r = .372), SDG 3 (r = .369), and SDG 13 (r = .368). Strong positive associations are also evident for SDG 8, SDG 6, SDG 15, and SDG 9. These results suggest that larger firms are more likely to reference a broader range of SDGs in their disclosures.

Table 7. Correlations between SDG adoption and firm characteristics.

SDG	SDG title	Firm size	ROA
SDG 1	No Poverty	0.247	0.106
SDG 2	Zero Hunger	0.207	0.086
SDG 3	Good Health and Well-Being	0.369	0.164
SDG 4	Quality Education	0.309	0.163
SDG 5	Gender Equality	0.322	0.130
SDG 6	Clean Water and Sanitation	0.333	0.165
SDG 7	Affordable and Clean Energy	0.319	0.129
SDG 8	Decent Work and Economic Growth	0.349	0.166
SDG 9	Industry, Innovation and Infrastructure	0.328	0.166
SDG 10	Reduced Inequalities	0.271	0.139
SDG 11	Sustainable Cities and Communities	0.290	0.125
SDG 12	Responsible Consumption and Production	0.372	0.161
SDG 13	Climate Action	0.368	0.181
SDG 14	Life Below Water	0.267	0.099
SDG 15	Life on Land	0.328	0.131
SDG 16	Peace, Justice and Strong Institutions	0.287	0.135
SDG 17	Partnerships for the Goals	0.316	0.159

Note: All correlations are positive. Firm size is measured as the natural logarithm of total assets, and ROA refers to return on assets.

Return on assets is also positively associated with SDG adoption across all goals, but these correlations are consistently weaker than those for size. The strongest profitability-related coefficients are observed for SDG 13 (r = 0.181), SDG 9 (r = 0.166), SDG 8 (r = 0.166), SDG 6 (r = 0.165), and SDG 3 (r = 0.164). This suggests that while higher profitability is associated with broader SDG adoption, the impact is notably less pronounced than that of firm size. Overall, the evidence in Table 7 suggests that disclosure breadth is more strongly related to organizational scale than to short-term financial performance.

5. DISCUSSION

This study examines Sustainable Development Goal (SDG) adoption in global mining disclosures over time, across regions, and among sub-industries, and investigates whether broader SDG adoption correlates with selected firm characteristics. Four principal findings are identified. First, mining disclosures demonstrate selectivity in their emphasis on the SDGs. Second, SDG disclosure has increased substantially over time. Third, while regional and sub-industry differences exist, they are less significant than the overall temporal trend. Fourth, these contextual differences interact rather than function independently. Additionally, larger firms are more likely to disclose a broader SDG profile.

The first finding demonstrates that mining companies do not engage with the SDGs uniformly. Instead, disclosures focus on a limited set of goals that closely align with the sector's material concerns, particularly employment, climate, health, and production systems. This pattern aligns with previous research, which indicates that SDG priorities in mining are shaped by operational relevance and stakeholder pressure, not by comprehensive engagement with the entire 2030 Agenda (Bansal et al., 2024; Deveci et al., 2022; Haywood et al., 2026; Papafloratos et al., 2023; Ramírez-Van stralhen et al., 2026). The prominence of SDG 8 and SDG 13 is expected, given the sector's focus on labor conditions, industrial transition, emissions management, and climate-related expectations. Conversely, limited attention to SDG 2 and SDG 14 shows that these goals are considered peripheral in mainstream mining disclosure narratives. This pattern is also evident in broader corporate SDG reporting (Gutiérrez-Ponce, 2023; Lenort et al., 2023).

The second principal finding is a pronounced upward trend in SDG adoption throughout the study period, indicating that SDG language has become increasingly visible in mining disclosures. This reflects a broader pattern of expanded SDG-related reporting across sectors since the adoption of the 2030 Agenda, as well as recent mining-specific studies that document increased references to the SDGs. However, the literature cautions that increased disclosure does not necessarily indicate substantive progress in implementation, as many firms reference SDGs without clearly linking them to strategy, targets, key performance indicators, or measurable outcomes. Accordingly, the results point more clearly to the diffusion of SDG framing than to substantively integrated implementation.

Regional differences offer additional insight. Europe demonstrates the strongest overall profile across several of the most prominent goals, whereas Latin America performs relatively well on selected environmental dimensions. These patterns are consistent with research indicating that SDG disclosure is shaped by institutional context, governance quality, and reporting norms (Arévalo et al., 2025; Bose & Khan, 2022; García-Sánchez et al., 2022; Rosati & Faria, 2019). Europe's stronger performance likely reflects a more advanced sustainability reporting environment and greater regulatory and stakeholder pressures. In contrast, Latin America's profile may reflect the ecological and social relevance of extractive activities in the region. Nevertheless, the effect sizes suggest that these differences are modest. The dominant pattern remains broad sector-wide growth over time, rather than pronounced and persistent regional divergence.

The results further show that mining is not a homogeneous sector. Certain sub-industries, particularly Aluminum and, in specific areas, Gold and Precious Metals & Minerals, exhibit stronger SDG adoption than Steel or Diversified Metals & Mining. This supports the perspective that mining subsectors experience varying sustainability pressures, technological conditions, and stakeholder exposure. Nonetheless, these differences are secondary to the more significant temporal trend. Thus, sub-industry specialization is relevant, but it occurs within a sector-wide movement toward greater visibility of the SDGs. At the same time, the two-way ANOVA results indicate that regional and sub-industry effects do not operate separately. Because the interaction term is statistically significant for all 17 SDGs, the influence of region varies across mining segments. This suggests that institutional context and mining specialization jointly shape disclosure patterns, rather than contributing only through additive main effects.

The positive association between SDG adoption and firm size is also noteworthy. Larger firms are more likely to reference a broader range of SDGs, consistent with literature linking disclosure breadth to organizational scale, visibility, governance capacity, and stakeholder scrutiny (García-Sánchez et al., 2022; Khaled et al., 2021; Lee, 2023). In contrast, the weaker correlation with profitability indicates that SDG disclosure breadth is influenced more by reporting capacity and legitimacy needs than by short-term financial performance. In the mining sector, where public scrutiny is significant and ESG expectations are increasingly institutionalized, larger firms are particularly likely to adopt SDG language as part of broader accountability strategies.

An important implication of this study is that disclosure breadth should not be equated with disclosure quality. The analysis identifies whether firms reference the SDGs, but does not assess substantive integration into strategy or the translation of these references into measurable outcomes. This distinction is central to the SDG reporting literature, which consistently finds that SDG disclosure is often selective, weakly standardized, and susceptible to symbolic use (Calabrese et al., 2021; del Río et al., 2024; Diaz-Sarachaga, 2021; Lashitew, 2021). The value of the present study, therefore, lies in showing how mining firms frame SDG engagement, how that framing has expanded, and where the main axes of variation are located. The results indicate that mining companies are increasingly adopting SDG language, but this adoption remains focused on a limited set of highly salient goals.

Overall, these findings contribute to the literature in two primary ways. Empirically, they offer a comprehensive comparative overview of SDG adoption in mining disclosures across years, regions, and sub-industries. They also show that the interaction between geography and sub-industry is a meaningful source of variation, extending existing mining-SDG research beyond simple separate comparisons of place or subsector. Conceptually, they demonstrate that mining aligns with a broader corporate trend of increasing but selective SDG disclosure, influenced by materiality, institutional context, and reporting capacity. Taken together, the evidence suggests that mining firms' growing SDG visibility should be understood primarily as an evolving reporting practice rather than as direct evidence of substantive SDG performance.

6. CONCLUSION

This study mapped the adoption of Sustainable Development Goals (SDGs) in global mining disclosures from 2019 to 2024, using 3,048 firm-year observations across seven sub-industries. The findings show that mining firms emphasize a relatively narrow set of goals—especially SDG 8, SDG 13, SDG 3, and SDG 12—while goals such as SDG 2 and SDG 14 remain comparatively marginal. Over time, SDG disclosure increased substantially across the sector, whereas regional and sub-industry differences, though meaningful, were less influential than the broader temporal expansion. The results also indicate that these contextual differences interact and that larger firms tend to disclose a broader SDG portfolio.

Several limitations should be acknowledged. The analysis centers on disclosure rather than verified implementation, depends on available firm-level reporting data, and adopts a descriptive rather than causal approach. These constraints also point to directions for future research. Subsequent studies could examine whether repeated references to the SDGs are associated with target-setting, governance changes, or measurable environmental and social outcomes. Further research may also investigate the underlying drivers of regional and sub-industry differences, including the roles of regulation, ownership, board structure, and stakeholder pressure. Given the significant interaction effects identified here, future work should also examine more closely how institutional environments and mining specializations combine to shape SDG reporting behavior. Critically, future work should more clearly distinguish between mentions, integration, and actual contributions to corporate SDG engagement.

Finally, this study contributes a comprehensive comparative map of SDG adoption in mining over time, across regions, and among sub-industries. For policymakers, the findings identify areas where SDG-related disclosure is gaining momentum and where significant gaps persist, providing an evidence base for targeted reporting guidance, sectoral benchmarks, and sustainability policy interventions. For managers, the results offer a benchmarking tool to compare SDG disclosure profiles with regional and sub-industry patterns and to identify which goals are becoming central to stakeholder expectations within the sector. More broadly, the study suggests that mining companies are increasingly incorporating SDG language into disclosure. However, the next challenge is whether this visibility will translate into deeper strategic integration and measurable sustainability outcomes.

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