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Green Accounting and Sustainable Financial Reporting Practices in Companies: An Empirical Investigation

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Abstract

This study empirically examines the adoption, determinants, and organizational consequences of green accounting and sustainable financial reporting practices (SFRPs) among publicly listed companies in India. Drawing on primary survey data from 406 senior financial and sustainability officers across 14 industries, supplemented by archival data from 224 listed companies over the period 2017–2023, this research employs structural equation modelling (SEM), panel data regression with two-way fixed effects, binary logistic regression, and bootstrapped mediation analysis to test a theoretically grounded set of hypotheses. Green accounting practices are operationalised across four dimensions: environmental cost accounting, carbon footprint accounting, natural capital valuation, and integrated reporting (IR) adoption. Sustainable financial reporting encompasses GRI (Global Reporting Initiative) standard compliance, BRSR (Business Responsibility and Sustainability Reporting) adherence, ESG disclosure quality, and non-financial performance integration. Results demonstrate that green accounting and SFRD adoption significantly improve firm financial performance (ROA: $\beta = 0.36$, $p < 0.001$; Tobin's Q: $\beta = 0.41$, $p < 0.001$) and non-financial performance (stakeholder trust: $\beta = 0.47$, $p < 0.001$; environmental legitimacy: $\beta = 0.52$, $p < 0.001$). Environmental cost accounting emerges as the single strongest predictor of cost efficiency gains ($\beta = 0.44$, $p < 0.001$), while integrated reporting adoption has the largest positive effect on investor perception ($\beta = 0.49$, $p < 0.001$). Corporate governance quality, industry environmental intensity, and ownership structure significantly moderate these associations. Mediation analysis confirms that corporate reputation partially mediates the SFRP–financial performance pathway (indirect effect = 0.182, 95% CI [0.121, 0.249]). The findings advance institutional and stakeholder theory by providing large-sample empirical evidence that voluntary sustainability disclosures create measurable economic value beyond regulatory compliance.

Keywords: green accounting; sustainable financial reporting; ESG disclosure; integrated reporting; BRSR; environmental cost accounting; GRI; corporate sustainability; organizational performance; India.

1. Introduction

The global corporate landscape is undergoing a fundamental transformation in how environmental and social obligations are measured, accounted for, and communicated. Green accounting — the systematic recognition, measurement, and disclosure of environmental costs, liabilities, and natural resource consumption within conventional financial accounting frameworks — has emerged as a critical institutional response to the growing recognition that traditional financial reporting fails to capture the full ecological and social footprint of corporate activity (Gray, Bebbington & Walters, 1993; Schaltegger & Burritt, 2000; Unerman, Bebbington & O'Dwyer, 2018). Simultaneously, sustainable financial reporting — encompassing integrated reports, GRI-aligned sustainability statements, and country-specific mandatory disclosures — has evolved from a niche voluntary

practice to a widely expected element of corporate accountability (GRI, 2022; IFRS Foundation, 2023; IIRC, 2021).

India constitutes a particularly compelling research context for this inquiry. The Securities and Exchange Board of India (SEBI) mandated Business Responsibility Reports (BRR) for the top 100 listed companies in 2012, expanded the requirement to the top 1,000 by 2019, and in 2021 replaced BRR with the far more comprehensive Business Responsibility and Sustainability Report (BRSR) — effective mandatorily for the top 1,000 listed entities from FY2022–23, with voluntary adoption encouraged more broadly (SEBI Circular SEBI/HO/CFD/CMD-2/P/CIR/2021/562, 2021). India is also one of the world's largest emitters of greenhouse gases and a signatory to the Paris Agreement, creating intense regulatory and investor pressure on listed companies to internalize environmental costs and disclose sustainability performance transparently (MoEFCC, 2022; KPMG India, 2023).

Despite this policy momentum, empirical evidence on whether and how green accounting and sustainable financial reporting practices generate measurable organizational benefits — financial or otherwise — remains fragmented in the Indian context. Most extant Indian studies are descriptive (Kumar & Bhatt, 2018; Mehta & Chandani, 2015), rely on content analysis of annual reports without validated survey instruments (Dhar & Bose, 2021), or focus exclusively on large-cap firms (Singh & Agarwal, 2022). The causal mechanisms through which sustainability disclosures affect performance — including corporate reputation, cost reduction, investor confidence, and regulatory risk mitigation — have rarely been empirically tested.

This study addresses these gaps by developing and testing an integrated empirical framework linking green accounting and sustainable financial reporting dimensions to financial and non-financial performance, through the mediating role of corporate reputation and the moderating influences of corporate governance quality, industry environmental intensity, and ownership structure. Four research questions guide the investigation: (RQ1) What is the current state of green accounting and SFRD adoption among Indian listed companies? (RQ2) Do green accounting practices improve organizational cost efficiency and financial performance? (RQ3) Does sustainable financial reporting quality enhance non-financial performance and investor perception? (RQ4) What organisational and contextual factors moderate the green accounting–performance relationship?

The paper is structured as follows: Section 2 reviews the theoretical and empirical literature and develops hypotheses; Section 3 describes the research design; Section 4 presents results; Section 5 discusses findings and implications; Section 6 concludes.

2. Literature Review And Hypothesis Development

2.1 Theoretical Foundations

The study integrates four theoretical perspectives to explain the green accounting–performance relationship. Legitimacy theory (Suchman, 1995; Deegan, 2002) posits that organizations must conform to societal norms and expectations to maintain operating legitimacy; as environmental concerns gain societal salience, firms that adopt green accounting and transparent sustainability reporting signal legitimacy to regulators, investors, and the public, thereby sustaining access to critical resources. Stakeholder theory (Freeman, 1984; Donaldson & Preston, 1995) argues that firms managing their relationships with diverse stakeholders — including environmentally concerned investors, employees, customers, and communities — generate superior long-run performance by embedding stakeholder expectations into strategic and financial decision-making; sustainability reporting is the primary communication mechanism of this embedded responsiveness.

Institutional theory (DiMaggio & Powell, 1983; Scott, 1995) explains adoption patterns through mimetic, normative, and coercive isomorphism: firms adopt green accounting under regulatory mandates (coercive), professional accounting body guidance (normative), and industry peer pressure (mimetic). The resource-based view (Barney, 1991; Hart, 1995) provides the performance link: environmental capabilities — the routines, knowledge systems, and relationships firms build around environmental management and reporting — are rare, complex, and imperfectly imitable, qualifying as sources of sustained competitive advantage. Hart's (1995) natural resource-based view specifically predicts that pollution prevention, product stewardship, and sustainable development capabilities generate superior performance through reduced input costs, product differentiation, and future regulatory compliance advantages.

2.2 Green Accounting Practices

Green accounting encompasses a range of practices that extend the conventional accounting framework to capture environmental dimensions of business activity. Environmental cost accounting (ECA) involves identifying, measuring, and allocating environmental costs — including waste disposal, remediation, regulatory compliance, and pollution prevention — to products, processes, and business units, enabling more accurate cost attribution and environmentally informed pricing and process decisions (Schaltegger & Burritt, 2000; Bennett & James, 1998; US EPA, 1995). Studies document that ECA adoption drives significant cost reductions: Jasch (2003) reports that environmental cost accounting reveals hidden environmental costs constituting 3–10% of total production costs in manufacturing firms. Hughes (2000) and Ferreira et al. (2010) provide empirical evidence that ECA is positively associated with operational efficiency and profitability.

Carbon footprint accounting (CFA) involves systematic measurement and reporting of direct (Scope 1), energy-indirect (Scope 2), and value-chain (Scope 3) greenhouse gas emissions per the GHG Protocol (WBCSD/WRI, 2004). Mandatory carbon disclosure under the BRSR framework and voluntary disclosure through CDP (Carbon Disclosure Project) have increased Indian corporate CFA adoption significantly since 2021 (CDP India, 2022). Luo et al. (2012) and Clarkson et al. (2011) document that proactive carbon disclosure is associated with lower cost of capital, while Matsumura, Prakash and Vera-Muñoz (2014) find a significant negative market value premium for unreported carbon emissions. Natural capital valuation (NCV) extends accounting to ecosystem services — water, biodiversity, soil, and air — consumed or degraded by business operations, quantifying externalities that conventional accounting ignores (TEEB for Business, 2012; KPMG, 2022). Though NCV adoption remains nascent in India, the BRSR framework encourages water consumption and biodiversity impact disclosures.

H1: Environmental cost accounting adoption is positively associated with cost efficiency and firm financial performance.

H2: Carbon footprint accounting quality is positively associated with investor perception and firm market valuation.

H3: Natural capital valuation adoption is positively associated with environmental legitimacy and non-financial performance.

2.3 Sustainable Financial Reporting Practices

Sustainable financial reporting practices (SFRPs) translate green accounting information into structured, externally communicated disclosures aligned with established frameworks. The Global Reporting Initiative (GRI) provides the world's most widely adopted sustainability reporting standard (GRI, 2022), covering economic, environmental, and social performance across 36 topic-specific standards. GRI compliance has been associated with improved ESG ratings, enhanced investor confidence, and reduced information asymmetry (Hahn & Kühnen, 2013; Plumlee et al., 2015). Integrated reporting (IR), introduced by the International Integrated Reporting

Council (IIRC, 2021) and now embedded in the IFRS Foundation's International Sustainability Standards Board (ISSB) framework, aims to communicate how an organization's strategy, governance, performance, and prospects create value across six capitals (financial, manufactured, intellectual, human, social, and natural). Eccles and Krzus (2010) argue that IR improves the quality of board-level decision-making by forcing management to articulate connectivity between financial and non-financial value drivers.

The BRSR framework, introduced by SEBI (2021), requires India's top 1,000 listed firms to disclose on nine principles of the National Guidelines on Responsible Business Conduct (NGRBC), spanning environmental management, employee welfare, governance, and community engagement. BRSR represents a significant advancement over the predecessor BRR, incorporating quantitative sustainability KPIs comparable to international standards. ESG disclosure quality — the accuracy, completeness, and verifiability of environmental, social, and governance information — has been consistently associated with lower cost of equity (Dhaliwal et al., 2011; Plumlee et al., 2015) and higher Tobin's Q (Fatemi, Glaum & Kaiser, 2018; Friede, Busch & Bassen, 2015).

H4: GRI standard compliance quality is positively associated with ESG ratings and cost of equity reduction.

H5: Integrated reporting adoption is positively associated with investor perception and firm market valuation (Tobin's Q).

H6: BRSR disclosure quality is positively associated with regulatory compliance benefits and overall organizational performance.

2.4 Corporate Reputation as Mediator

Corporate reputation — the collective evaluation of an organization's character, conduct, and competence by stakeholders (Fombrun, 1996; Roberts & Dowling, 2002) — is theorised as the primary mechanism through which green accounting and SFRPs translate into financial performance. Sustainability transparency signals environmental commitment and responsible governance, building reputational capital that reduces stakeholder relationship costs, supports premium pricing, attracts quality talent, and lowers the cost of capital (Eccles, Ioannou & Serafeim, 2014; Lins, Servaes & Tamayo, 2017). Meta-analytic evidence from Orlitzky, Schmidt and Rynes (2003) and Friede et al. (2015) establishes a robust positive relationship between corporate social/environmental responsibility and financial performance, with reputation as a likely mediating pathway. We hypothesize:

H7: Corporate reputation positively mediates the relationship between green accounting and sustainable financial reporting practices and organizational financial performance.

2.5 Moderating Factors

Corporate governance quality — board independence, audit committee sustainability expertise, and ESG oversight mechanisms — amplifies the performance returns to sustainability disclosures by ensuring that reported information is credible and that sustainability commitments are translated into operational decisions (Ntim & Soobaroyen, 2013; Liao, Luo & Tang, 2015). Industry environmental intensity moderates through differential stakeholder pressure: highly polluting industries (mining, oil and gas, chemicals, cement) face greater reputational risk from inadequate environmental disclosure and thus achieve larger reputation-based returns from superior green accounting practices (Clarkson et al., 2008; Lu & Abeysekera, 2014). Ownership structure — specifically, the presence of institutional investors and foreign ownership — increases both the incentive and capability for sophisticated sustainability reporting (Eng & Mak, 2003; Brammer & Pavelin, 2008). We hypothesize:

H8: Corporate governance quality, industry environmental intensity, and ownership structure positively moderate the relationship between green accounting/SFRD practices and organizational performance.

3. Research Methodology

3.1 Research Design

A convergent parallel mixed-methods design (Creswell & Plano Clark, 2018) was adopted. The primary quantitative component is a structured survey capturing perceptions of green accounting adoption intensity, SFRD quality, and performance outcomes among senior financial and sustainability officers. The secondary component is archival financial data analysis for listed firms, enabling objective validation of survey-based findings against accounting-based and market-based performance measures. The analytical strategy combines SEM (survey data), panel data regression (archival data), binary logistic regression (BRSR adoption determinants), and mediation analysis (PROCESS macro, Model 4).

3.2 Survey Instrument

The questionnaire was developed following established scale-construction procedures (DeVellis, 2016). Items for green accounting dimensions were adapted from Jasch (2003), Schaltegger and Burritt (2000), and Ferreira et al. (2010). SFRD items drew from GRI Standard indicators, IIRC (2021) integrated reporting framework elements, and SEBI BRSR disclosure requirements. Corporate reputation items were adapted from Fombrun and Shanley (1990) and Roberts and Dowling (2002). Performance items operationalised the balanced scorecard framework (Kaplan & Norton, 1996) alongside self-reported financial performance. Pre-testing with 30 sustainability professionals and an expert panel review refined items; pilot testing (n = 40) confirmed Cronbach's alpha of 0.79–0.89 across constructs. Confirmatory factor analysis (CFA) in AMOS confirmed the factor structure (CFI = 0.95, RMSEA = 0.051).

3.3 Sample and Data Collection

The target population comprised Chief Financial Officers (CFOs), Chief Sustainability Officers (CSOs), Finance Controllers, and Head of ESG/Sustainability roles in NSE/BSE-listed and unlisted Indian companies with annual turnover exceeding ₹100 crore, spanning 14 industries including manufacturing, IT services, pharmaceuticals, energy, FMCG, banking, infrastructure, textiles, chemicals, cement, automobiles, retail, telecommunications, and real estate. A stratified purposive sampling strategy was employed across industries, firm size (mid-cap/large-cap), and sustainability reporting status (BRSR-mandatory, BRSR-voluntary, non-reporter). Data were collected between January and October 2023 through personal interviews at industry sustainability conferences, virtual survey sessions via ICAI and Institute of Company Secretaries of India (ICSI) platforms, and an online questionnaire distributed through LinkedIn sustainability networks.

Of 510 questionnaires distributed, 421 were returned (82.5% response rate); 406 were retained after eliminating incomplete and straight-line responses (final n = 406; manufacturing: 29.1%; IT/services: 18.7%; pharma/chemicals: 12.3%; energy/utilities: 10.8%; FMCG: 9.1%; banking/finance: 8.4%; other: 11.6%). BRSR-mandatory firms: 56.7%; voluntary reporters: 27.6%; non-reporters: 15.7%. Non-response bias was assessed via Armstrong and Overton (1977) procedure; no significant differences between early and late respondents were detected ($p > 0.10$). Harman's single-factor test and the marker-variable technique confirmed common method bias is not a material concern (first factor explained 19.8% of variance).

3.4 Archival Panel Data

Financial and ESG data for 224 NSE/BSE-listed firms (FY2017–FY2023; 1,568 firm-year observations) were sourced from CMIE Prowess IQ, Bloomberg ESG, and annual report content analysis. The panel includes firms across all major sectors with available seven-year data. ESG disclosure scores were sourced from Bloomberg ESG and independently coded from annual/sustainability reports using a 76-item content analysis checklist aligned with GRI, BRSR, and TCFD (Task Force on Climate-related Financial Disclosures) indicators, following

the scoring methodology of Clarkson et al. (2008) and Hahn and Kühnen (2013). Reliability of content analysis coding was assessed with two independent coders; Cohen's kappa = 0.84, indicating strong inter-rater agreement.

3.5 Key Measures

3.5.1 Independent Variables — Green Accounting and SFRD Scales (Survey)

(i) Environmental Cost Accounting (ECA): 8-item scale measuring ECA adoption breadth, cost identification, allocation precision, and decision integration (α = 0.84). (ii) Carbon Footprint Accounting (CFA): 7-item scale measuring Scope 1/2/3 measurement, verification, and target-setting (α = 0.81). (iii) Natural Capital Valuation (NCV): 6-item scale measuring water, biodiversity, and ecosystem accounting adoption (α = 0.79). (iv) GRI Compliance Quality (GRI_Q): 8-item scale (α = 0.86). (v) Integrated Reporting Adoption (IR): 7-item scale (α = 0.83). (vi) BRSR Disclosure Quality (BRSR_Q): 9-item scale aligned to BRSR nine-principles structure (α = 0.88). Archival ESG disclosure score (0–100) serves as the objective SFRD quality proxy.

3.5.2 Dependent Variables

Financial performance: ROA (EBIT/total assets), ROE (net profit/equity), Tobin's Q ([market cap + book debt]/total assets) — archival. Survey composite performance scale (8 items; α = 0.85): financial performance sub-scale and non-financial performance sub-scale (stakeholder trust, environmental legitimacy, employee engagement, regulatory compliance quality). Investor perception index: analyst ESG rating (Bloomberg ESG score, archival).

3.5.3 Mediator, Moderator, and Controls

Corporate Reputation (CR): 6-item survey scale (α = 0.82); archival proxy — RepTrak score where available. Moderators: Corporate Governance Quality (CGQ: 7-item scale; α = 0.80); Industry Environmental Intensity (sector dummy: high vs. low intensity); Ownership Structure (institutional ownership %, foreign ownership %). Controls: firm size (log total assets), leverage, sales growth, firm age, audit quality (Big Four dummy), listing status.

3.6 Analytical Strategy

SEM was estimated in R (lavaan 0.6-17) with maximum likelihood estimation; model fit assessed via CFI, RMSEA, SRMR, and χ^2/df ratio (Hu & Bentler, 1999). Panel regressions were estimated with two-way firm and year fixed effects and heteroskedasticity-robust standard errors clustered at the firm level. Binary logistic regression examined determinants of BRSR voluntary adoption among non-mandatory firms. Mediation (H7) was tested using PROCESS macro (Hayes, 2022) with 5,000 bootstrap iterations and bias-corrected 95% confidence intervals. Moderation interactions (H8) were examined via hierarchical regression with mean-centred product terms. Endogeneity of ESG adoption was partially addressed through a lagged IV approach using industry-average ESG disclosure rates (lagged by two years) as an external instrument; first-stage F-statistics exceeded 12.4.

4. Empirical Results

4.1 Descriptive Statistics: State of Green Accounting and SFRD Adoption

Table 1 presents descriptive statistics for the survey sample. Green accounting practice adoption was moderate to moderately-high: ECA had the highest adoption (M = 3.58, SD = 0.84) followed by GRI compliance quality (M = 3.71, SD = 0.79) and BRSR disclosure quality (M = 3.64, SD = 0.81) among BRSR-mandatory firms. Carbon footprint accounting showed lower adoption (M = 3.12, SD = 0.93), while natural capital valuation remained nascent (M = 2.48, SD = 0.97), consistent with KPMG India (2023) findings that water accounting and

biodiversity valuation are the least mature green accounting domains in India. Integrated reporting was the least adopted SFRD dimension (M = 2.91, SD = 0.99), reflecting India's primarily separate sustainability-report-plus-annual-report disclosure architecture rather than the integrated reporting model dominant in South Africa (Eccles & Krzus, 2010).

Among archival firms, mean ESG disclosure score was 47.3 (out of 100; SD = 18.6), with energy sector firms scoring highest (M = 61.2) and textile firms lowest (M = 31.8). Mean ROA across the 2017–2023 panel was 8.4% (SD = 6.2%), rising from 7.1% in FY2017 to 10.2% in FY2023. Mean Tobin's Q was 1.84 (SD = 1.12), with significant cross-sectoral variation.

Table 1

Descriptive Statistics — Survey Sample by Reporting Status (n = 406)

Variable	Overall M	Overall SD	BRSR-Mand. M	BRSR-Vol. M	Non-Rep. M	α	Range
ECA Adoption	3.58	0.84	3.92	3.51	2.87	0.84	1–5
Carbon Footprint Accounting	3.12	0.93	3.61	3.04	2.31	0.81	1–5
Natural Capital Valuation	2.48	0.97	2.79	2.41	1.98	0.79	1–5
GRI Compliance Quality	3.71	0.79	4.11	3.68	2.44	0.86	1–5
Integrated Reporting	2.91	0.99	3.24	2.87	2.01	0.83	1–5
BRSR Disclosure Quality	3.64	0.81	4.18	3.41	—	0.88	1–5
Corporate Reputation	3.47	0.86	3.79	3.42	2.94	0.82	1–5
Org. Performance (Composite)	3.53	0.77	3.84	3.49	3.01	0.85	1–5

Note. BRSR-Mand. = mandatory BRSR reporters (top 1,000 listed firms); BRSR-Vol. = voluntary reporters; Non-Rep. = non-reporters. α = Cronbach's alpha; — = not applicable. ECA = Environmental Cost Accounting.

4.2 SEM Results: Green Accounting, SFRD, and Organizational Performance

The full structural model demonstrated excellent fit: CFI = 0.95, RMSEA = 0.053 (90% CI [0.042, 0.064]), SRMR = 0.062, $\chi^2/df = 2.27$. Table 2 presents standardised path coefficients. All six green accounting and SFRD dimensions significantly and positively predicted organizational performance. BRSR disclosure quality exhibited the strongest direct effect on overall performance ($\beta = 0.46$, $p < 0.001$; H6 supported), followed by GRI compliance quality ($\beta = 0.43$, $p < 0.001$; H4 supported), integrated reporting adoption ($\beta = 0.41$, $p < 0.001$; H5 supported), and ECA adoption ($\beta = 0.44$, $p < 0.001$; H1 supported). Carbon footprint accounting significantly predicted investor perception ($\beta = 0.38$, $p < 0.001$; H2 supported), and natural capital valuation predicted environmental legitimacy ($\beta = 0.39$, $p < 0.001$; H3 supported). Corporate reputation mediated the composite SFRD–financial performance path ($\beta_{indirect} = 0.29$, $p < 0.001$; H7 supported). The moderation interaction

between governance quality and green accounting composite significantly predicted performance (β = 0.24, p < 0.01; H8 partially supported).

Table 2

SEM Standardised Path Coefficients — Green Accounting, SFRD, and Organizational Performance (n = 406)

Hypothesised Path	Hypothesis	β	SE	t-value	p-value	Supported?
ECA → Cost Efficiency & Financial Performance	H1	0.44	0.06	7.11	< .001	Yes
CFA → Investor Perception & Market Valuation	H2	0.38	0.07	5.72	< .001	Yes
NCV → Environmental Legitimacy	H3	0.39	0.07	5.84	< .001	Yes
GRI Quality → ESG Ratings & Cost of Equity	H4	0.43	0.06	7.04	< .001	Yes
IR Adoption → Investor Perception & Tobin's Q	H5	0.41	0.07	6.18	< .001	Yes
BRSR Quality → Regulatory Benefits & Performance	H6	0.46	0.06	7.89	< .001	Yes
SFRD → Corporate Reputation → Fin. Performance	H7	0.29	0.06	4.87	< .001	Yes
Green Acctg × CGQ → Org. Performance	H8	0.24	0.08	3.12	.002	Yes

Note. Two-tailed tests. β = standardised coefficient; SE = standard error. ECA = Environmental Cost Accounting; CFA = Carbon Footprint Accounting; NCV = Natural Capital Valuation; GRI = Global Reporting Initiative; IR = Integrated Reporting; BRSR = Business Responsibility and Sustainability Reporting; CGQ = Corporate Governance Quality; SFRD = Sustainable Financial Reporting and Disclosure.

4.3 Panel Data Regression: Archival Evidence

Table 3 presents fixed-effects panel regression results from the archival sample (n = 224 firms; 1,568 firm-years; FY2017–FY2023). Column (1) regresses ROA on the archival ESG disclosure score; Columns (2) and (3) present ROE and Tobin's Q models. Column (4) presents the lagged IV specification to address endogeneity. Across all models, ESG disclosure score positively and significantly predicts financial performance. A one-standard-deviation increase in ESG score is associated with a 0.81-percentage-point higher ROA (p < 0.001), a 1.24-percentage-point higher ROE (p < 0.001), and a 0.22-unit higher Tobin's Q (p < 0.001). IV estimates in Column (4) are directionally consistent (IV β_ROA = 0.94, p < 0.01), with first-stage F = 14.8, confirming instrument relevance. Sector interactions reveal that the ESG–Tobin's Q relationship is significantly stronger in high-environmental-intensity industries (energy, chemicals, cement: incremental β = 0.31, p < 0.01) than in low-intensity service industries, consistent with H8.

Table 3

Fixed-Effects Panel Regression: ESG Disclosure and Firm Performance (n = 224 firms; 1,568 firm-years; FY2017–FY2023)

Variable	(1) ROA	(2) ROE	(3) Tobin's Q	(4) ROA (IV)	(5) Tobin's Q (IV)	VIF
ESG Disclosure Score	0.081***	0.124***	0.220***	0.094**	0.241**	2.34
ESG × High-Env-Intensity	0.041*	0.058*	0.310**	0.047*	0.328**	2.71
Log (Total Assets)	0.028***	0.031***	−0.114**	0.026***	−0.109**	1.94
Leverage	−0.062***	−0.071***	−0.183***	−0.059***	−0.178***	1.87
Sales Growth	0.041**	0.053**	0.142***	0.039**	0.138***	1.62
Big Four Auditor	0.019*	0.024*	0.094**	0.018*	0.090*	1.41
Institutional Ownership %	0.034**	0.041**	0.187***	0.032**	0.181***	1.78
Firm & Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	—
Within R^2	0.431	0.398	0.462	0.424	0.451	—

*Note. Robust SEs clustered at firm level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. ESG score standardised (mean 0, SD 1) for comparability. IV = Instrumental Variable (industry-average ESG lagged 2 years); first-stage F = 14.8–17.2.*

4.4 Mediation Analysis: Corporate Reputation

Table 4 presents bootstrapped mediation results (PROCESS Model 4; 5,000 iterations). The indirect effect of the composite green accounting and SFRD index on financial performance through corporate reputation was positive and significant (b = 0.182, SE = 0.033, 95% CI [0.121, 0.249]), representing 31.6% of the total effect and confirming partial mediation (H7 supported). Among individual SFRD dimensions, GRI compliance quality had the largest indirect effect through reputation (b = 0.091, CI [0.058, 0.127]), consistent with the established role of GRI as the global benchmark for sustainability credibility. BRSR disclosure quality had a slightly smaller indirect effect (b = 0.078, CI [0.048, 0.113]), reflecting the framework's more recent introduction and associated market learning curve. Integrated reporting generated the second-largest indirect effect (b = 0.084, CI [0.051, 0.121]), confirming prior evidence that IR adoption signals transparency and holistic value creation to capital markets (Eccles & Krzus, 2010; IIRC, 2021).

Table 4

Mediation Analysis: Indirect Effects of Green Accounting and SFRD on Financial Performance via Corporate Reputation (Bootstrap n = 5,000)

Dimension / Path	Indirect Effect (b)	SE	95% CI LL	95% CI UL	% Mediated
Composite SFRD Index	0.182	0.033	0.121	0.249	31.6%
GRI Compliance Quality	0.091	0.018	0.058	0.127	21.2%
Integrated Reporting	0.084	0.018	0.051	0.121	20.5%
BRSR Disclosure Quality	0.078	0.017	0.048	0.113	17.0%
Environmental Cost Accounting	0.064	0.016	0.036	0.098	14.5%
Carbon Footprint Accounting	0.049	0.014	0.025	0.079	12.8%
Natural Capital Valuation	0.037	0.012	0.016	0.063	9.6%

Note. CI = confidence interval; LL = lower limit; UL = upper limit. All intervals exclude zero, confirming significance. Direct effect (composite SFRD → Financial Performance) remains significant (b = 0.394, p < 0.001), confirming partial mediation.

4.5 Binary Logistic Regression: Determinants of Voluntary BRSR Adoption

Among non-mandatory firms (n = 112 not in the top-1,000 mandatory category), binary logistic regression examined what predicts voluntary BRSR adoption (adopted = 1; n = 47; not adopted = n = 65). Table 5 presents results. Institutional ownership percentage (OR = 1.84, $p < 0.01$), foreign ownership presence (OR = 2.41, $p < 0.001$), corporate governance quality (OR = 2.17, $p < 0.001$), and prior GRI adoption (OR = 3.62, $p < 0.001$) were the strongest positive predictors. Firm size (OR = 1.63, $p < 0.01$) and industry environmental intensity (OR = 1.74, $p < 0.05$) also significantly predicted voluntary adoption. Leverage was negatively associated with voluntary adoption (OR = 0.68, $p < 0.05$), suggesting financially stressed firms are less likely to invest in voluntary sustainability disclosure. These findings corroborate H8's prediction that governance quality and ownership structure drive sustainability reporting adoption, and underscore the role of institutional investor pressure as an adoption catalyst.

Table 5

Binary Logistic Regression: Determinants of Voluntary BRSR Adoption (n = 112 Non-Mandatory Firms)

Predictor	OR	95% CI LL	95% CI UL	z-value	p-value
Institutional Ownership %	1.84	1.28	2.63	3.21	.001
Foreign Ownership (Dummy)	2.41	1.57	3.71	4.18	< .001
Corporate Governance Quality	2.17	1.48	3.19	3.87	< .001
Prior GRI Adoption	3.62	2.11	6.21	5.04	< .001
Firm Size (Log Assets)	1.63	1.14	2.33	2.84	.005
High Environmental Intensity	1.74	1.08	2.79	2.27	.023
Leverage	0.68	0.48	0.97	−2.19	.029
Firm Age	1.21	0.88	1.67	1.21	.225
Nagelkerke Pseudo R^2	0.418				

*Note. OR = odds ratio. CI = confidence interval. Reference category for Foreign Ownership: no foreign ownership. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.*

4.6 Moderation Analysis

Hierarchical regression confirmed H8 comprehensively. Corporate governance quality significantly moderated the green accounting composite–performance relationship (β_interaction = 0.24, $p < 0.01$): firms with high-quality boards, independent audit committees, and dedicated ESG oversight mechanisms achieved significantly higher performance returns from green accounting investments than low-governance peers. This is consistent with Ntim and Soobaroyen (2013) and Liao et al. (2015), who argue that governance mechanisms are needed to convert sustainability disclosure commitments into operational changes. Industry environmental intensity significantly moderated the ECA–cost efficiency path (β_interaction = 0.22, $p < 0.01$): manufacturing and energy firms, which carry larger and more complex environmental cost bases, realise proportionally greater cost savings from ECA adoption than service firms. Institutional ownership positively moderated the BRSR–investor perception path (β_interaction = 0.19, $p < 0.05$), confirming that institutional investors act as both demand-side drivers and amplifiers of sustainability disclosure value.

5. Discussion

5.1 BRSR and GRI: The Dominant Performance Drivers

BRSR disclosure quality and GRI compliance quality emerged as the two strongest predictors of overall organizational performance (β = 0.46 and 0.43, respectively), corroborating the regulatory and market signalling value of structured sustainability reporting frameworks. The BRSR's superior direct effect may reflect the SEBI

mandate's legitimacy signal: mandatory adoption carries an external credibility premium that purely voluntary GRI reports may not fully replicate, particularly among domestic institutional investors and retail shareholders. This finding advances the institutional theory prediction that coercive isomorphism — here, the BRSR mandate — produces stronger performance consequences than mimetic or normative adoption because it enforces minimum disclosure standards across a broad firm population, reducing reporting quality heterogeneity (DiMaggio & Powell, 1983; Deegan, 2002).

The GRI's stronger reputation-mediated indirect effect (b = 0.091) than the BRSR's (b = 0.078) suggests that internationally aligned disclosure — which signals credibility to global ESG-oriented investors and rating agencies — builds reputational capital more effectively than country-specific mandatory frameworks. This has implications for policymakers: progressively aligning BRSR requirements with international sustainability standards (GRI, ISSB S1/S2) would not only reduce reporting cost for multi-framework filers but also magnify the performance benefits of mandatory disclosure by attracting international investor interest.

5.2 Environmental Cost Accounting as an Operational Performance Driver

ECA's position as the strongest predictor of cost efficiency (β = 0.44) validates the foundational claim of environmental management accounting literature: hidden environmental costs — waste, energy, water, regulatory penalties — constitute a substantial and recoverable portion of total production costs, but only become actionable when rigorously measured and attributed (Schaltegger & Burritt, 2000; Jasch, 2003; US EPA, 1995). The moderation by industry environmental intensity (β_interaction = 0.22) confirms that ECA's value is highest in sectors with large environmental cost bases, such as chemicals, cement, textiles, and energy — precisely the sectors that face the most intense regulatory and investor pressure under India's BRSR and Environmental Protection Act frameworks. CFOs and management accountants in these sectors should prioritise ECA investments as a financially justified sustainability initiative, not merely a compliance expense.

5.3 Carbon Footprint Accounting and Market Valuation

The significant positive effect of CFA on investor perception and market valuation (β = 0.38; archival ESG–Tobin's Q: β = 0.22, $p < 0.001$) corroborates international evidence from Matsumura et al. (2014) and Luo et al. (2012) and extends it to the Indian context. As climate risk has increasingly been incorporated into institutional investor ESG mandates and credit rating methodologies (TCFD, 2023; RBI, 2023), companies with credible, verified carbon accounts benefit from lower equity risk premiums and higher analyst ESG ratings. The relatively lower mean CFA adoption among Indian firms (M = 3.12 vs. M = 3.58 for ECA) suggests that a significant value creation opportunity remains unrealised: firms that improve Scope 1/2/3 measurement, third-party verification, and science-based target-setting stand to benefit both operationally (through carbon-cost internalisation) and strategically (through superior capital market positioning).

5.4 Integrated Reporting and Investor Communication

Integrated reporting adoption's strong effect on investor perception (β = 0.41) and its second-largest reputation-mediated indirect effect (b = 0.084) confirm the theoretical premise of the <IR> framework: communicating connectivity between strategy, governance, and six-capital value creation improves the quality of investor mental models about future value, reducing discount rates and supporting valuation premiums (Eccles & Krzus, 2010; IIRC, 2021; Bernardi & Stark, 2018). That IR adoption remains low in India (M = 2.91) relative to BRSR and GRI — despite its demonstrable performance benefits — suggests that Indian firms are leaving a significant capital-market communication opportunity unrealised. The International Sustainability Standards Board's (ISSB) S1 and S2 standards (effective 2024), which require integrated reporting logic in IFRS jurisdictions, will likely accelerate adoption; SEBI and MCA may consider aligning BRSR with ISSB S1/S2 to harmonise India's sustainability reporting architecture.

5.5 Natural Capital Valuation: Nascent but Consequential

Despite the lowest current adoption among the six dimensions (M = 2.48), natural capital valuation exerts a significant positive effect on environmental legitimacy (β = 0.39) and, through reputation mediation, on financial performance. The reputational pathway is particularly important for NCV: firms that credibly quantify and disclose their water footprint, biodiversity impact, and ecosystem service dependencies build distinctive environmental credibility signals that are difficult for competitors to imitate — a classic RBV-based source of competitive advantage (Hart, 1995; Barney, 1991). India's water stress, rapid biodiversity decline, and emerging regulatory attention to water accounting in the BRSR framework suggest that early NCV adopters will capture disproportionate reputational and regulatory advantage as disclosure expectations mature.

5.6 Corporate Reputation as the Mediating Mechanism

The partial mediation by corporate reputation (31.6% of total effect; H7 supported) confirms that sustainability transparency creates financial value substantially through the reputational channel — building stakeholder trust, reducing perceived counterparty risk, and enabling premium-priced stakeholder relationships — while also retaining significant direct effects through cost efficiency, regulatory compliance advantages, and ITC eligibility improvements. The composite finding supports Eccles, Ioannou and Serafeim's (2014) longitudinal evidence that firms with high sustainability emphasis significantly outperform low-sustainability peers over the long run, with reputation as a documented mediating mechanism. For investors and analysts, reputation-mediated performance effects suggest that ESG disclosure quality should be assessed not merely as a compliance indicator but as a forward-looking indicator of reputational and thus financial trajectory.

5.7 Policy and Managerial Implications

For SEBI and the Ministry of Corporate Affairs, the significant performance benefits documented for BRSR disclosure quality reinforce the case for progressively strengthening BRSR requirements — expanding mandatory coverage to smaller listed companies, introducing third-party assurance requirements, and aligning with ISSB S1/S2 for international comparability. For boards and audit committees, the governance moderation finding (H8) underscores the importance of dedicated ESG oversight: companies should establish board-level sustainability committees with financial expertise, integrate sustainability KPIs into executive compensation, and commission periodic environmental cost audits. For CFOs and management accountants, ECA represents the highest near-term ROI sustainability investment — particularly in manufacturing, energy, and chemicals sectors. For sustainability reporting teams, the reputational mediation evidence supports investing in credibility-enhancing practices: GRI third-party assurance, CDP registration for carbon disclosure, and progressive movement toward integrated reporting architecture.

5.8 Limitations

Several limitations constrain the findings. First, the cross-sectional survey design precludes strong causal inference from perception-based measures, though archival panel fixed-effects specifications partially mitigate this concern. Second, sustainability reporting quality is inherently difficult to measure comprehensively from either survey responses or annual report content analysis; scores may not capture the full quality of internal sustainability management systems not publicly disclosed. Third, the sample over-represents large-cap and mid-cap listed firms; findings may not generalise to unlisted SMEs, for which green accounting and SFRD adoption is significantly lower. Fourth, common method bias, though statistically assessed as non-problematic, cannot be fully ruled out in any self-reported survey study. Future research should employ longitudinal designs, link survey measures to actual investor behavior data (fund flows, analyst coverage changes), and examine green accounting outcomes in SME and non-listed contexts.

6. Conclusion

This study provides comprehensive, large-sample empirical evidence that green accounting and sustainable financial reporting practices generate measurable and economically significant benefits for Indian listed companies — spanning financial performance (ROA, ROE, Tobin's Q), non-financial performance (stakeholder trust, environmental legitimacy), and market valuation. BRSR disclosure quality and GRI compliance quality emerge as the dominant performance drivers, while environmental cost accounting is the most powerful cost-efficiency lever. Corporate reputation partially mediates the sustainability practice–performance relationship, confirming that transparency-driven reputational capital is a key mechanism through which green accounting investments create financial value.

The moderating roles of corporate governance quality, industry environmental intensity, and ownership structure reveal that sustainability disclosure benefits are amplified by strong governance infrastructure and sector-specific environmental exposure — a finding with direct implications for board design, executive incentive structures, and regulatory policy. As India's BRSR framework matures and global sustainability standards (ISSB S1/S2, GRI Universal Standards) converge, the evidence base developed in this study can inform evidence-driven policy decisions that make sustainability reporting not merely a compliance exercise but a genuine organizational performance improvement mechanism. Green accounting, at its fullest implementation, is not a cost of responsibility — it is an investment in competitive resilience.

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