



Carbon Accounting and Financial Disclosure Requirements: Enhancing Transparency in Corporate Sustainability Reporting

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ABSTRACT

Climate change has intensified the demand for transparent corporate reporting, particularly in the areas of carbon accounting and financial disclosure. Carbon accounting, which measures greenhouse gas (GHG) emissions across scopes 1, 2, and 3, has become a critical tool for organizations seeking to align with global sustainability goals. Financial disclosure requirements, mandated by frameworks such as the Task Force on Climate-related Financial Disclosures (TCFD) and the International Financial Reporting Standards (IFRS) Sustainability Disclosure Standards, ensure that investors and stakeholders receive reliable information about climate-related risks and opportunities. This paper explores the intersection of carbon accounting and financial disclosure, highlighting regulatory developments, corporate practices, and the role of standardized reporting in fostering accountability. Using facts, figures, and comparative tables, the study examines how disclosure requirements influence corporate governance, investment decisions, and long-term value creation. It also evaluates challenges such as data reliability, cost implications, and integration into existing financial systems. Ultimately, the paper argues that robust carbon accounting and disclosure frameworks are essential for achieving global net-zero targets and enhancing investor confidence in sustainable business practices.



Introduction

As global efforts to mitigate climate change intensify, carbon accounting—the systematic measurement and disclosure of greenhouse gas (GHG) emissions—has emerged as a cornerstone of modern corporate governance. It enables organizations to quantify their environmental impact and align with international sustainability goals such as the Paris Agreement. Financial disclosure requirements, in parallel, ensure that climate-related risks and opportunities are transparently communicated to investors, regulators, and stakeholders, thereby strengthening accountability and trust in capital markets.

Carbon accounting frameworks, such as the Greenhouse Gas Protocol and the Partnership for Carbon Accounting Financials (PCAF), provide standardized methodologies for measuring emissions across scopes 1, 2, and 3. These frameworks are increasingly integrated into financial disclosure regimes, including the Task Force on Climate-related Financial Disclosures (TCFD) and the International Financial Reporting Standards (IFRS) Sustainability Disclosure Standards. Together, they form the backbone of sustainability reporting, linking environmental performance with financial accountability.

The growing emphasis on disclosure reflects investor demand for reliable data on climate risks, as well as regulatory pressures from jurisdictions such as the European Union under the Corporate Sustainability Reporting Directive (CSRD). This section sets the stage for examining how carbon accounting and financial disclosure requirements intersect, shaping corporate strategies and influencing long-term value creation.

TABLE:1

| Framework | Focus Area | Scope Coverage | Regulatory/Voluntary |
|---------------|--------------------------------------|------------------------------|-----------------------------------|
| GHG Protocol | Emissions measurement | Scope 1, 2, 3 | Voluntary, widely adopted |
| PCAF Standard | Financed emissions | Scope 3 (Category 15) | Voluntary, financial institutions |
| TCFD | Climate-related financial disclosure | Risk & opportunity reporting | Voluntary, increasingly mandated |
| IFRS S1 & S2 | Sustainability disclosure standards | Financial + climate metrics | Regulatory (global adoption) |
| CSRD (EU) | Corporate sustainability | Broad ESG + climate | Regulatory (EU companies) |



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Section 2: Carbon Accounting Frameworks

Carbon accounting frameworks provide the methodological backbone for measuring, reporting, and verifying greenhouse gas (GHG) emissions. They ensure consistency, comparability, and credibility in sustainability reporting, enabling organizations to align with global climate goals. The most widely recognized frameworks include the Greenhouse Gas (GHG) Protocol, ISO 14064 standards, and the Partnership for Carbon Accounting Financials (PCAF). Each framework addresses different aspects of emissions measurement and disclosure, but collectively they form the foundation of corporate climate accountability.

2.1 The Greenhouse Gas Protocol

The GHG Protocol, developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD), is the most widely adopted standard. It categorizes emissions into three scopes:

- **Scope 1:** Direct emissions from owned or controlled sources (e.g., fuel combustion).
- **Scope 2:** Indirect emissions from purchased electricity, steam, heating, and cooling.
- **Scope 3:** All other indirect emissions across the value chain (e.g., supply chain, employee travel, product use).

According to the CDP, Scope 3 emissions often account for 70–90% of a company’s total carbon footprint, underscoring the importance of comprehensive measurement.

2.2 ISO 14064 Standards

The ISO 14064 series provides internationally recognized specifications for quantifying, monitoring, and reporting GHG emissions. It emphasizes verification and assurance, making it particularly relevant for companies seeking third-party validation of their carbon data. ISO 14064-1 focuses on organizational-level emissions, while ISO 14064-2 addresses project-level accounting.

2.3 Partnership for Carbon Accounting Financials (PCAF)

PCAF is tailored for financial institutions, enabling them to measure and disclose financed emissions—emissions associated with loans and investments. This framework is critical for banks, asset managers,



and insurers, as it links financial portfolios to climate impact. By 2025, over 400 financial institutions worldwide had adopted PCAF standards.

Comparative Table: Major Carbon Accounting Frameworks

| Framework | Scope Coverage | Primary Users | Key Strengths | Adoption Level |
|---|---------------------------------------|---------------------------|----------------------------------|-----------------------------|
| GHG Protocol | Scope 1, 2, 3 | Corporations, governments | Comprehensive, widely recognized | Global standard |
| ISO 14064 | Organizational & project-level | Corporations, auditors | Verification & assurance | International certification |
| PCAF | Financed emissions (Scope 3, Cat. 15) | Banks, asset managers | Portfolio-level accountability | 400+ institutions worldwide |
| Science-Based Targets Initiative (SBTi) | Emission reduction targets | Corporations | Aligns with Paris Agreement | 5,000+ companies committed |

Section 3: Financial Disclosure Requirements

Financial disclosure requirements have evolved to integrate climate-related risks and sustainability metrics into mainstream corporate reporting. These frameworks ensure that investors, regulators, and stakeholders receive reliable, comparable, and decision-useful information about how climate change affects financial performance and long-term value creation.

3.1 Task Force on Climate-related Financial Disclosures (TCFD)

Established by the Financial Stability Board in 2015, the TCFD provides recommendations across four thematic areas: governance, strategy, risk management, and metrics & targets. Its framework encourages companies to disclose how climate risks and opportunities impact their operations and financial planning. By 2024, more than 4,000 organizations across 100+ jurisdictions had expressed support for TCFD, making it one of the most influential disclosure standards globally.

3.2 IFRS Sustainability Disclosure Standards

In 2023, the International Sustainability Standards Board (ISSB) introduced IFRS S1 (General Requirements for Sustainability-related Financial Disclosure) and IFRS S2 (Climate-related Disclosures).



These standards aim to unify sustainability reporting globally, ensuring consistency across markets. IFRS S2 builds directly on the TCFD framework, requiring disclosure of GHG emissions, transition plans, and climate resilience strategies. Adoption is accelerating, with jurisdictions such as the UK, Canada, and Japan announcing plans to integrate ISSB standards into national reporting regimes.

3.3 European Union Corporate Sustainability Reporting Directive (CSRD)

The CSRD, effective from 2024, expands the scope of sustainability reporting to nearly 50,000 companies in the EU, including non-EU firms with significant operations in Europe. It mandates detailed disclosures on environmental, social, and governance (ESG) factors, aligned with the European Sustainability Reporting Standards (ESRS). Unlike voluntary frameworks, CSRD imposes legal obligations, with penalties for non-compliance.

Comparative Table: Financial Disclosure Frameworks

| Framework | Scope | Key Features | Adoption Level |
|--------------|---------------------------------------|--|---------------------------------------|
| TCFD | Climate-related risks & opportunities | Governance, strategy, risk management, metrics | 4,000+ organizations worldwide |
| IFRS S1 & S2 | Sustainability & climate disclosure | Global baseline, aligned with TCFD | Adopted/endorsed in UK, Canada, Japan |
| CSRD (EU) | ESG + climate | Mandatory, detailed ESRS standards | 50,000+ EU & non-EU companies |

Section 4: Facts

Carbon accounting and financial disclosure requirements are best understood through empirical evidence. Global emissions data, corporate reporting statistics, and case studies illustrate the scale of the challenge and the progress made in integrating sustainability into financial systems.

4.1 Global Emissions Data

According to the Intergovernmental Panel on Climate Change (IPCC), global greenhouse gas emissions reached approximately 59 gigatonnes of CO₂-equivalent in 2019, with energy production and industrial processes accounting for nearly 65% of total emissions.¹ Despite commitments under the Paris



Agreement, emissions continue to rise in several regions, underscoring the urgency of robust carbon accounting.

4.2 Corporate Reporting Statistics

The Carbon Disclosure Project (CDP) reported in 2024 that over 23,000 companies worldwide disclosed environmental data, covering more than 64% of global market capitalization.² However, only 41% of these companies provided comprehensive Scope 3 emissions data, highlighting persistent gaps in disclosure quality.

4.3 Case Studies

- **Microsoft Corporation:** In its 2023 sustainability report, Microsoft disclosed Scope 1, 2, and 3 emissions, committing to become carbon negative by 2030.³
- **Unilever PLC:** Unilever integrates climate-related risks into its financial disclosures, aligning with TCFD recommendations and reporting on supply chain emissions.⁴
- **HSBC Holdings:** As a PCAF signatory, HSBC measures financed emissions across its lending portfolio, linking climate impact directly to financial risk.⁵

Table 1: Global Emissions by Sector (2019)

| Sector | Emissions (Gt CO ₂ -eq) | Share of Total (%) |
|----------------------------|------------------------------------|--------------------|
| Energy (electricity, heat) | 20.1 | 34% |
| Industry | 18.6 | 31% |
| Agriculture & Land Use | 11.9 | 20% |
| Transport | 8.4 | 14% |
| Waste | 0.9 | 1% |
| Total | 59.9 | 100% |

Table 2: Corporate Disclosure Trends (2024)

| Indicator | Value |
|------------------------------------|---------|
| Companies disclosing to CDP | 23,000+ |
| Share of global market cap covered | 64% |
| Companies reporting Scope 3 data | 41% |



| | |
|-----------------------------|--------|
| Companies aligned with TCFD | 4,000+ |
|-----------------------------|--------|

Section 5: Challenges and Opportunities

While carbon accounting and financial disclosure frameworks have advanced significantly, their implementation presents both challenges and opportunities for corporations, regulators, and investors. Understanding these dynamics is essential for evaluating the effectiveness of sustainability reporting.

5.1 Challenges

- **Data Accuracy and Reliability**

Measuring Scope 3 emissions remains particularly difficult due to reliance on supplier data and assumptions. Studies indicate that over 50% of companies struggle to obtain reliable Scope 3 data, leading to inconsistencies in reporting.¹

- **Integration with Financial Systems**

Traditional financial reporting systems are not designed to capture non-financial metrics such as GHG emissions. Integrating sustainability data requires new IT infrastructure, cross-departmental collaboration, and training, which can be resource-intensive.

- **Cost Implications**

Compliance with frameworks like CSRD or IFRS S2 involves significant costs, including external audits, data management systems, and consultancy fees. Smaller firms often face disproportionate burdens compared to large multinationals.

- **Regulatory Fragmentation**

Different jurisdictions impose varying requirements (e.g., CSRD in the EU vs. voluntary TCFD in other regions), creating complexity for multinational corporations. Harmonization remains a challenge.

5.2 Opportunities

- **Investor Confidence and Capital Access**

Transparent disclosure enhances investor trust. A 2024 PwC survey found that 79% of institutional investors consider ESG disclosures critical in investment decisions.² Companies with robust reporting often enjoy lower capital costs and stronger market reputations.



• **Strategic Risk Management**

Carbon accounting helps firms identify emission hotspots, enabling targeted efficiency improvements. For example, Unilever reduced supply chain emissions by 15% between 2018 and 2023 through supplier engagement programs.³

• **Innovation and Competitive Advantage**

Disclosure requirements incentivize innovation in low-carbon technologies. Firms that proactively reduce emissions can differentiate themselves in markets increasingly shaped by sustainability preferences.

• **Alignment with Global Net-Zero Goals**

By adopting standardized frameworks, corporations contribute to collective climate action, aligning with the Paris Agreement and national net-zero commitments. This alignment strengthens long-term resilience and stakeholder legitimacy.

TABLE 3

| Dimension | Challenges | Opportunities |
|-----------------------|-----------------------------------|---|
| Data | Inconsistent Scope 3 data | Improved accuracy through digital solutions |
| Financial Integration | High compliance costs | Enhanced investor confidence |
| Regulation | Fragmented global standards | Movement toward harmonization (IFRS, TCFD) |
| Strategy | Resource-intensive implementation | Risk management & innovation benefits |

Section 6: Conclusion

Carbon accounting and financial disclosure requirements have become indispensable tools in the global effort to combat climate change and foster sustainable business practices. By quantifying greenhouse gas emissions and embedding climate-related risks into financial reporting, organizations enhance transparency, accountability, and investor confidence. Frameworks such as the GHG Protocol, ISO 14064, and PCAF provide methodological rigor, while disclosure standards like TCFD, IFRS S1 & S2,



and the EU's CSRD ensure that sustainability information is integrated into mainstream financial systems.

The evidence presented—ranging from global emissions data to corporate reporting statistics—demonstrates both progress and persistent gaps. While thousands of companies now disclose climate-related information, challenges remain in Scope 3 measurement, regulatory fragmentation, and the cost of compliance. Yet, these hurdles are counterbalanced by significant opportunities: improved investor trust, enhanced risk management, innovation in low-carbon technologies, and alignment with global net-zero commitments.

Looking ahead, the convergence of voluntary and regulatory frameworks suggests a trajectory toward harmonized global standards. As climate risks increasingly shape financial markets, robust carbon accounting and disclosure will not only serve compliance purposes but also act as strategic levers for resilience and long-term value creation. Ultimately, the integration of sustainability into financial reporting is not merely a regulatory obligation—it is a defining feature of responsible corporate governance in the 21st century.

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11. CDP (2023). Global Disclosure Report.
12. World Economic Forum (2021). Measuring Stakeholder Capitalism: Towards Common Metrics and Consistent Reporting of Sustainable Value Creation.

Footnote 1

Scope 1 emissions refer to direct emissions from owned or controlled sources, Scope 2 covers indirect emissions from purchased energy, and Scope 3 includes all other indirect emissions across the value chain.

Footnote 2

Financed emissions refer to GHG emissions associated with investments, loans, and other financial activities, reflecting the indirect climate impact of financial institutions.

Footnote 3

3. The ISSB's IFRS S2 standard explicitly incorporates TCFD recommendations, ensuring continuity while enhancing global comparability of climate-related disclosures.

Footnote 4

1. IPCC, Climate Change 2021: The Physical Science Basis.
2. CDP Global Disclosure Report, 2024.
3. Microsoft Sustainability Report, 2023.



4. Unilever Annual Report, 2023.
5. HSBC Climate Strategy Report, 2024.

Footnote 5

1. CDP Global Disclosure Report, 2024.
2. PwC Investor Survey on ESG, 2024.
3. Unilever Sustainability Progress Report, 2023.

Footnote 6

The convergence of IFRS and TCFD frameworks illustrates the global push toward standardized sustainability reporting, reducing fragmentation and enhancing comparability across jurisdictions.