

Sentiment Analysis of Sustainability Disclosures in Annual Reports: Evidence from the Indian IT Sector

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ABSTRACT:

As sustainability gains prominence in corporate strategy, analyzing how companies communicate their environmental and social commitments becomes essential. This study examines the sentiment embedded in the sustainability-related disclosures of firms listed in the NSE IT sectoral index in India. By consolidating annual reports from multiple IT companies into a single corpus and applying sentiment analysis techniques using targeted HRM and SDG-related keywords, we assess the tone and focus of disclosures. The analysis reveals variations in positivity across companies, with a noticeable emphasis on themes such as employee well-being, diversity, and green technologies. Our findings contribute to understanding corporate transparency and stakeholder communication strategies in the Indian IT industry.

Keywords: Sustainability, Sentiment Analysis, Indian IT Sector, ESG Disclosures, Human Resource Practices

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Introduction

Organizations globally integrating Environmental, Social, and Governance (ESG) principles into their corporate strategies and reporting systems due to the increasing focus on sustainability driven by urgent climate change issues, evolving regulatory frameworks, and heightened stakeholder activism. The Indian information technology (IT) sector holds a notably prominent position in this context. As a prominent and globally interconnected sector, Indian IT companies face pressure to exemplify the adoption and promotion of sustainable practices while maintaining rigorous corporate governance requirements. This necessity compels these firms to not only enhance their operational efficiencies but also to engage in transparent reporting of their ESG initiatives. By aligning their strategies with global sustainability goals, Indian IT companies can better position themselves as leaders in responsible business practices, ultimately fostering trust among their stakeholders.

This study primarily examines the attitude inherent in sustainability disclosures within the annual reports of Indian IT businesses listed on the NSE IT Index. This research aims to provide data-driven (NLP) techniques and sentiment analysis tools. The research uses specific word lists and carefully chosen terms related to HR and the UN Sustainable Development Goals (SDGs) to evaluate whether the tone of sustainability-related content is neutral, positive, or negative. The analysis seeks to uncover patterns and trends in how these companies communicate their sustainability efforts, ultimately revealing insights into their commitment to responsible practices. By examining the sentiment expressed in these disclosures, the study aims to highlight the alignment—or lack thereof—between corporate messaging and stakeholder expectations regarding sustainability.

The research seeks to delineate critical focus areas within the expansive ESG framework by (1) systematically extracting and consolidating sustainability disclosures from the annual reports of selected Indian IT companies; (2) employing sentiment analysis techniques on these disclosures utilizing keywords pertinent to HR and SDGs; (3) interpreting the strategic positioning and emotional tone evident in sustainability communication; and (4) identifying emerging patterns, thematic

priorities, and discrepancies among firms. This technique aims to yield substantial insights into the discourse around corporate sustainability within the Indian IT sector and its alignment with global sustainability norms.

Literature Review

Environmental, Social, and Governance (ESG) reporting has become a significant concern in corporate strategy, especially in high-impact sectors like IT. The tone and attitude of annual reports are assessed for sustainability themes. Recent research has explored the evolution of ESG disclosures, the legislative framework regulating sustainability reporting, and their impact on stakeholder perception and corporate performance. Advancements in sentiment analysis and natural language processing have allowed researchers to assess the qualitative aspects of corporate communication. This literature review examines the role and evolution of sustainability disclosures in corporate reporting, the application of natural language processing and sentiment analysis in ESG communication, and the dynamics of sustainability reporting within the Indian IT sector.

Sustainability assessments benefit from quantifiable indicators that provide clarity and direction for improvement. These indicators help in evaluating the sustainability of systems by considering economic, social, and environmental factors. (Sustainability, 2023). The concept of sustainability is often debated, with discussions focusing on its anthropocentric assumptions and the question of "sustaining what, for whom?" This debate highlights contradictions between mainstream approaches, such as those outlined in the Sustainable Development Goals, and more radical ideas like degrowth. (Caverly, 2023).

The idea of sustainability has been shaped by historical developments and global initiatives, such as the Brundtland Report and the Rio Summit, which have led to its widespread adoption. However, this has also resulted in varied interpretations and applications by governments and corporations. (Caverly, 2023). The sustainability movement has expanded significantly, influenced by climate change policies and activism. Understanding its historical development is crucial for education and for those interested in the broader implications of

sustainability in areas like corporate social responsibility and urban planning (Caradonna, 2022). Sustainability can be viewed as a state of dynamic equilibrium, where resource renewal is managed to ensure ongoing availability without compromising future need (Ramirez, 2024).

Lexicon-Based Approach: Utilizes a predefined dictionary of words with associated sentiment scores. It is quick to implement but often yields moderate performance (Kirilenko et al., 2022). **Machine Learning Approach:** Involves training algorithms on manually classified data, leading to higher accuracy but requiring more resources (Shiferaw et al., 2024). Companies analyze customer feedback to enhance products and services, as demonstrated by projects that categorize social media sentiments (Ren, 2023). Sentiment analysis helps gauge public sentiment on various issues, influencing political and social strategies ("Sentiment Analysis Using Text Mining: A Survey," 2023). The Indian IT sector currently accounts for approximately 7.7% of the national GDP, with projections suggesting it could rise to 10% by 2025 (Sharma, 2021). Technologies such as AI, Big Data, and Cloud Computing are reshaping service delivery and operational efficiency in the IT sector (Kamath & Venumuddala, 2023).

A study on the impact of Corporate Social Responsibility (CSR) indicates that CSR initiatives positively influence the financial performance of leading IT firms, enhancing metrics like Return on Assets (ROA) and profitability (Vaidya & Rohit, 2023). This relationship underscores the importance of ethical practices in sustaining business growth amidst competitive pressures (Vaidya & Rohit, 2023). The depreciation of the Indian Rupee has paradoxically benefited the IT sector by making Indian services more competitive in international markets, particularly in the US and Europe (Priya, 2023). Increasing frequency of ESG disclosures among private equity firms from 2000 to 2022 (Abraham et al., 2024). Social topics gaining equal importance to environmental topics in recent years (Abraham et al., 2024).

Positive correlation between high ESG ratings and better financial performance in companies (Wang, 2024). Environmental disclosures positively affect operational and financial performance in the coal mining sector (Durlista & Wahyudi, 2023). ESG disclosures help

reduce information asymmetry between managers and investors, enhancing market efficiency (Sugianto et al., 2022).

Methodology and Data Collection

Annual reports from 2020 to 2024 for every company included in the NSE IT sectoral index were gathered straight from the websites of the individual companies to perform the analysis. Sections of these reports that were particularly concerned with sustainability, such as Corporate Social Responsibility (CSR), Environmental, Social, and Governance (ESG), Human Resource Management (HRM), and Environmental Management, were found, taken out, and assembled into a single textual dataset for additional examination.

Two lists of carefully chosen keywords were created for sentiment analysis. The first set concentrated on terms related to human resources (HR), such as "talent", "diversity", "reskilling", and "engagement". The second set of keywords contained terms like "sustainability", "carbon", "green IT", and "net zero" that are in line with the Sustainable Development Goals (SDGs) of the UN. VADER (Valence Aware Dictionary and sEntiment Reasoner), a lexicon and rule-based sentiment analysis tool available in Python, was used to conduct sentiment analysis. VADER was applied to sentences that contained the chosen keywords and is especially useful for assessing the sentiment of brief text excerpts. Every sentence was given a compound sentiment score, which was then classified as either negative (compound score < 0.05), neutral ($-0.05 \leq \text{compound score} \leq 0.05$), or positive (compound score > 0.05).

Word clouds were created from the processed text to show trends and key themes across businesses. These visuals made it easier to spot common topics and words used in the industry by showing how often certain sustainability-related terms were mentioned.

Results and Discussion

The research examines sustainability declarations of Indian IT firms listed on the NSE IT Index through natural language processing methodologies. It offers insights into how these organizations convey their dedication to ESG principles, especially in human resource

development and environmental stewardship. The findings indicate sentiment polarity linked to HR and SDG-related phrases, offering a detailed comprehension of business sustainability narratives. Comparative patterns among enterprises are examined to discern sector-wide trends and prevalent themes. The analysis also delineates areas of deviation from global best practices and stakeholder expectations. The analysis looks at how much, how consistently, and why these disclosures are made, providing a clearer understanding of how the Indian IT sector contributes to the overall sustainability efforts.

Table 1. Sentiment Summary

Theme	Frequency	Sentiment Summary
Human Resources	44	Traditional terms, limited but present, often in structural or departmental references.
Talent	533	Strong positive sentiment; associated with growth, management, acquisition, and retention.
Training	585	Positive and developmental; indicates a high focus on capability enhancement.
Leadership	649	Highest frequency; points to strategic importance of people leadership in organizational success.
Engagement	619	Positively loaded; focus on employee satisfaction, inclusion, and motivation.
Diversity & Inclusion	642 (combined)	Progressive tone emphasizes fairness, representation, and modern DEI practices.
Workforce	272	Neutral to positive; structural references to employee bases and demographic shifts.
Culture	371	Strongly linked to leadership and values; sentiment is positively transformational.
Well-being	196	Reflects a growing emphasis on mental health, work-life balance, and humane workplaces.
Recruitment & Retention	~103 (combined)	Balanced focus on talent inflow and holding on to valuable employees. Shows recognition of hiring and attrition challenges.

Hybrid/Remote Work	20+	Emerging and adaptive; sentiment is pragmatic and solution-focused in post-pandemic contexts.
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Source: Authors' Own Calculations

Overall Sentiment Majority of sustainability-related disclosures were positive (~67%), indicating an optimistic tone in HR and environmental initiatives. Company-wise Comparison: Larger firms (e.g., Infosys, TCS) showed higher consistency and detail in positive disclosures. Smaller firms showed variance in tone and keyword coverage. HR-Focused Terms: "Leadership", "engagement", "inclusion" received highly positive sentiment, particularly in sections on employee well-being and remote work adaptations. Environmental Focus: Terms like "carbon neutral", "green IT", and "e-waste" were prominent, often linked with pledges or roadmap commitments. Neutral Sentiment Cases: Some firms used formal, factual reporting language without expressive tone, leading to neutral scores.

The sentiment analysis of sustainability disclosures yielded significant insights into the tone and thematic emphasis of Indian IT businesses' annual reports, particularly with organisational sustainability and human capital. Leadership, with 649 references, emerged as the most frequently referenced concept, underscoring its strategic importance in sustainability discourse. The vast majority of replies were favorable, suggesting that enterprises regard good leadership as fundamental to establishing resilient and sustainable organizations, in addition to enhancing performance. In this context, engagement was mentioned 619 times, all of which were highly favorable. This signifies that the organization prioritizes employee motivation, inclusiveness, and overall job satisfaction, all of which are critical elements of sustainable HR strategy.

The combined frequency of the themes of diversity and inclusion was 642, showing a positive and progressive attitude. To comply with international ESG requirements, firms often prioritize equity, equal opportunity, and the integration of DEI (Diversity, Equity, and Inclusion) concepts into their corporate culture. Similarly, 371 references to culture were noted, characterized by an attitude that favored positively transformational language. Corporate culture is

often discussed in leadership talks, indicating that it is perceived as both a leadership outcome and a lever for sustainability.

Training (585 mentions) and talent (533 references) were notably prevalent, characterized by a robust, developmental, and growth-oriented tone. These disclosures underscored the IT industry's reliance on highly skilled human capital, highlighting the need for capability enhancement, talent acquisition, and retention. The frequent and favorable references suggest that firms are significantly investing in human resource development, aligning with the Sustainable Development Goals (SDG 8: Decent Work and Economic Growth and SDG 4: Quality Education).

The HR function is essential, although the sustainability story explicitly addresses themes such as talent, engagement, and leadership. Conversely, the term "human resources" appeared only 44 times and was often utilized in a structural or departmental context. The sentiment towards the workers, with 272 remarks, was indifferent to mildly positive. It was generally utilized for labor planning, headcount statistics, or demographic alterations. In contrast, well-being was referenced 196 times and was closely associated with work-life balance, mental health, and empathetic workplace rules. In consideration of post-pandemic work conditions, the tone was distinctly optimistic and empathetic, indicating an increasing acknowledgement of comprehensive employee well-being. The sentiment towards recruiting and retention was equitable, with a total frequency of approximately 103. Businesses acknowledged the importance of acquiring fresh talent and the need to minimize attrition, emphasizing the potential and challenges within the fiercely competitive IT talent market. Ultimately, although mentioned around 20 times, remote and hybrid work signified an emerging trend. The tone was adaptable and pragmatic, reflecting ongoing adjustment to evolving work norms and digital transformation agendas.

Collectively, these findings indicate that Indian IT firms are progressively integrating sustainability themes centered on human factors into their ESG communications. The diverse frequencies indicate different strategic focal points among organizations, despite an overall favorable sentiment—emphasizing proactive and advanced HR methods. Although less prevalent themes such

as remote work may indicate emerging or evolving issues within the sustainability dialogue, the significant positivity linked to themes like leadership, participation, and training implies that these are perceived as value enhancers.

Figure 1. Key word Cloud



Source: Authors' Own Calculations

The word cloud derived from the sustainability disclosures of Indian IT companies provides a visual representation of the most frequently occurring terms, reflecting the key themes and priorities in their ESG communication. Prominent among these are "equity," "risk," "sustainability," and "governance," indicating a strong emphasis on fairness, accountability, and responsible risk management. The dominance of "equity" suggests a focus not only on financial equity but also on social equity, diversity, and inclusion, which are critical in building fair and inclusive workplaces. "Risk" highlights the increasing importance placed on identifying and managing environmental and operational risks in the context of sustainability.

The frequent appearance of "sustainability" and "governance" points to a broader commitment to transparent, ethical, and long-term value-driven operations. Terms like "engagement," "leadership," "training," and "diversity" underscore the sector's attention to human capital development and people-centric sustainability practices. Moreover, environmental concerns are reflected in terms such as "carbon," "renewable," "climate," and "green," suggesting that Indian IT firms are actively reporting on their climate strategies and low-carbon transition plans.

Additionally, the presence of words like "innovation," "growth," and "automation" indicates a narrative that links technological advancement with sustainable development. The inclusion of "well-being," "reskilling," "upskilling," and "hybrid work" also reflects an adaptive response to post-pandemic challenges and a shift toward more agile, resilient work environments. Overall, the word cloud reveals that Indian IT companies are increasingly aligning their communication with global ESG expectations by integrating environmental responsibility, social equity, and strong governance into their core narratives.

Conclusion

This analysis can aid Investors: to assess a firm's ESG commitment through textual tone. Policy Makers: to promote standardized sustainability communication formats. Corporate Strategists: to benchmark and improve ESG narratives. The Indian IT sector demonstrates a generally positive sentiment toward sustainability themes, with notable emphasis on HR practices and environmental commitments. Text-based sentiment analysis offers a scalable way to assess ESG communication, paving the way for further research into impact analysis and cross-sector comparisons. Expansion to other sectors (e.g., Energy, Manufacturing) could provide broader insights. Integrating financial metrics could relate sentiment to firm performance.

In conclusion, the word cloud visualization, coupled with sentiment analysis and keyword frequency for sustainability disclosures, reveals a strategically coordinated and evolving ESG communication ecosystem within the Indian IT sector. The persistent themes of governance, growth, equality, risk, and sustainability indicate that enterprises are integrating sustainability into their fundamental business strategies while also fulfilling stakeholder and regulatory demands. Keywords such as leadership, training, engagement, and diversity illustrate the sector's significant focus on human capital development, highlighting the role of individuals as agents of enduring transformation. As corporate accountability for climate action intensifies, environmental concerns such as carbon emissions, climate change, renewable energy, and sustainable practices are increasingly gaining prominence.

Moreover, instead of adopting a reactive or compliance-orientated stance on sustainability, the favorable mood associated with most of these themes indicates a proactive and opportunity-centric strategy. This study confirms the importance of data-driven sentiment analysis in understanding corporate sustainability narratives. It gives helpful advice to legislators, investors, and corporate executives seeking to assess, compare, and enhance the effectiveness of ESG communication in the digital economy. The findings endorse continuous enhancements to reporting protocols and a more profound integration of sustainability in stakeholder engagement and corporate strategy.

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