

Invisible Assets, Measurable Impacts: The New Language Of Carbon Accounting

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Problem of practice

Extreme weather events and geopolitical conflicts are stressing modern supply chains and underscoring the importance of embedding sustainability into business strategy. To that end, many companies have adopted net-zero pledges, signalling their commitment to reducing carbon emissions (CE). To honour these pledges, businesses need dependable sustainability data, as comprehensive and accurate emissions data can impact financial, operational and supply-chain decisions. Existing accounting methods fail to capture comprehensive emissions data, especially for indirect emissions. This not only limits the stakeholders' ability to evaluate progress toward net-zero goals but also affects investor confidence, regulatory compliance and brand reputation. So how can supply chain, accounting and sustainability managers better capture their organisation's carbon footprint and use this for more sustainable and less vulnerable supply chains? The answer lies in carbon accounting, which can help businesses identify and manage climate-related risks and track progress toward net-zero goals. However, there is a lack of standardised carbon accounting frameworks. But the solution emerges from recent [research](#) by Stefan Reichelstein, who recommends using a structured carbon reporting framework that integrates both balance sheets and flow statements¹

¹ The article 'Corporate carbon accounting: Balance sheets and flow statements' by Stefan Reichelstein, featured in Volume 29, Issue 3 of *Review of Accounting Studies* proposes a carbon accounting system that works like financial accounting, helping companies track emissions in assets, production and sales more clearly and consistently

The burning need

Sustainability reporting rates have increased worldwide. In the [Asia-Pacific](#) region, 49% of companies reported on sustainability in 2011; by 2024, this had risen to 92%. Similarly, in North America, the proportion increased from 69% in 2011 to 97% in 2024.² Carbon accounting can help businesses identify and manage climate-related risks, track progress toward [net-zero goals](#) and support organisation's [brand value](#) by strengthening credibility with stakeholders.^{3,4} An important blind spot on many companies' dashboards is [Scope 3](#) emissions – those caused by the company's outsourced operations, for instance, through suppliers of raw materials, equipment, and third-party logistics.⁵ These differ from Greenhouse Gas (GHG) emissions resulting from company operations ([Scope 1](#)) and the purchase of electric power (Scope 2), both of which are usually easier to identify and measure. These indirect emissions across the supply chain form 90% of a business' carbon footprint.⁶

Since these emissions do not originate directly from the company, calculating and reducing them is complicated. As Peter Drucker stated, “What gets measured, gets managed.” The same principle applies to carbon accounting: accurate measurement is the essential first step. The Climate Transition Plan Disclosure report by CDP Worldwide, published in June 2024, states that around [95-99%](#) of global firms reported Scope 1 & 2 emissions, but only 38% reported Scope 3 emissions.⁷ In India, only [51%](#) of the top 100 listed companies voluntarily report Scope 3 emissions.⁸ Measurement is only the starting point; the greater challenge is providing the transparent reporting necessary to validate a company's journey to net zero.

Current limitations

Despite the growing importance of sustainability reporting, carbon reporting practices vary significantly across countries. Different regulatory bodies have introduced climate-related reporting requirements but there is still no universally accepted accounting framework for carbon emissions. For example, in the accounting framework used by US companies, there are no dedicated carbon accounting standards. But the regulatory body responsible for setting US accounting standards, the International Financial Reporting Standards (IFRS), requires climate-related disclosures. In Europe, the Corporate Sustainability Reporting Directive mandates Scope 1-3 reporting through the European Sustainability Reporting Standards. At the same time, countries such as Japan and South Korea have adopted climate disclosure frameworks aligned with the Task Force on Climate-related Financial Disclosures. In



India, carbon accounting is largely voluntary and guided by the GHG Protocol. While SEBI requires listed companies to file Business Responsibility and Sustainability Reports (BRSRs), there is no standardised carbon accounting framework, leading to inconsistent sector-specific metrics and selective disclosure. As a result, companies' reported emissions are often difficult to compare across industries and geographies.

Most firms, therefore, rely on estimation approaches recommended by the GHG Protocol – supplier-specific data, industry averages, spend-based estimates or hybrid methods – to calculate emissions across their operations and supply networks. However, emissions data are typically collected from multiple internal sources, leading to fragmented, inconsistent and difficult-to-verify reporting. These limitations make it challenging for managers and stakeholders to obtain a clear and comparable view of corporate carbon performance.

These limitations also highlight the need for a more structured and standardised accounting system – one that can track emissions with the same rigour as financial transactions. Research by Reichelstein offers a standardised way of accounting for carbon emissions that, if implemented across nations, can bring uniformity and credibility to comparisons of companies.

Proposed framework

Reichelstein's carbon accounting framework is built on robust accounting principles and, thereby, extends its application to systematic tracking of carbon emissions.

The framework proposes a distinction between 'stock variables' (emissions embedded in assets such as machinery and equipment and other infrastructure) and 'flow variables' (emissions generated during operations in a given period such as annual emissions) to maintain consistency in reporting



The framework proposes a distinction between 'stock variables' (emissions embedded in assets like machinery and equipment and other infrastructure) and 'flow variables' (emissions generated during operations in a given period such as annual emissions) to maintain consistency in reporting. The cradle-to-gate product carbon footprints integrated by this framework provide emissions visibility at every level of the supply chain. For instance, an airline could calculate the carbon footprint of individual flights by combining emissions data from aircraft manufacturing, fuel combustion and operational activities. This accounting framework serves as a mechanism for transparent disclosure; however, its integrity relies entirely on companies gathering comprehensive data across Scope 1, 2 and 3 emissions.

Let's look at CE balance sheets for a manufacturing company (see Figure 1A) and a service company (see Figure 1B) using the proposed framework to understand how carbon emissions are recorded. This framework is similar to the traditional accounting equation.

CE in Assets = CE in Liabilities and Equity

Like the financial balance sheet, the CE balance sheet accumulates carbon balances over time. The left-hand side of this equation denotes carbon emissions embedded in the firms' operating assets. The right-hand side shows the sources of these emissions: Direct emissions from the firm or indirect emissions incurred through its suppliers.

Figure 1A: Carbon emissions flow statement for a manufacturing company for the year ended
(all units in lakh metric tonnes of CO₂ equivalent)

Ledger accounts which get affected in carbon accounting	Carbon emission in assets				Carbon emission in liabilities			
	PPE	Material	Work-in progress	Finished goods	Emissions transferred in	Direct emissions	Direct removal	Equity
Beginning balance	30.94				30.94			
Transactions								
Purchase of raw materials		80.08			80.08			
Transfer to WIP		-80.08	80.08					
Depreciation charge	-2.29		2.29					
Production emissions			40.29			40.29		
Transfer to finished goods			-122.66	123				
Emission transfer due to sales				-80				-79.69
Ending balances	28.65	0	0	43	111.02	40.29	0	-79.69

Source: Created by authors based on Stefan Reichelstein, "Corporate Carbon Accounting: Balance Sheets and Flow Statements," *Review of Accounting Studies* 29, no. 3 (2024): 2125-56, <https://doi.org/10.1007/s11142-024-09830-y>

Figure 1B: Carbon emissions flow statement for a service company for the year ended
(all units in lakh metric tonnes of CO₂ equivalent)

Ledger accounts which get affected in carbon accounting	Carbon emission in assets			Carbon emission in liabilities			
	PPE	Expenses on delivering the serves (electricity, travel, depreciation)	Value of services to be delivered	Emissions transferred in	Direct emissions	Direct removal	Equity
Beginning balance	110.94			110.94			
Transactions							
Spending on expenses while serving the clients in house		20.15			20.15		
Spending on travel		18.14			18.14		
Depreciation	-2.2	2.2					
Planting of trees		-6				-6	
Emission transfer due to transfer of services			-34.49				-34.49
Ending balances	108.74	34.49	-34.49	110.94	38.29	-6	-34.49

Source: Created by authors based on Stefan Reichelstein, “Corporate Carbon Accounting: Balance Sheets and Flow Statements,” *Review of Accounting Studies* 29, no. 3 (2024): 2125–56, <https://doi.org/10.1007/s11142-024-09830-y>

‘Beginning balance’ is the ‘stock’ of emissions locked up in property, plant and equipment (PPE), assets and the liabilities side of the balance sheet shows who is liable for the emission, whether it is the company itself or any other vendor. These emissions will eventually be released in the production of goods or services. Anything purchased from outsiders will be considered Scope 2 emissions affecting the liabilities side of the balance sheet, with the corresponding transferred emissions recorded on the asset side as purchased assets. Emissions from the production of goods or services are considered Scope 1, along with stocked emissions from long-term assets that are essentially transferred into the final product. When the product is sold, these emissions are effectively passed from the company to the customer. This is called Carbon Emission in Goods Sold (CEGS). The CEGS metric resembles Cost of Goods Sold (COGS) in the financial statements, providing insights into the company’s carbon intensity for current sales.

The framework also captures reductions in emissions. Investments in cleaner technologies, energy-efficient processes, carbon capture or nature-based solutions like afforestation can reduce a company’s overall carbon balance. The above carbon emissions flow statement (see Figure 1B) shows how a company creates, carries, passes on and reduces carbon over time. It begins with the carbon already locked in

physical assets such as buildings, machinery and digital infrastructure. As the company operates, additional carbon is added through day-to-day activities and through goods or services sourced from others. When a company delivers a product or service, the associated carbon is effectively passed along to customers. At the same time, investments in cleaner technology or removal efforts reduce the overall carbon burden. Together, this view makes carbon visible at every stage of the value chain – what already exists, what is added, what moves out and what is reduced. Thus, companies





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like Ultratech Cement and Infosys can present the flow of carbon alongside their financial statements, clearly showing year-on-year carbon emissions and whether they are turning carbon positive.

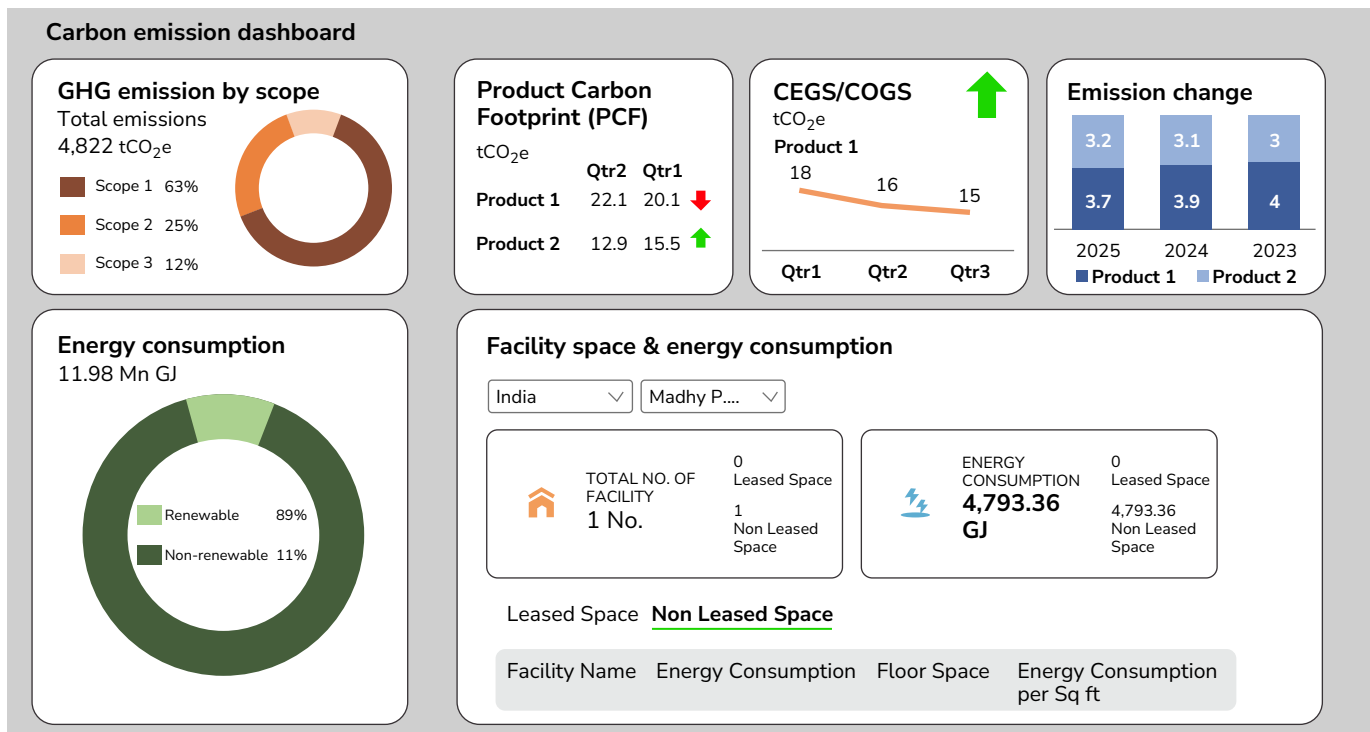
Industry adoption

Several leading companies have begun integrating carbon metrics into their management and reporting systems. Leading companies such as Microsoft, Google and BASF have already integrated GHG reporting into their financial reporting, thus demonstrating that transparent carbon accounting strengthens credibility and accountability.⁹ Microsoft treats carbon data as a

decision-grade management metric, rather than just a narrative for Environmental, Social and Governance data disclosure, alongside financial performance, as per the GHG Protocol.¹⁰ Google reports metrics such as the data centre’s Power Usage Effectiveness ratio and the emissions intensity of operations, similar to CEGS/COGS-style ratios, in which emissions are evaluated relative to business output.¹¹ Also in India, where carbon emission reporting is gaining importance for informed investment and lending decisions, this could be a preliminary step towards a transparent disclosure of carbon emissions.

A prototype dashboard, as shown in Figure 2, may be

Figure 2: Prototype dashboard



Source: Created by authors based on Orient Cement Limited, CK Birla Group, Annual Report 2023-24 (2024), https://orientcement.com/wp-content/uploads/2024/07/ORIENT_CEMENT_LIMITED_AR_2023-24.pdf.

maintained by companies and typically overseen by the Chief Sustainability Officer, while remaining aligned with financial reporting to ensure clarity and accessibility for CFOs and operations leaders.

The Volkswagen's Dieselgate example illustrates the risks of opaque reporting and a lack of a robust emissions measurement system. In 2015, the company was found to have installed software that manipulated emissions test results, allowing vehicles to appear compliant while emitting pollutants far above regulatory limits in real driving conditions. The incident highlights how structured carbon accounting could have exposed inconsistencies and improved comparability of reported emissions among companies.

Performance metrics

Product carbon footprint is an important metric for capturing emissions and is calculated by dividing the total carbon emissions of finished goods by the number of products produced. This could then be compared with industry standards of emissions to demonstrate measurable progress toward the sustainability goals.

Another possible metric for tracking the carbon intensity of a firm's sales products is CEGS/COGS. With this ratio

declining or turning negative, it would mean a positive contribution to the global climate.

The above two metrics may be reported along with other qualitative details in the annual report. This framework prevents companies from overlooking the embedded carbon emissions in their existing assets. It ensures comprehensive, ongoing accountability by meticulously recording and tracking emissions generated by every transaction—whether an asset purchase (stock) or an operational activity (flow).

Framework value

In 40 countries where greenhouse reporting is mandatory, the disclosed Scope 1–3 data can be directly mapped onto the company's emissions balance sheet by recording 'direct emissions' and supplier emissions as 'emissions transferred in' in the liabilities and removals as contra-liabilities.^{12,13} In addition to balance sheets, companies will find it easier to construct the corresponding emissions flow statements if they maintain product carbon footprint information. Cradle-to-gate footprints can be systematically linked to goods sold and reconciled with the company's balance sheet entries.

Glossary

- Scope 1 emissions: Direct GHG emissions occur from sources that are owned or controlled by the company.
- Scope 2 emissions: Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the company.
- Scope 3 emissions: Scope 3 emissions result from the company's activities but occur from sources not owned or controlled by the company.



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REFERENCES

- ¹ Stefan Reichelstein, "Corporate Carbon Accounting: Balance Sheets and Flow Statements," *Review of Accounting Studies* 29, no. 3 (2024): 2125–56, <https://doi.org/10.1007/s11142-024-09830-y>.
- ² K. Scholle, "Global Sustainability Reporting Rates 2024," Statista, March 3, 2026, <https://www.statista.com/statistics/1338724/sustainability-reporting-rates-worldwide/>.
- ³ Kyla Aiuto et al., "What Are Greenhouse Gas Accounting and Corporate Climate Disclosures? 6 Questions, Answered," 7 March 2024, <https://www.wri.org/insights/ghg-accounting-corporate-climate-disclosures-explained>.
- ⁴ Deloitte Canada, "Creating Value for Sustainable Products," 22 January 2024, <https://www.deloitte.com/ca/en/Industries/consumer/research/creating-value-for-sustainable-products.html>.
- ⁵ Sustainability Practice, "What Are Scope 1, 2, and 3 Emissions?," *Mckinsey Quarterly [Online]*, September 17, 2024, <https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-are-scope-1-2-and-3-emissions>.
- ⁶ Sustainability Practice, "What Are Scope 1, 2, and 3 Emissions?"
- ⁷ CDP Worldwide, "Climate Transition Plans," 2024, <https://www.cdp.net/en/climate-transition-plans>.
- ⁸ PwC India, *Navigating India's Transition to Sustainability Reporting*, February 2024, <https://www.pwc.in/assets/pdfs/navigating-indias-transition-to-sustainability-reporting.pdf>.
- ⁹ "GHG Emissions Accounting & ESG Data | Microsoft Sustainability," October 15, 2024, <https://www.microsoft.com/en-us/sustainability/learning-center/ghg-emissions-accounting-esg-data>.
- ¹⁰ Microsoft, *2025 Environmental Sustainability Report: Accelerating Progress to 2030 (2025)*, <https://cdn-dynmedia-1.microsoft.com/is/content/microsoftcorp/microsoft/msc/documents/presentations/CSR/2025-Microsoft-Environmental-Sustainability-Report.pdf#page=01>.
- ¹¹ "Power Usage Effectiveness," Google Data Centers, <https://datacenters.google/efficiency>.
- ¹² Neelam Singh and Lindsey Longendyke, "A Global Look at Mandatory Greenhouse Gas Reporting Programs," May 27, 2015, <https://www.wri.org/insights/global-look-mandatory-greenhouse-gas-reporting-programs>.
- ¹³ KPMG LLP, *Handbook: GHG Emissions Reporting (2024)*, <https://kpmg.com/kpmg-us/content/dam/kpmg/frv/pdf/2024/handbook-ghg-emissions-reporting-dec-2024.pdf>.

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