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Content analysis of ESG disclosures of Indian chemical companies and the impact analysis of disclosures on the financial and market performance of the companies

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ABSTRACT

Sustainability reporting is increasingly becoming critical in the chemical sector, given its environmental impacts, including emissions, waste generation, and resource consumption. This study examines the business responsibility and sustainability reporting (BRSR) of seven leading Indian chemical companies, selected on the basis of CRISIL and Bloomberg scores, to evaluate the transparency and scope of environmental, social, and governance (ESG) disclosures. Using content analysis, the study categorizes key disclosure themes such as environmental stewardship, employee health & safety, governance & transparency, human rights & social inclusion, corporate social responsibility, risk management & compliance, digital governance & data security, sustainable production & consumption, and biodiversity & conservation. These themes are examined in relation to financial and market performance indicators, specifically return on assets, return on equity, and stock valuation. The findings suggest that there is a growing emphasis on sustainability communication; however, inconsistencies in data quality, accuracy, and completeness persist despite securities and exchange board of India-mandated BRSR formats. The study highlights the complexities arising from the coexistence of multiple sustainability standards and underscores the imperative for enhanced standardization, in disclosure practices. By offering actionable insights, this research highlights the role of robust ESG disclosures in building transparency, stakeholder trust, and long-term value creation within the Indian chemical industry.

Keywords: content analysis, ESG disclosures, BRSR, market performance

INTRODUCTION

Growing concerns about climate change and global warming have intensified the importance of sustainability in corporate strategies (Dechow, 2023). Corporate sustainability and social responsibility are no longer peripheral concepts but central to business communications (Atan et al., 2016; Kandpal et al., 2024). Sustainability reporting has emerged as a means of showcasing organizational commitment to stakeholders, including employees, investors, regulators, policymakers, and communities, by disclosing performance toward sustainable development (Chopra et al., 2024). Over the past decade, disclosure requirements have advanced rapidly, compelling companies to adopt greater accountability and transparency in environmental, social, and governance (ESG) reporting (Sharma et al., 2020; Singhania et al., 2023). ESG disclosures, debated as either credible signals of performance or tools for legitimacy, are increasingly broadening to encompass ESG responsibilities (Boiral, 2013; Dhaliwal et al., 2012; Friske et al., 2023; Torres et al., 2024; Zhou et al., 2024).

Certain sectors have been active in adopting sustainability reporting due to their high environmental and social impacts. These include energy, mining, consumer goods, textiles, and pharmaceuticals (Asogwa, 2023; Benvenuto et al., 2023). The chemical industry, in particular, occupies a prominent position due to its resource-intensive processes, high emissions, and hazardous waste generation. Globally and in India, chemical companies are under increasing pressure to disclose sustainability practices transparently (Johnson, 2012; Stein et al., 2019). The Indian chemical sector, a critical contributor to the nation's economy, faces distinct sustainability challenges such as resource management, compliance with stringent regulations, and operational risks (Srinivas, 2023).

In India, business responsibility and sustainability reporting (BRSR) has emerged as a key regulatory framework for enhancing the transparency and comparability of ESG disclosures (Kriplani et al., 2021). Against this backdrop, the present study undertakes a content analysis of the BRSR reports of seven leading listed Indian chemical companies, identified through CRISIL rankings and Bloomberg scores. The study identifies and evaluates the thematic coverage of ESG disclosures and examines their relationship with financial and market performance indicators such as return on assets (ROA), return on equity (ROE), and stock market valuation. It attempts to assess whether ESG disclosures in the Indian chemical industry serve as genuine indicators of sustainable practices or remain limited to symbolic compliance.

Sustainability Reporting

India has strategically aligned itself with the United Nations sustainable development goals (SDGs). Securities and Exchange Board of India (SEBI) reinforced this commitment by introducing the BRSR framework in 2021. Built on the nine principles of the national guidelines for responsible business conduct (NGRBC), BRSR aims to enhance corporate transparency and accountability in ESG performance. Globally, frameworks such as the Global Reporting Initiative (GRI), Sustainability Accounting Standards Board (SASB), and the Task Force on Climate-related Financial Disclosures (TCFD) have established consistency, comparability, and reliability in sustainability reporting.

India’s BRSR differs from GRI, SASB, and TCFD in scope, focus, and regulatory intent. Mandatory for the top 1,000 listed companies, BRSR aligns with India’s NGRBC, integrating ESG disclosures. While GRI emphasizes broad stakeholder impacts, SASB focuses on industry-specific financial materiality, and TCFD targets climate-related financial risks, BRSR combines compliance, transparency, and investor-relevant reporting within a national context. Sustainability disclosures help firms identify risks and opportunities, build stakeholder trust, ensure regulatory compliance, and enhance operational efficiency, though challenges persist in data quality, materiality assessment, and credible reporting.

Study Objective

The focus on sustainability has brought a fundamental shift in the practice and scope of corporate reporting. It is now shifting from narrow financial orientation to an integrated model of ESG considerations. This evolution is driven by growing pressure from investors, consumers, and regulators who expect company’s ethical footprint and long-term sustainability as essential components of its overall valuation. For industries such as chemicals, which are resource-intensive and often associated with high emissions and environmental risks. In such context, ESG disclosures have become a critical determinant of both corporate accountability and long-term business sustainability. While financial metrics remain important indicators of organizational performance, they do not fully capture the broader impact of business operations on stakeholders, natural resources, and society. This necessitates a closer evaluation of ESG disclosures, not only as a measure of transparency but also as a driver of financial and market performance.

The primary objective of this study is to conduct a content analysis of ESG disclosures of listed Indian chemical companies and to examine their impact on financial and market performance. The study seeks to address three sub-objectives. First, it aims to identify the major thematic areas of ESG disclosures in the Indian chemical sector. Second, it seeks to evaluate the quality and comprehensiveness of ESG data disclosed by these companies. Third, it investigates the relationship between ESG disclosures and the financial and market performance of companies. Using indicators such as ROA, ROE, and stock market performance, the research seeks to understand whether higher quality and more transparent ESG disclosures correlate with improved financial outcomes and market valuation.

LITERATURE REVIEW

The importance of sustainability reporting has been analyzed through stakeholder theory, legitimacy theory, and systems theory. Stakeholder theory posits that businesses are accountable not only to shareholders but also to a broader set of stakeholders, customers, employees, investors, regulators, suppliers, and communities (Garcia-Torea et al., 2016; Rezaee, 2016). ESG practices, therefore, are central to aligning corporate actions with stakeholder interests, balancing profit maximization with environmental and social responsibilities (Alsayegh et al., 2020; Peng & Isa, 2020). Legitimacy theory complements this by emphasizing that corporate actions must align with societal values and expectations to secure legitimacy and continued operation (Aureli et al., 2020; Chopra et al., 2024). Systems theory further broadens the perspective, viewing firms as part of an interconnected ecosystem where business, society, and nature are mutually dependent, making sustainability reporting a systemic rather than isolated activity (Bebbington et al., 2020; Chatterjee et al., 2023; Folke et al., 2019).

Despite consensus on its relevance, the role of sustainability reporting remains debated. Some scholars argue that disclosures serve as credible signals to the market, improving corporate reputation and transparency (Dhaliwal et al., 2012; Friske et al., 2023). Others caution that such reports often function as impression management tools, prioritizing corporate image over substantive accountability (Beelitz & Merkl-Davies, 2012; Boiral, 2013; Borgstedt et al., 2019). This duality reflects the ongoing tension between symbolic compliance and genuine commitment. Recent research has extended these theoretical debates to financial and market performance. ESG integration is increasingly viewed as a driver of long-term shareholder value, with performance assessed using indicators such as ROA, ROE, earnings per share (EPS), and Tobin’s Q (Atan et al., 2016; Bhattacharya, 2024). Studies by Bătae et al. (2020), Velte (2020), and Duque-Grisales and Aguilera-Caracuel (2019) suggest that strong ESG disclosures correlate with higher profitability, efficiency, and market confidence. Conversely, others such as Liu et al. (2022) and Cornell and Damodaran (2020) report weak or inconsistent associations, highlighting the influence of external factors.

Overall, while global literature underscores the potential of ESG disclosures to enhance legitimacy, stakeholder trust, and financial outcomes, findings remain mixed. This indicates a need for context-specific analysis. In particular, the Indian

Table 1. Profiling of data sample

S/N	Name of the company	Number of pages of BRSR reports	ESG score by CRISIL	Rank by Bloomberg disclosure
1	UPL Limited	23	60	1
2	Rallis India Limited	41	59	2
3	PI Industries Limited	30	58	3
4	Apcotex Limited	33	57	4
5	Bayer CropScience Limited	51	57	5
6	Galaxy Surfactants Limited	36	57	6
7	Jubilant Ingrevia Limited	28	57	7

Table 2. Quantitative indicators used in the study

Parameters	Description
Overall ESG score, E score, S score, G score	CRISIL ESG disclosure score for the firm
Market performance	Tobin's Q = Current liabilities plus the market value of the share capital divided by the total assets of the firm
Financial performance	ROE = Net income divided by the book value of the equity
Financial performance	ROA = Net operating profit after tax (NOPAT) divided by total assets
Financial performance	EPS = Net income divided by total outstanding shares
Company size	Total asset
Leverage of company	Debt/total asset

chemical sector with its high environmental footprint, regulatory pressures, and strategic significance provides a relevant setting to examine whether ESG disclosures translate into improved financial and market performance or remain largely symbolic.

METHODOLOGY

The present study employed a mixed-methods research design, integrating qualitative and quantitative approaches to understand ESG disclosures and their impact on financial and market performance in the Indian chemical sector. The design combined content analysis of BRSR, analysis of secondary data, and semi-structured interviews with ESG consultants and practitioners. The sampling universe consisted of the top 100 NSE-listed chemical companies for the financial year 2023-2024. Of these, 57 companies have published BRSR reports. From this set, the top seven companies (**Table 1**) were purposively selected based on their CRISIL ESG ratings (2023-2024), ensuring inclusion of firms with comparatively strong ESG performance and reporting practices. BRSR reports and annual reports for FY 2023-2024 were downloaded directly from company websites. Additionally, ESG disclosure scores were obtained from Bloomberg to complement the reporting data.

The qualitative strand involved semi-structured interviews with five senior executives from the selected companies, identified through purposive sampling. The interviews explored the role of ESG in India's sustainable investment, corporate preparedness, disclosure practices, and perceived financial impacts. Each interview lasted 45-60 minutes, was conducted via Google Meet, recorded with consent, and transcribed verbatim. Complementary data were sourced from company annual reports and official sustainability communications. Content analysis of BRSR reports was carried out using a deductive, descriptive coding framework aligned with statutory BRSR requirements (Ball et al., 1982). Themes and sub-themes were created around ESG dimensions, enabling a systematic evaluation of compliance and disclosure depth. To enrich analysis, word clouds were generated from interview transcripts and company reports to visually highlight dominant themes and high-frequency ESG terms.

Thematic content analysis of qualitative data identified recurring patterns, and sector-specific insights. Triangulation across BRSR reports, interview transcripts, and annual reports was applied to validate findings and reduce bias. Quantitative indicators such as ROA, ROE, and stock market performance were used to examine the association between ESG disclosures and financial outcomes (**Table 2**). To ensure credibility and reliability, Lincoln and Guba's (1985) framework was applied. Credibility was strengthened through triangulation, member checking, and peer debriefing. Dependability was established via audit trails, code-recode checks, and reproducibility of word cloud outputs. Confirmability was maintained through reflexive journaling and independent validation of coding. Transferability was supported by providing detailed contextual descriptions of the sampled companies, regulatory environment, and ESG norms, allowing applicability to similar industry contexts.

To ensure the reliability and trustworthiness of the qualitative data, different methods were used as suggested by Lincoln and Guba's (1985) framework. The credibility was strengthened through triangulation of semi-structured interviews, company annual reports, and BRSR data; member checking by sharing preliminary findings with interviewees for validation; and peer debriefing with fellow researchers to verify coding accuracy and interpretation. Also, the BRSR reporting format is fixed by SEBI, and Indian listed companies publish two versions: a lite version (maximum three pages) presenting key sustainability indicators, and a comprehensive annual BRSR report aligned with GRI, TCFD, and the NGRBC's nine principles, mapped to the SDGs. **Table 3** has been added comparing BRSR with GRI, TCFD, and SASB standards.

Table 3 outlines the scope, focus areas, disclosure requirements, and sector-specific indicators of each framework. It highlights how BRSR aligns with global ESG reporting standards while incorporating India-specific regulatory and sustainability requirements. The core elements

Table 3. Comparison of BRSR against GRI, TCFD, and SASB standards

Aspect	BRSR (India, SEBI)	GRI	TCFD	SASB
Scope	ESG disclosures for listed companies; mandatory for top 1,000 market cap	Broad sustainability reporting across E, S, G	Climate-related financial risks and opportunities	Industry-specific financially material ESG metrics
Framework type	National regulatory framework aligned with SDGs	Voluntary global standard	Voluntary guidance for climate disclosures	Voluntary, industry-focused standard
Focus areas	Environmental, social, governance, sector-specific KPIs	Comprehensive ESG topics including social and environmental impact	Climate governance, strategy, risk management, metrics	Financially material ESG factors relevant to investors per industry
Disclosure requirement	Mandatory for large, listed companies in India; includes "lite" and comprehensive versions	Voluntary; narrative and quantitative reporting	Voluntary; narrative and metrics on climate impact	Voluntary; standardized metrics per industry sector
Alignment	Maps NGRBC principles to SDGs; integrates elements of GRI, TCFD, SASB	Global benchmark for sustainability	Focus on financial materiality of climate risks	Investor-focused, financial materiality per sector
Verification	Internal and external audit required	Assurance optional	Assurance optional	Assurance optional
Sector-specific indicators	Yes, mandatory per sector	Optional	Limited to climate-relevant sectors	Yes, detailed per industry

of the NGRBC principles are reflected in the semi-structured format of the questionnaire, and responses are provided by organizations in a structured manner.

These BRSR reports are audited by both internal and external agencies, further enhancing the reliability of the data. Dependability was ensured by maintaining a detailed audit trail documenting the research design, interview protocols, coding procedures, and software outputs; applying a code-recode strategy to selected transcripts to check coding consistency; and cross-validating word cloud outputs to ensure reproducibility. Confirmability was enhanced through reflexive journaling to record researcher assumptions and potential biases, validation of interpretations by a second researcher, and secure storage of anonymized transcripts and coding files for auditability. Transferability was supported by providing rich contextual descriptions of the sampled companies, the regulatory environment, and ESG disclosure norms, along with a transparent rationale for selecting the seven focal companies, enabling applicability to comparable industry contexts.

Data Analysis

The textual data from BRSR reports was analyzed using text mining and natural language processing techniques to extract, organize, and quantify relevant information. Given the variability in report length and quality, text mining provided a systematic approach to identify patterns and reduce unstructured text into analyzable units (Hassani et al., 2020). The analysis began with preprocessing, which involved tokenization (splitting text into words), removal of punctuation, hyperlinks, and stop words, followed by lemmatization to reduce words to their base forms. This ensured consistency in word representation and minimized redundancy. A bag-of-words model was applied to transform textual data into fixed-length numerical vectors, allowing the computation of word frequencies (Ferrario et al., 2020). Subsequently, a document-term matrix was constructed to tabulate the frequency of words across reports (Chakrabarti, 2023). From this, the 50 most frequent terms, including single words, collocations, and trigrams, were identified. These terms

Figure 1. NVivo word cloud based on UPL Limited's BRSR disclosures (Source: Authors' own elaboration)

were further categorized into themes aligned with ESG dimensions of BRSR reporting.

Word clouds were generated using WordCloudPlus software to visually highlight high-frequency ESG terms and provide an intuitive representation of disclosure emphasis. The resulting keyword dataset captured recurring themes, enabling both data reduction and thematic grouping. This text mining process not only provided a quantitative measure of disclosure patterns but also facilitated the identification of emerging trends in sustainability reporting. The analysis formed the foundation for linking disclosure content with companies' ESG scores and financial performance. The word cloud analysis of the BRSR reports from seven leading Indian chemical companies provided meaningful insights into their ESG orientations. By transforming unstructured text into visual representations, the analysis highlighted recurring themes, stakeholder priorities, and disclosure practices. While each company adopted a distinct emphasis reflecting its operational realities, several cross-cutting patterns emerged, underscoring the sector's growing alignment with ESG principles.

UPL Limited

The word cloud (**Figure 1**) for UPL Limited revealed a strong focus on *human rights, grievance redressal, and employee well-being*.

Figure 2. NVivo word cloud based on Rallis India Limited's BRSR disclosures (Source: Authors' own elaboration)

Figure 3. NVivo word cloud based on PI Industries Limited's BRSR disclosures (Source: Authors' own elaboration)

Figure 4. NVivo word cloud based on Apcotex Limited's BRSR disclosures (Source: Authors' own elaboration)

Figure 5. NVivo word cloud based on Bayer CropScience Limited's BRSR disclosures (Source: Authors' own elaboration)

This emphasis reflected the company's recognition of its large and diverse workforce, as well as the ethical sensitivities surrounding pesticide and agrochemical production. Sustainability themes such as waste management, packaging reuse, and wildlife conservation further indicated UPL's integration of circular economy practices into its operations. Its prioritization of occupational health and safety aligned with broader global ESG trends, while its Bloomberg ESG score of 60 underscored robust disclosure quality.

Rallis India Limited

Rallis India's thematic profile (**Figure 2**) centered on *risk management, hazardous waste handling, and compliance*. The prominence of "toxic red triangle" products highlighted the company's attention to regulatory risks inherent in agrochemicals. Governance-related keywords such as *data security, ethical values, and financial monitoring* reflected strong oversight mechanisms. The integration of safety training and environmental footprint tracking reinforced its proactive approach to sustainability. With an ESG score of 59, Rallis India demonstrated a balanced orientation, blending operational safety, environmental stewardship, and corporate ethics.

PI Industries Limited

PI Industries' word cloud (**Figure 3**) emphasized *human rights, equality, diversity, and whistleblower policies*, suggesting a strong governance and social focus. Employee safety and pollution mitigation emerged as central concerns, alongside environmentally responsible procurement and water management. Its efforts to align with stakeholder expectations and regulatory frameworks highlighted a strategy deeply rooted in both compliance and innovation. The ESG score of 58 confirmed its status as a role model in harmonizing employee-centric practices with environmental responsibility.

Apcotex Limited

The thematic spread for Apcotex Limited (**Figure 4**) reflected *environmental management, waste reduction, and water stewardship*. Repeated mentions of *zero liquid discharge, recycled packaging, and hazardous waste* pointed to strong ecological commitments. Equally visible were *corporate governance terms*–board members, independent directors–signifying oversight and accountability. Social engagement surfaced through references to *Seva Sadan and EdelGive Foundation*, demonstrating the integration of corporate social responsibility (CSR) into its sustainability narrative. Operational challenges, coupled with ISO certification, highlighted resilience, and adherence to global standards.

Bayer CropScience Limited

Bayer CropScience Limited's (**Figure 5**) analysis underscored its *commitment to sustainable agriculture, climate change mitigation, and plastic waste management*. Words such as *soil health, emissions reduction, and cleaner energy* revealed a strategy linking environmental stewardship with its agribusiness portfolio. Human rights and employee welfare were equally central, encompassing fair wages, inclusion, and labor rights. Product lifecycle responsibility and proactive CSR initiatives suggested holistic ESG integration, consistent with global expectations from a multinational corporation. Its ESG score of 58 positioned it among the leading performers.

Figure 6. NVivo word cloud based on Galaxy Surfactants Limited's BRSR disclosures (Source: Authors' own elaboration)

Figure 7. NVivo word cloud based on Jubilant Ingrevia Limited's BRSR disclosures (Source: Authors' own elaboration)

Table 4. Analysis of word cloud and key indicators

Initial codes (from word cloud/reports)	Grouped categories (axial coding)	Emergent thematic areas (selective coding)
Carbon emissions, renewable energy, water conservation, waste recycling, hazardous waste, circular economy	Environmental practices	Environmental stewardship
Occupational health, employee training, workplace safety, inclusivity, diversity	Workforce well-being	Employee health & safety
Whistleblower policy, board independence, grievance redressal, anti-corruption, ethics	Accountability mechanisms	Governance & transparency
Human rights, stakeholder engagement, grievance redressal for vulnerable groups	Rights-based focus	Human rights & social inclusion
CSR initiatives, seva Sadan, Edelgive Foundation, community outreach	Social investment	CSR
Risk assessment, toxic product management, emergency readiness, mitigation planning	Risk & hazard control	Risk management & compliance
Data privacy, cybersecurity, financial monitoring, ISO 27001	Technology-enabled governance	Digital governance & data security
Sustainable agriculture, product lifecycle management, eco-friendly innovation	Product responsibility	Sustainable production & consumption
Biodiversity, wildlife conservation, soil health, natural resource protection	Ecological balance	Biodiversity & conservation

Galaxy Surfactants Limited

The word cloud for Galaxy Surfactants Limited (**Figure 6**) highlighted *renewable energy, solar power, carbon emissions reduction, and water conservation* as core priorities. Social dimensions, including *occupational health, inclusivity, and diversity*, further enriched its ESG orientation. Community upliftment initiatives and climate risk preparedness demonstrated a comprehensive approach, balancing internal workplace welfare with external environmental responsibility. The company's ESG score of 58 validated its commitment to integrating sustainability into both operational and community-facing strategies.

Jubilant Ingrevia Limited

The thematic profile of Jubilant Ingrevia Limited (**Figure 7**) emphasized *energy efficiency, technological innovation, and resource recycling*. The frequent mention of *sulphur sludge and fly-ash recycling* pointed to strong industrial ecology practices. Keywords associated with inclusivity and workplace equality highlighted its social agenda, while recognition of climate change risks underscored its environmental accountability. The dual emphasis on *sustainable product development and community engagement* reflected its vision of long-term shared value creation. From the all the above word clouds, it can be concluded that these reports focused on various aspect of ESG scores.

Text mining was carried out using the word cloud approach. This consolidated recurring terms into nine thematic areas (**Table 4**). The themes were guided by sustainability and governance literature. Each company's disclosures were coded against these themes through a three-stage process. Initial codes were derived from word cloud outputs and company reports. These were grouped into broader categories using axial coding. Finally, selective coding was applied to refine the themes. The nine themes identified were: environmental stewardship, employee health and safety, governance and transparency, human rights and social inclusion, CSR, risk management and compliance, digital governance and data security, sustainable production and consumption, and biodiversity and conservation. To capture variations in disclosure, themes were assigned emphasis levels as low (1, red), medium (2, yellow), or high (3, green) in the form of heat map (**Table 5**). This process led to a matrix mapping ESG themes against company-specific emphasis. The matrix highlighted sector-wide commonalities and firm-level differences. By integrating text mining with thematic coding, the study ensured methodological rigor. It also enhanced comparability across firms and preserved qualitative insights.

The ESG scores were assessed using Bloomberg's disclosure indicators (**Table 6**) covering ESG dimensions. Environmental indicators included water intensity, water recycling, waste intensity, and energy intensity, reflecting resource efficiency and ecological impact.

Table 5. Matrix of ESG thematic areas vs. company emphasis

	UPL Limited	Rallis India Limited	PI Industries Limited	Apcotex Limited	Bayer CropScience Limited	Galaxy Surfactants Limited	Jubilant Ingrevia Limited
Environmental stewardship							
Employee health & safety							
Governance & transparency							
Human rights & social inclusion							
CSR							
Risk management & compliance							
Digital governance & data security							
Sustainable production & consumption							
Biodiversity & conservation							

Table 6. ESG disclosure indicators (as per Bloomberg)

Dimension	Indicators
Environment	Water intensity, water recycling, waste intensity, energy intensity
Social	Employee turnover, lost time incident rate, human rights policy, biodiversity policy
Governance	Board size, independent directors, women on board, ESG-linked executive compensation, total CEO compensation, CEO tenure

Table 7. Key environment disclosure indicators

S/N	Name of the company	Water intensity per sales	Percentage of water recycled	Waste intensity per sales	Energy intensity per sales
1	UPL Limited	12.37	Not disclosed	0.41	5.83
2	Rallis India Limited	254.27	58.62	1.45	5.99
3	PI Industries Limited	11.59	Not disclosed	0.91	5.34
4	Apcotex Limited	58.50	Not disclosed	0.24	17.90
5	Bayer CropScience Limited	1.54	Not disclosed	0.05	0.25
6	Galaxy Surfactants Limited	118.82	25.00	4.24	1.21
7	Jubilant Ingrevia Limited	2.32	65.11	Not disclosed	1.86

Social indicators captured workforce well-being and societal responsibility, including employee turnover, lost time incident rate, human rights policy, and biodiversity policy. Governance indicators focused on board structure and accountability, such as board size, proportion of independent and women directors, ESG-linked executive compensation, total CEO compensation, CEO tenure, and gender representation in management and the workforce. Together, these parameters provided a comprehensive view of sustainability practices. The analysis is based on data from a single year, which may not reflect trends or year-to-year variations in ESG performance. This limitation was mitigated by triangulating Bloomberg scores with BRSR disclosures, CRISIL ESG ratings, and qualitative interview insights, ensuring a more balanced and reliable assessment of ESG practices.

Table 7 on key environment disclosure Indicators highlighted the environmental performance of seven Indian chemical companies in terms of water intensity, water recycling, waste intensity, and energy intensity.

Rallis India Limited exhibited the highest water intensity per sales (254.27), indicating substantial water usage relative to sales. Companies like Bayer CropScience Limited (1.54) and Jubilant Industries Limited (2.32) demonstrated the lowest water intensity, reflecting efficient water management practices. Jubilant Industries Limited (65.11%) led in water recycling, showcasing a strong commitment to resource conservation. Rallis India Limited (58.62%) and Galaxy Surfactants Limited (25%) also reported water recycling efforts. Other companies, including UPL Limited, PI Industries Limited, Apcotex Limited, and Bayer CropScience Limited, did not disclose water recycling percentages, indicating either a lack of transparency or structured practices. Galaxy Surfactants Limited exhibited the highest waste intensity per sales (4.24), highlighting a need for improved waste management practices. Bayer CropScience Limited (0.05) and Apcotex Limited (0.24) showed the lowest waste intensity, reflecting efficient waste minimization efforts. Apcotex Limited reported the highest energy intensity per sales (17.90), indicating potential inefficiencies in production. Bayer CropScience Limited (0.25) and Jubilant Industries Limited (1.86) had the lowest energy intensity, showcasing energy-efficient operations. The data analysis revealed variability across companies in all key environmental indicators, suggesting differing levels of environmental commitment and operational efficiency. Companies with high water and energy intensity, such as Rallis India Limited and Apcotex Limited, needed to prioritize efficiency improvements. Galaxy Surfactants Limited must address its waste intensity to enhance environmental performance.

The selected sample company, Galaxy Surfactants Ltd., demonstrated strong performance across several key social disclosure indicators (**Table 8**) as outlined in BRSR reporting. The company's human rights policy aligned with fundamental social and environmental principles, suggesting a commitment to ethical practices. While the company's employee turnover ratio was comparatively low, indicating positive work conditions and effective retention strategies, some peers like Jubilant Ingreva and Rallies India Ltd. faced

Table 8. Key social disclosure indicators (Bloomberg data)

S/N	Name of the company	Percentage of employee turnover	Lost time incident rate	Human rights policy	Biodiversity policy
1	UPL Limited	22.00	0.16	1.00	1.00
2	Rallis India Limited	18.03	Not disclosed	1.00	1.00
3	PI Industries Limited	18.03	Not disclosed	1.00	1.00
4	Apcotex Limited	13.00	Not disclosed	1.00	Not disclosed
5	Bayer CropScience Limited	Not disclosed	Not disclosed	1.00	Not disclosed
6	Galaxy Surfactants Limited	9.00	0.15	1.00	1.00
7	Jubilant Ingrevia Limited	23.00	0.15	1.00	1.00

Table 9. Key governance disclosure ratio (Bloomberg data)

S/N	Company name	Size of board	Percentage of independent directors	Percentage of women on board	Executive compensation linked to ESG	Total compensation paid to CEO/ equivalent (CR)	CEO tenure	Percentage of women in management	Percentage of women in workforce
1	UPL Limited	9	55.56	22.22	1	Not disclosed	17.83	10.11	5.32
2	Rallis India Limited	6	50.00	16.67	Not disclosed	5.29	0.67	Not disclosed	7.58
3	PI Industries Limited	9	44.44	22.22	Not disclosed	27.32	20.00	4.65	5.33
4	Apcotex Limited	8	66.67	25.00	Not disclosed	2.09	19.00	Not disclosed	2.06
5	Bayer CropScience Limited	8	42.86	37.50	Not disclosed	13.25	1.08	Not disclosed	20.84
6	Galaxy Surfactants Limited	10	66.66	10.00	Not disclosed	Not disclosed	0.40	Not disclosed	9.00
7	Jubilant Ingrevia Limited	7	66.66	0.29	Not disclosed	6.10	8.00	Not disclosed	1.54

challenges in this area. In terms of occupational health and safety, PI Industries, Bayer Crop Science Ltd., Apcotex Industries, and Galaxy Surfactants Ltd. had track records with zero reported time-loss incidents. The remaining sample companies had room for improvement in this regard. However, a gap existed in the area of biodiversity conservation. While the company had a human rights policy, a dedicated biodiversity policy was absent. This suggested a potential area for future focus. Overall, Galaxy Surfactants Ltd. outperformed the other sample companies in terms of employee retention, health and safety, human rights, and policy implementation. However, a more comprehensive approach to biodiversity conservation was essential to achieve a well-rounded social performance.

Table 9 shows the key governance disclosure ratio provided governance-related metrics for the select Indian chemical companies based on data from Bloomberg. The data suggested that companies like Galaxy Surfactants and Jubilant Industries had the highest proportion of independent directors on their board (66.66%), indicating a strong emphasis on governance and independent oversight. Rallis India Limited had the lowest percentage of independent directors (50%), suggesting potential room for strengthening board independence. Gender diversity on boards was limited, with UPL Limited having the highest proportion of women on the board (22.22%). Several companies, such as Galaxy Surfactants and Jubilant Industries, had minimal female representation (0%). The percentage of executive compensation linked to ESG was generally low across all companies, with UPL Limited having the highest linkage (22%). This reflected limited integration of sustainability goals into executive remuneration structures. The CEO-to-employee pay ratio varied significantly, with PI Industries having the highest ratio (27.32), reflecting higher executive compensation compared to other firms. Galaxy Surfactants did not disclose this metric, indicating gaps in transparency. The female representation in management and workforce remained low across all companies. UPL Limited had the highest percentage of women in management (10.11%) and workforce (5.32%), reflecting marginal progress in gender inclusion. Companies like Rallis India Limited and Jubilant Industries had extremely low female workforce participation, suggesting significant room for improvement in diversity. It could be concluded that governance practices varied across the companies, with some showing stronger board independence but limited progress in gender diversity and ESG-linked executive compensation. Gender inclusion remained a challenge across all levels, from boardrooms to the general workforce, highlighting a need for stronger diversity and inclusion initiatives. The lack of uniformity in disclosure, particularly in CEO pay ratios and ESG-linked compensation, underscored a need for standardized governance reporting across the sector.

Impact of ESG Disclosure on Financial and Market Performance

ESG disclosures provide critical insights into a company's sustainability practices. To examine their impact on financial and market performance, data were obtained from Bloomberg, including environmental (E), social (S), governance (G), and overall ESG scores, alongside financial metrics such as Tobin's Q, ROA, ROE, EPS, company size, and leverage. Correlation analysis was employed to explore relationships between ESG performance and financial outcomes, assessing whether higher ESG scores align with superior market valuation, operational efficiency, and profitability. Tobin's Q measured market performance, while ROA and ROE captured operational and shareholder returns, linking sustainable practices to financial stability and investor confidence.

The correlation analysis (**Table 10**) suggested statistically significant associations. Financial performance drivers are evident, with Tobin's Q demonstrating strong positive correlations with ROE ($r = 0.888$, $p = 0.004$) and EPS ($r = 0.926$, $p = 0.001$), confirming the role of profitability and earnings in enhancing firm valuation. Leverage exhibits significant negative correlations with Tobin's Q ($r = -0.684$, $p = 0.045$) and EPS ($r = -0.740$, $p = 0.029$), indicating the adverse effect of debt

Table 10. Correlation matrix of esg disclosure score and financial and market performance

		Tobin's Q	Size	Leverage	ROE	E	S	G	EPS
Pearson correlation	Tobin's Q	1.000	0.066	-0.684	0.888	0.127	-0.464	-0.364	0.926
	Size	0.066	1.000	-0.194	0.342	0.509	-0.277	0.345	0.051
	Leverage	-0.684	-0.194	1.000	-0.695	-0.353	0.546	0.130	-0.740
	ROE	0.888	0.342	-0.695	1.000	0.203	-0.399	-0.240	0.927
	E	0.127	0.509	-0.353	0.203	1.000	-0.862	-0.476	0.051
	S	-0.464	-0.277	0.546	-0.399	-0.862	1.000	0.662	-0.405
	G	-0.364	0.345	0.130	-0.240	-0.476	0.662	1.000	-0.333
	EPS	0.926	0.051	-0.740	0.927	0.051	-0.405	-0.333	1.000
Sig. (1-tailed)	Tobin's Q		0.444	0.045	0.004	0.393	0.147	0.211	0.001
	Size	0.444		0.338	0.226	0.122	0.274	0.225	0.457
	Leverage	0.045	0.338		0.041	0.219	0.102	0.390	0.029
	ROE	0.004	0.226	0.041		0.331	0.188	0.302	0.001
	E	0.393	0.122	0.219	0.331		0.006	0.140	0.456
	S	0.147	0.274	0.102	0.188	0.006		0.053	0.184
	G	0.211	0.225	0.390	0.302	0.140	0.053		0.233
	EPS	0.001	0.457	0.029	0.001	0.456	0.184	0.233	

on performance outcomes. Sustainability trade-offs emerge between environmental and social dimensions, as indicated by a strong inverse correlation ($r = -0.862$, $p = 0.006$), suggesting mutually exclusive prioritization. The governance-social association is positive but marginally significant ($r = 0.662$, $p = 0.053$). Overall, ESG variables show weak or insignificant links with financial metrics, limiting evidence of performance translation. This analysis highlighted complex relationships, suggesting that while ESG practices are more aligned with company size and governance structures, their direct financial benefits may take time to materialize.

FINDINGS AND DISCUSSION

A comparative analysis of BRSR disclosures across seven leading Indian chemical companies revealed both sector-wide consistencies and firm-specific differentiators in ESG reporting. Three themes were consistently emphasized: environmental stewardship (emissions reduction, waste management, water conservation), employee health and safety (training, inclusivity, occupational safeguards), and governance practices (independent boards, whistleblower mechanisms, ethical oversight). Firm-specific priorities included human rights and grievance redressal (UPL, PI Industries), toxic product risk management and data security (Rallis India), supply chain responsibility and CSR (Apcotex), climate-smart agriculture (Bayer), renewable energy transition (Galaxy), and industrial byproduct recycling (Jubilant), illustrating varied strategies to embed ESG principles.

ESG scores clustered between 58 and 60, but thematic focus varied: UPL and PI emphasized social and governance dimensions, Bayer and Galaxy balanced environmental and social concerns, while Apcotex and Jubilant highlighted CSR and circular economy initiatives. Sectoral trends included SEBI BRSR compliance, uneven integration of ESG into business strategy, and adoption of circular economy, digital governance, and renewable energy practices. Although these reporting showed progress, still gaps persist. Quantitative metrics such as scope-wise carbon accounting and third-party assurance were limited. Social disclosures often prioritized training over diversity and inclusion metrics. Governance practices showed uneven advancement, particularly in gender diversity and ESG-linked executive compensation, while biodiversity policies were largely underreported, reflecting a partial alignment with global frameworks. Smaller firms faced additional challenges in data collection, validation, and integration due to resource constraints and limited expertise. These findings indicate varying ESG maturity across the sector. Benchmarking against leaders such as Bayer and Jubilant, emphasizing intensity-based metrics, gender inclusion, and standardized governance reporting, and refining BRSR to include industry-specific benchmarks could improve comparability, transparency, and stakeholder trust.

CONCLUSION

The analysis highlights a shift in the Indian chemical industry from symbolic ESG compliance to strategic integration into the corporate strategy. Companies prioritize environmental stewardship, employee health and safety, and governance accountability, reflecting growing awareness of ecological and social responsibilities. Firm-specific innovations such as grievance redressal (UPL, PI), renewable energy adoption (Galaxy), and circular economy practices (Jubilant) show differentiated ESG strategies. However, reporting gaps persist, with non-disclosures in emissions, energy use, biodiversity, and diversity metrics, and limited third-party assurance affecting credibility, highlighting areas for improved transparency and completeness.

Bloomberg ESG scores, being disclosure-based, may reflect reporting extent rather than actual performance; this was mitigated through triangulation with CRISIL ratings, BRSR disclosures, and qualitative interviews. Recognizing that some companies report ESG primarily for reputation, the study underscores the need for transparency, accountability, and standardized reporting. Policy recommendations include mandatory third-party verification, sector-specific ESG targets, incentives for comprehensive disclosure, and integration of ESG metrics into regulatory compliance. These measures can strengthen credibility, comparability, and long-term value creation, positioning firms as leaders in national and global sustainability agendas.

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