ISSN:3030-332X
Impact factor: 9,493
International journal of scientific researchers
2nd International Conference on Green Economy & Sustainability 2.0, 30 April 2026

CORPORATE SUSTAINABILITY AND ENVIRONMENTAL ACCOUNTING

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ABSTRACT

As global environmental challenges intensify, corporations are under increasing pressure to integrate sustainability into their core strategies and reporting practices. This paper explores the evolving role of environmental accounting as a critical tool for advancing corporate sustainability. It examines how organizations measure, disclose, and manage environmental costs, liabilities, and performance, highlighting frameworks such as carbon accounting, lifecycle assessment, and sustainability reporting standards. The study analyzes the relationship between environmental accounting practices and corporate decision-making, demonstrating how transparent reporting can enhance accountability, improve resource efficiency, and strengthen stakeholder trust. It also addresses key challenges, including the lack of standardized metrics, data reliability issues, and the integration of environmental considerations into traditional financial systems. The findings suggest that firms adopting robust environmental accounting systems are better positioned to mitigate risks, comply with regulatory requirements, and achieve long-term sustainable growth. This research contributes to the growing discourse on sustainable business practices by emphasizing the importance of aligning financial and environmental objectives, offering practical insights for policymakers, practitioners, and academics.

Keywords: risks, sustainable business, policymakers, academics, environmental objectives, key challenges, enhance accountability

Introduction

The relationship between business and the natural environment has never been more consequential. As global temperatures breach the 1.5°C threshold identified by the Intergovernmental Panel on Climate Change (IPCC), corporations face an unprecedented convergence of physical climate risks, regulatory pressure, and investor scrutiny. The financial materiality of environmental performance — once dismissed as a soft concern — is now firmly established in both academic literature and capital markets.

Environmental accounting, broadly defined as the process of identifying, measuring, and communicating the environmental costs and impacts associated with an organisation's activities, sits at the intersection of financial reporting, sustainability management, and public accountability. Its emergence as a discipline reflects a broader societal recognition that traditional financial statements, premised on the assumptions of industrial capitalism, fundamentally fail to capture the depletion of natural capital that underpins all economic activity.

2. Theoretical Foundations

2.1 The Triple Bottom Line and Beyond

John Elkington's 1994 concept of the Triple Bottom Line (TBL) — measuring corporate performance across economic, social, and environmental dimensions — provided early vocabulary for sustainability accounting. TBL proposed that firms should evaluate success not merely through profit, but through their contribution to people and the planet. While influential, TBL has faced criticism for its imprecision and susceptibility to greenwashing: absent shared metrics, companies could report selectively, emphasising favourable dimensions while obscuring trade-offs.

Elkington himself, writing in Harvard Business Review in 2018, 'recalled' the concept, arguing it had been reduced to a superficial accounting exercise rather than a transformative redesign of capitalism. This critique underscores the central challenge of environmental accounting: the gap between measurement and meaningful change.

2.2 Stakeholder Theory and Extended Accountability

Freeman's (1984) stakeholder theory extended corporate accountability beyond shareholders to include employees, communities, regulators, and the environment itself. Subsequent scholars — notably Gray, Owen, and Adams (1996) — applied this lens to social and environmental accounting, arguing that corporations hold an implicit social contract requiring disclosure of impacts on all stakeholder groups. This theoretical tradition underpins the 'social legitimacy' rationale for sustainability reporting: firms disclose environmental performance not only because it is profitable, but because continued social licence to operate depends upon it.

2.3 Natural Capital Theory

Perhaps the most intellectually ambitious theoretical development is natural capital accounting, which seeks to treat ecosystems, biodiversity, clean water, stable climate, and other natural assets as forms of capital whose depletion should be recognised on corporate (and national) balance sheets. Developed by economists including Partha Dasgupta, Robert Costanza, and the Natural Capital Project, this framework challenges the deepest assumption of industrial accounting: that nature is a free input rather than a finite and depreciating asset.

Dasgupta's landmark 2021 review for the UK Treasury estimated the total economic value of global ecosystem services at approximately US$125–145 trillion per year — roughly one and a half times global GDP — yet these services appear nowhere in corporate or national accounts. Correcting this omission is the central project of modern environmental accounting.

3. Frameworks and Standards

The environmental reporting landscape has evolved from a fragmented collection of voluntary initiatives into an increasingly coherent, and in many jurisdictions mandatory, system of disclosure frameworks. The key frameworks are summarised below.

Framework	Established	Scope	Mandatory?
GRI Standards	1997 (GRI 1.0)	Economic, environmental, social (Universal)	Voluntary (mandatory in some jurisdictions)
TCFD	2017	Climate-related financial risks & opportunities	Mandatory in UK, NZ, Singapore
ISSB / IFRS S2	2023	Climate-related disclosures (financial materiality)	Adoption accelerating globally
CDP (formerly Carbon Disclosure Project)	2000	Greenhouse gases, water, forests	Voluntary; required by many investors
TNFD	2023	Nature & biodiversity-related financial risks	Voluntary; adoption growing rapidly
EU CSRD /	2023	Comprehensive ESG	Mandatory for

Framework	Established	Scope	Mandatory?
ESRS	(effective 2024+)	— double materiality	large EU companies

3.1 GRI Standards

The Global Reporting Initiative (GRI) Standards remain the most widely adopted sustainability reporting framework globally, used by over 10,000 organisations in 100 countries. GRI employs a multi-stakeholder approach and applies the principle of impact materiality — disclosing information about a company's most significant impacts on people and the environment, regardless of financial materiality to investors. GRI 300 (Environmental) covers energy, emissions, water, biodiversity, waste, and compliance, providing granular disclosure requirements for each topic.

3.2 TCFD and Climate-Related Financial Risk

The Task Force on Climate-related Financial Disclosures (TCFD), established by the Financial Stability Board, shifted the discourse by framing climate risk as a financial stability issue rather than merely a sustainability matter. TCFD requires disclosure under four pillars: Governance, Strategy, Risk Management, and Metrics & Targets. Crucially, TCFD introduced the concept of scenario analysis — requiring companies to model their resilience under 1.5°C, 2°C, and higher warming pathways — embedding climate uncertainty directly into strategic planning processes.

3.3 ISSB and the Global Baseline

The International Sustainability Standards Board (ISSB), launched at COP26 in 2021 under the IFRS Foundation, published IFRS S1 (general sustainability) and IFRS S2 (climate) in June 2023. The ISSB represents a landmark consolidation of investor-focused frameworks and is widely expected to form the global baseline for sustainability disclosure, with jurisdictions including the UK, Australia, Canada, Japan, and Singapore committing to adoption. Notably, ISSB applies investor-focused financial materiality rather than the broader stakeholder materiality of GRI, creating a complementary rather than competing architecture.

3.4 Nature and Biodiversity: The TNFD Frontier

The Taskforce on Nature-related Financial Disclosures (TNFD), finalised in 2023, extends the TCFD architecture to biodiversity and ecosystem services. TNFD's LEAP framework (Locate, Evaluate, Assess, Prepare) guides companies in identifying nature-related dependencies and impacts across value chains. With biodiversity loss now recognised as a systemic financial risk — the World Economic Forum identifies nature destruction among the top five global risks by likelihood — TNFD represents the leading edge of environmental accounting's expanding frontier.

4. Key Metrics and Measurement

4.1 Greenhouse Gas Accounting

Carbon accounting is the most developed area of environmental measurement. The GHG Protocol — developed by the World Resources Institute and World Business Council for Sustainable Development — provides the dominant methodology, classifying emissions into three scopes:

- Scope 1: Direct emissions from owned or controlled sources (e.g., combustion in company boilers, company vehicle fleets).
- Scope 2: Indirect emissions from the generation of purchased electricity, heat, or steam consumed by the company.
- Scope 3: All other indirect emissions in the value chain, including supplier emissions (upstream) and product use and disposal (downstream). Scope 3 typically constitutes 70–90% of a company's total carbon footprint.

While Scope 1 and 2 measurement is now well-established, Scope 3 accounting remains technically challenging and subject to significant estimation uncertainty. Data gaps in supply chains, varying national emission factors, and inconsistent allocation methodologies create material limitations in

comparability. Nonetheless, the Science-Based Targets initiative (SBTi) now requires credible near-term Scope 3 targets from companies in high-impact sectors, driving rapid improvement in measurement practice.

4.2 Water Accounting

Water is an increasingly material resource risk, particularly for companies operating in water-stressed regions or with water-intensive production processes. The Water Accounting Standards developed by the Water Accounting Standards Board (WASB) and the GRI 303 standard provide frameworks for measuring water withdrawal, consumption, and discharge by source. The concept of water footprinting — analogous to carbon footprinting — distinguishes green water (rainwater), blue water (surface and groundwater), and grey water (water required to dilute pollutants to safe concentrations), enabling more nuanced risk assessment.

4.3 Biodiversity and Ecosystem Services Metrics

Quantifying biodiversity impacts remains the most methodologically immature area of environmental accounting. Approaches range from simple biodiversity footprinting metrics — such as the Biodiversity Footprint for Financial Institutions (BFFI) — to sophisticated ecosystem service valuation methodologies drawing on ecological economics. The EU's Biodiversity Strategy and the forthcoming EU Nature Restoration Law are expected to drive significant advances in standardised biodiversity measurement within the coming decade.

5. From Voluntary to Mandatory: The Regulatory Turn

For three decades, corporate environmental reporting was primarily voluntary, driven by reputational incentives, investor pressure, and corporate values. This model produced significant innovation — the GRI, CDP, and TCFD frameworks all originated as voluntary initiatives — but also systematic under-disclosure, greenwashing, and incomparability that limited the usefulness of sustainability information to investors and other stakeholders.

The 2020s have seen a decisive regulatory turn. The EU's Corporate Sustainability Reporting Directive (CSRD), effective from 2024, mandates detailed sustainability reporting under the European Sustainability Reporting Standards (ESRS) for approximately 50,000 companies — including large non-EU companies with significant EU turnover. ESRS applies double materiality: companies must report both on sustainability risks and opportunities that are financially material to the company (financial materiality) and on impacts on people and the environment (impact materiality). This represents the most demanding sustainability disclosure regime yet enacted.

In the United States, the Securities and Exchange Commission (SEC) proposed climate disclosure rules in 2022, though these faced legal challenges and political opposition. California enacted its own climate disclosure legislation in 2023, requiring large companies doing business in the state to disclose Scope 1, 2, and 3 emissions — the most stringent sub-national mandate globally. These developments signal that mandatory environmental reporting is becoming the global norm, with convergence toward ISSB and CSRD standards expected over the remainder of the decade.

6. Integrated Reporting and Natural Capital Accounting

6.1 The Integrated Reporting Framework

The International Integrated Reporting Council (IIRC), now merged with SASB to form the Value Reporting Foundation (subsequently consolidated into ISSB), developed the Integrated Reporting <IR> Framework as a response to the fragmentation of corporate disclosure. The <IR> Framework organises value creation around six capitals — financial, manufactured, intellectual, human, social and relationship, and natural — requiring companies to explain how they use and affect each capital in creating long-term value. By situating natural capital alongside financial capital in the same report and management logic, integrated reporting creates structural incentives for internalising environmental impacts into strategic decision-making.

6.2 Natural Capital Accounting in Practice

A small but growing number of pioneering companies have begun to experiment with comprehensive natural capital accounting, placing monetary values on their environmental impacts and

dependencies. Puma's Environmental Profit and Loss (EP&L) account, developed in collaboration with KPMG and published in 2011, was the first published corporate natural capital account, estimating the total environmental costs of the company's operations and supply chain at €145 million — representing approximately half of reported EBIT. More recently, companies including AB InBev, Kering, and Unilever have developed sophisticated natural capital assessments, typically revealing that environmental externalities are material relative to conventional financial performance.

These exercises highlight both the promise and the challenges of natural capital accounting. Valuation methodologies — including avoided cost, replacement cost, hedonic pricing, and contingent valuation — remain contested and produce widely varying estimates. The distributional question of who bears environmental costs (typically communities least responsible for causing them) introduces ethical complexity that purely economic valuation cannot fully capture. Nonetheless, the direction of travel is clear: the externalisation of environmental costs is increasingly untenable both ethically and financially.

7. Challenges and Critiques

- Greenwashing and credibility: Despite the expansion of environmental disclosure, concerns persist that sustainability reports frequently overstate positive performance and understate material risks. Third-party assurance — while increasingly common — varies widely in rigour.
- Comparability and standardisation: The proliferation of frameworks has historically limited the comparability of environmental disclosures across companies and sectors. The consolidation around ISSB and ESRS represents a significant improvement, though jurisdictional divergence remains.
- Short-termism: Financial markets continue to discount long-term environmental risks, reducing the incentive for ambitious environmental accounting. Carbon prices remain far below the levels required to drive deep decarbonisation, limiting the financial materiality of climate information.
- Systemic scope: Even the most sophisticated environmental accounting frameworks measure corporate-level impacts rather than systemic ecological thresholds. A company can meet all disclosure requirements while contributing to aggregate ecosystem collapse if its impacts, combined with those of peers, breach planetary boundaries.
- Data availability and cost: Particularly for Scope 3 emissions, biodiversity impacts, and supply chain water use, data availability remains a critical limitation — especially for smaller companies and those operating in emerging markets.

8. Conclusion

Corporate sustainability and environmental accounting have undergone a transformation from peripheral voluntary activity to strategic and regulatory imperative within a single generation. The convergence of investor demand, regulatory pressure, physical climate impacts, and evolving societal expectations has established environmental performance as a dimension of corporate value that no serious organisation can afford to ignore.

Yet the discipline remains incomplete. Current frameworks measure impacts and risks with increasing sophistication but stop short of the deeper integration — embedding natural capital fully into corporate accounts, aligning business strategy with planetary boundaries, and pricing externalities such that environmental costs are borne by those who create them — that a genuinely sustainable economy requires. The gap between disclosure and transformation remains the central challenge of the field.

The path forward requires continued convergence of standards to reduce fragmentation; stronger assurance regimes to enhance credibility; progressive mandatory requirements extending to smaller enterprises and supply chains; and, ultimately, the embedding of natural capital logic into the legal architecture of corporate purpose. Accounting, properly understood, is a technology of attention — it directs resources, shapes incentives, and defines what counts as success. Redesigning accounting to count what matters for a sustainable future is among the most consequential tasks of our time.

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