

Driving Product-Level Emissions Information in Dell's Supply Chain

*Columbia School of International and Public Affairs Capstone
Project, in collaboration with Dell Technologies*

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II. ABBREVIATIONS

ACRA - The Accounting and Corporate Regulatory Authority

ADEME - The French Agency for Environment and Energy Management

AF - Accelerated Filer

AGEC - Anti-Waste and Circular Economy Law

A-PACT - Automotive Partnership for Carbon Transparency

BCSD - Business Council for Sustainable Development

CARB - California Air Resources Board

CBAM - The Carbon Border Adjustment Mechanism

CCDAA - California's Climate Corporate Data Accountability Act

CDP - Carbon Disclosure Project

CDSB - Climate Disclosure Standards Board

CFP - Carbon Footprint

COP - Conference of the Parties

CSDDD - Corporate Sustainability Due Diligence Directive

CSRD - Corporate Sustainability Reporting Directive

CX-PCF - Catena-X Product Carbon Footprint

EF - Environmental Footprint

EFRAG - European Financial Reporting Advisory Group

EGC - Emerging Growth Company

EICC - Electronic Industry Citizenship Coalition

EPEAT - Electronic Product Environmental Assessment Tool

ESG - Environmental, Social, and Governance

ESRS - European Sustainability Reporting Standards

ETS - Emissions Trading System

EU - European Union

FCRL - French Climate and Resilience Law

FSA - Financial Services Agency

GBA - Global Battery Alliance

GEC - Global Electronics Council

GEM - Growth Enterprise Market

GeSI - Global e-Sustainability Initiative

GFANZ - Glasgow Financial Alliance for Net Zero

GHG - Greenhouse Gas

GHG Protocol - Greenhouse Gas Protocol

GRI - Global Reporting Initiative

ICT - Information and Communication Technology

IFRS - International Financial Reporting Standards

III - The Institute for Information Industry

iNEMI - International Electronics Manufacturing Initiative

IOSCO - International Organization of Securities Commissions

ISO - International Organization for Standardization

ISSB - The International Sustainability Standards Board

JRC - The Joint Research Centre

KCGS - Korea ESG Standards Institute

LAF - Large Accelerated Filer

LCA - Life Cycle Assessment

LCI - Life Cycle Inventory

LCIA - Life Cycle Impact Assessment

NAF - Non-accelerated Filer

NCA - National Competent Authorities

NDC - Nationally Determined Contribution

NFRD - Non-Financial Reporting Directive

NLCos - Non-Listed Companies

OEFSR - Organizational Environmental Footprint Sector Rules

OEM - Original Equipment Manufacturer

PAIA - Product Attribute to Impact Algorithm

PACT - Partnership for Carbon Transparency

PEF - Product Environmental Footprint

PEFCR - Product Environmental Footprint Category Rules

PCF - Product Carbon Footprint

RBA - Responsible Business Alliance

RMI - Rocky Mountain Institute

R2 - Responsible Recycling

SASB - Sustainability Accounting Standards Board

SCC - Semiconductor Climate Consortium

SEC - Securities and Exchange Commission

SER - Social and Environmental Responsibility

SERI - Sustainable Electronics Recycling International

SGX RegCo - Singapore Exchange Regulation

SME - Small and Medium-sized Enterprises (SMEs)

SRC - Smaller Reporting Company

SSBJ - Sustainability Standards Board of Japan

SSE - The United Nations Sustainable Stock Exchanges

TCFD - Task Force on Climate-Related Financial Disclosures

TfS - Together for Sustainability

UNFCCC - United Nations Framework Convention on Climate Change

WBCSD - World Business Council for Sustainable Development

WRI - World Resources Institute

III. EXECUTIVE SUMMARY

Increasingly stringent reporting requirements are placing new obligations on companies to report product-level emissions. Dell Technologies' Social and Environmental Responsibility (SER) team partnered with the Columbia SIPA Capstone Team to assess the emerging regulatory landscape for scope 3 category 1 emissions disclosures, as well as the trends in methodology frameworks for calculating and reporting scope 3 category 1 emissions.

This report provides a detailed analysis of the regulatory landscape for scope 3 category 1 emissions, with a particular focus on first-mover jurisdictions: the European Union, France, and the United States. For each of these jurisdictions, our team assessed the scope, disclosure requirements, timeline, and status of the respective regulation. For the European Union in particular, in many ways the global pace setter in this space, we include a detailed assessment of the transposition process, which dictates how European Union member states must integrate the regulation into their national legal and procedural landscape.

Since the regulatory landscape is rapidly evolving, we also include *watchpoints* for each jurisdiction, meant to aid Dell's SER team to stay up to date with each regulation. It is important to note that the United States is currently experiencing backlash against ESG regulations from some states and certain private parties, with both the Securities and Exchange Commission's (SEC) Climate Disclosure Rule and California's Climate Corporate Data Accountability Act (CCDAA) facing legal challenges. As such, the European Union's Corporate Sustainability Reporting Directive (CSRD) remains the most stringent and comprehensive GHG disclosure regulation to date. Companies such as Dell are required to submit their first disclosures by 2025 (for fiscal year 2024).

The report also assesses certain key jurisdictions where Dell's suppliers are located, including China, Japan, Singapore, South Korea, Taiwan, and Vietnam. Although regulations in these geographies are still nascent, trends point towards more stringent reporting requirements in the medium to long term, indicating that Dell and Dell suppliers must prepare for reporting now to stay ahead of the curve.

The report also provides Dell's SER team with a comprehensive overview of existing frameworks, technologies, and tools for tracking, calculating, and reporting scope 3 category 1 emissions. Our research explores industry-agnostic frameworks that could be tailored to Dell's operations, industry-specific frameworks that could be adapted to the information and communication technology (ICT) industry, and ICT sector-specific frameworks that other players in the industry are already utilizing. Our analysis of each framework includes assessing the general structure, its scope and boundary, and the methods and standards leveraged, among other elements.

We find that industry-specific frameworks generally align well with the Partnership for Carbon Transparency's (PACT) Pathfinder Framework and emphasize primary data sharing within industry supply chains. Industry-agnostic frameworks, on the other hand, establish standardized data models that align with PACT's guidelines but that can be customized to reflect the specific characteristics and requirements of each industry.

In addition, we provide a detailed assessment of industry initiatives and alliances in the space, including the Responsible Business Alliance (RBA), the Global Electronics Council (GEC), and the World Business Council for Sustainable Development (WBCSD). Companies that value sustainability have engaged in these initiatives to position themselves as leaders in the space or influence reporting standardization.

The information, insights, and recommendations in this report are designed to provide Dell's SER team with tools to support their work with the company, its suppliers, and peer companies within the ICT sector, to comply with the strictest reporting requirements, stay ahead of regulatory changes, and play a leadership role in the standardization of greenhouse gas (GHG) emissions reporting. Based on our research, we identified key opportunity areas, including:

- **Fostering Industry-Wide Collaboration:** Dell can play a leadership role in driving collaboration amongst peers in the development and implementation of harmonized frameworks and partnering with other ICT companies to participate in regulatory development and implementation conversations.
- **Embracing Standardization:** Dell can adopt or align with existing standardized frameworks such as PACT's Pathfinder Framework or Product Environmental Footprint (PEF) guidance. Aligning to these frameworks would advance consistency and comparability in product-level sustainability disclosures both within the ICT industry and across other industries.
- **Addressing Industry-Specific Challenges:** Progress can still be attained in tailoring frameworks and methodologies to the unique needs and challenges of the ICT industry. There is an opportunity for Dell to play a leadership role in developing additional guidance that caters to the unique needs of the ICT industry, such as considering durability, repairability, recyclability, and e-waste.
- **Keeping an Eye Towards the Future:** Given continuous changes in the regulatory landscape and available frameworks around product-level emissions reporting and monitoring ongoing changes will remain critical.

As consumers and investors continue calling for increased GHG emissions disclosures in line with company commitments, product-level reporting will become more relevant than ever. Calculating product-level GHG emissions not only equips companies with data to develop more sustainable products and meet emissions reduction targets, but also facilitates compliance with the emerging body of climate disclosure regulations. This creates new opportunities for Dell and Dell suppliers to efficiently and effectively advance product-level GHG emissions objectives.

IV. BACKGROUND

There is a growing consensus around the need for transparency in corporate environmental impact, with multiple stakeholders increasingly demanding greater accountability in how businesses contribute to sustainability goals. Alarmed by the rise of greenwashing and the existing opacity in environmental reporting, investors, consumers, and regulators alike have urgently called for detailed GHG emissions disclosures, especially at the product level.

As a result, a growing body of legislation aimed at disclosing GHG emissions has emerged. In November 2022, the European Union adopted the Corporate Sustainability Reporting Directive (CSRD), a groundbreaking legislation aimed at tackling greenwashing through greater emissions transparency.¹ Other countries have followed suit, including the United States, China, Singapore, Taiwan, Vietnam, and Japan. France has also implemented an ambitious climate law, the French Climate and Resilience Law, which outlines scope 3 category 1 requirements for two main relevant activities — labeling and advertising of products. The United States however has experienced rising anti-ESG sentiment, leading to pushback against its two GHG emissions disclosure legislations — the SEC’s Climate Disclosure Rule and California’s Climate Corporate Data Accountability Act (CCDAA). China, Japan, Singapore, Taiwan, and Vietnam, on the other hand, are still in the early stages of the legislative process. As such, the European Union’s CSRD remains the most stringent GHG disclosure regulation to date.

As countries around the globe begin to roll out increasingly stringent reporting requirements, companies are faced with new obligations to report product-level emissions. By tracking and calculating product-level GHG emissions, companies are equipped with additional information to make informed, data-driven decisions and improve product sustainability. Further, reporting emissions is a key tool for communicating a product’s sustainable attributes — allowing for the creation of science-backed ‘carbon tags’ or ‘eco-labels’ for products. Therefore, product-level emissions data helps cater to the needs of environmentally conscious consumers while calming investor concerns about climate risk.²

Accurately reporting product-level emissions requires a comprehensive assessment of a good’s scope 1, 2, and 3 GHG emissions. However, scope 3 emissions are particularly difficult to measure, especially for category 1, purchased goods and services. Calculating scope 3 emissions requires a detailed analysis of thousands of data points from multiple stakeholders, making it an arduous and time-consuming process.³ The fact that these data inputs come from stakeholders not under companies’ direct control makes calculating scope 3 emissions even more challenging.⁴

In response to the need for efficient, effective, and harmonized approaches to meet these growing demands and legal requirements, a series of frameworks and tools have been developed. Frameworks can be categorized into three distinct types: (1) industry-agnostic frameworks, such as the European Commission’s Product Environmental Footprint (PEF) framework, (2) industry-specific frameworks, such as the Product Carbon Footprint Guideline for the Chemical Industry, and (3) ICT-sector specific

¹ Branquart & Gorrin, 2024

² SEC Keynote Address at the 2021 Society for Corporate Governance National Conference, 2021

³ Yale Office of Sustainability, 2023

⁴ Ibid.

frameworks, such as the ICT Sector Guidance, developed by the Carbon Trust and the Global e-Sustainability Initiative (GeSI). Most existing frameworks align well with PACT's Pathfinder Framework, emphasize primary data sharing within industry supply chains, and reflect widespread collaboration with WBCSD and other industry players. In addition, several ICT industry groups are spearheading initiatives to maintain and share GHG emissions data, although these efforts are still in their early stages.

This report aims to provide Dell Technologies' SER team with a comprehensive overview of the regulatory landscape for scope 3 category 1 GHG emissions and existing frameworks, technologies, and tools to monitor, calculate, and report scope 3 category 1 emissions. Despite pushback in some jurisdictions, trends indicate that GHG emissions reporting is here to stay. The information and insights in the report are intended to support Dell's SER team in its work to enable Dell and Dell suppliers to meet current regulatory requirements and to prepare for future demands and regulatory changes.

V. LANDSCAPE ASSESSMENT

A. CONTEXT - EXTERNAL FACTORS INFLUENCING REGULATORY / FRAMEWORK ENVIRONMENT

Global efforts to combat climate change are accelerating. The 2015 Paris Agreement, amongst other international agreements, set the stage for ambitious climate action. Seeking to limit the effects of global warming, governments around the world have pledged to reduce their GHG emissions. These commitments have underscored the need for emissions tracking, contributing to the emergence of national climate-disclosure laws. Simultaneously, a heightened environmental awareness among consumers and investors has emerged. Consumers are increasingly demanding sustainable products and investors are increasingly interested in understanding climate risks. As a result of these dynamics, governments are encountering mounting pressures from multiple directions to impose stricter corporate sustainability disclosures on corporations.

Product-level disclosures, which can provide greater specificity and transparency regarding the environmental impact of corporate activities, have surfaced as a powerful tool for addressing investor and consumer concerns. As product-level disclosures gain traction in government regulations and frameworks, corporations must be prepared to adjust to an evolving landscape of external expectations and obligations.

International Agreements & Global Initiatives

The last decade has seen an uptick in international agreements to combat climate change, prompting countries to pledge significant reductions in GHG emissions. Robust national climate targets are shaping legislation at the country-level. This is particularly salient in first-mover jurisdictions within the European Union and the United States. Here it is important to highlight some of the most influential of these agreements and initiatives.

The Paris Agreement, a landmark international treaty on climate change, brought international attention to climate disclosures. Adopted in 2015 and notably signed by every country in the world, the Paris Agreement aims to limit global warming to below 2°C, and preferably to 1.5°C, compared to pre-industrial levels. All signatories must submit a climate plan detailing their emissions reduction targets, strategies for achieving these goals, and methods for monitoring progress — also known as nationally determined contribution (NDC). As a result, the Paris Agreement lays the foundation for national-level monitoring, collecting, and reporting of GHG emissions.

Although the Paris Agreement does not mandate product-level GHG disclosures, it was the first international framework for reducing the global carbon footprint. The push for product-level GHG disclosures can thus be seen as an extension of the Paris Agreement. As countries and businesses seek to meet their NDCs and reduce their carbon footprints, product-level emissions data becomes increasingly valuable as it allows for additional transparency and specificity into potential reduction areas.

The United Nations Sustainable Stock Exchanges (SSE) Initiative was launched in 2009 by the UN Secretary-General and has since emerged as a pivotal peer-to-peer learning platform. Designed to both foster sustainable investment and elevate corporate performance across environmental, social, and

corporate governance (ESG) issues, this ambitious initiative aims to catalyze sustainable practices among global exchanges; indirectly this should help sculpt the market environment and the regulatory frameworks they navigate. The SSE Initiative does not directly legislate on product-level emissions regulations. However, its substantial impact on the market and corporate behavior is undeniable, significantly shaping how companies tackle emissions in their offerings.

The SSE Initiative has had an important impact on the general regulatory environment. These impacts are felt due to the SSE's work promoting and implementing transparency enhancing measures around sustainability (e.g., emissions data within participating stock exchanges), the SSE's creation of sustainable investment vehicles (e.g., green bonds, which play a critical role in financing ventures aimed at curtailing product-level emissions), the cultivation of a market ethos that prizes sustainability, and the SSE's work defining sustainable practices (including those pertinent to emissions).

When the SSE launched its "Model Guidance" for exchanges in 2015, less than 10% of stock exchanges around the world were providing guidance on reporting environmental, social, and governance (ESG) information for their market. This number now stands at 59%.⁵

With its extensive network and influential capacity, this cooperative platform is likely to further affect the regulatory landscape by strategically advocating for policies that bolster sustainability objectives, including those addressing product-level emissions.

The Glasgow Financial Alliance for Net Zero (GFANZ), came into existence at the COP26 summit in 2021. GFANZ is a global coalition of an unprecedented array of banks, insurers, and investors, all pledging to align their lending and investment portfolios with the ambitious objectives of net zero GHG emissions by 2050, in accordance with the Paris Agreement's goal to limit global warming to 1.5°C above pre-industrial levels.

GFANZ operates under the principle that the financial sector holds the keys to unlocking the systemic transformations required to address the climate crisis. Through collective action and stringent commitments, GFANZ members are pivotal architects in shaping a sustainable future. GFANZ ties together members' portfolios with a net zero future, linking the mobilization of trillions in private capital necessary for the global transition to a low-carbon economy, while squarely placing the focus on sustainable development.

A significant chunk of this capital goes to financing climate solutions that include companies innovating in energy efficiency and sustainable manufacturing. GFANZ's efforts promote a shift towards environmentally friendly practices in manufacturing and product design, aligning the technology sector among others with global net zero objectives. GFANZ developed the Net Zero Transition Plan Framework⁶ and Expectations for Real Economy Transition Plans.⁷ These encourage companies to adopt science-based targets for emissions reduction, encompassing product-level emissions in their operations and supply chains.

⁵ Sustainable Stocks Exchanges Initiative, n.d.

⁶ Glasgow Financial Alliance for Net Zero, 2022a

⁷ Glasgow Financial Alliance for Net Zero, 2022b

By voicing the collective influence of its members, GFANZ aims to encourage governments and regulators to implement policy frameworks that facilitate increased climate finance and investment in green technologies. Although a recent initiative, GFANZ represents a critical juncture in the financial sector's engagement with climate action, embodying a collective determination to steer global finance in support of a sustainable and resilient future.

The International Sustainability Standards Board (ISSB) is another initiative that came into existence during COP26. The ISSB's formation came as a response to strong market demand for standardized, high-quality sustainability disclosures that address the needs of investors and the financial markets. Its efforts focus on creating a framework/standard to enhance transparency and accountability in corporate environmental impact, including emissions reporting. ISSB's work is backed by significant global consensus showcased by an array of international bodies supporting them including the G7, G20, the International Organization of Securities Commissions (IOSCO), and the Financial Stability Board among others.⁸

The ISSB has developed two key standards, General Requirements for Disclosure of Sustainability-related Financial Information (IFRS S1) and Climate-related Disclosures (IFRS S2), which are structured around four areas: governance, strategy, risk management, and metrics and targets (this is discussed in additional detail in the "Industry-Agnostic Frameworks" section of this report). These standards are designed to work harmoniously with jurisdiction-specific requirements around the world.

This is a significant landmark development in global efforts to harmonize and elevate sustainability reporting.

In October 2022, ISSB voted for confirmation of scope 3 GHG emissions disclosure requirements, emphasizing the importance of companies reporting not only their direct (scope 1) and indirect (scope 2) GHG emissions but also those emissions that occur in their value chain (scope 3).⁹ This requirement for comprehensive emissions reporting has already made a significant impact on product-level emissions regulations.

The ISSB standards are currently voluntary but their adoption and implementation by companies around the world, along with the support of governments, can already be seen in upcoming regulations and will likely have a significant influence on new regulations.

The G20 Sustainable Finance Roadmap, like GFANZ, is an initiative designed on the principle that the financial sector holds the keys to unlocking the systemic transformations required to address the climate crisis. However, rather than having private members, the G20 Roadmap is instead a collective effort by the world's major economies to align financial systems with more sustainable and green practices. This financial redirection is focused on supporting industries and technologies aimed at reducing emissions, including the development of low-emission products and services to create a net zero future.

⁸ International Financial Reporting Standards, n.d.

⁹ International Financial Reporting Standards, 2022

A central feature of the G20 Roadmap is its emphasis on international harmonization of standards across borders to ensure a unified global approach to sustainable finance. This includes encouraging the adoption of common taxonomies for sustainable activities, enhancing the comparability and interoperability of sustainability reporting standards, and improving the quality of sustainability data available to investors and other financial market participants.

The G20 Roadmap, much like its counterpart GFANZ, does not directly set product-level emissions regulations. Unlike GFANZ though, its members do set product-level emissions regulations at their individual country-level or as a bloc.

Thus far, the G20 Roadmap has supported the work of the IFRS Foundation in developing internationally consistent sustainability disclosure standards. The initiatives taken by the G20 Roadmap have and will likely lead to an even more conducive environment for such regulations, particularly when seen through the context of its intersection with the IFRS.

Consumer, Corporate, and Investor Sentiment

Increased consumer, corporate, and investor attention around sustainability is another driving factor behind climate disclosure legislation.

For consumers, the rising cost of living along with increased consumer environmental consciousness is leading to the growing adoption of sustainable lifestyles and environmentally conscious purchase decisions. In addition to opting for sustainable brands and products, consumers are increasingly calling for stricter regulatory oversight on businesses to ensure that corporate practices align with environmentally responsible standards. Growing customer demand for greater transparency around the products they are consuming is increasingly incentivizing companies to better track their sustainability at the product level.

For investors, mounting concerns about climate-related risks have also influenced the regulatory environment. Many investors recognize the ways in which climate risks can affect company performance. As a result, climate disclosures have served as a useful method for assessing and managing these long-term investment risks, prompting investors to demand detailed climate-risk and GHG emissions data. Investor calls for enhanced climate-related data are increasingly shaping legislation.

This shift in consumer and investor preferences towards products and firms committed to ESG has compelled companies to integrate sustainable practices into their value propositions. Companies are adopting circular economy principles, making net zero commitments, and advancing additional responsible business practices throughout their operations and supply chains. To communicate sustainability targets and company progress, measuring and reporting has become a key corporate function. However, the lack of standardized reporting requirements and methodologies has made it difficult to compare data, and at times, has led to greenwashing. The inconsistency in corporate GHG emissions reporting has further highlighted the need for increased regulatory oversight, pushing governments to strengthen their regulatory efforts.

B. REGULATORY ENVIRONMENT

EUROPE

Europe continues to be a key region to watch given the continued development of regulations around climate change and the green transition. The European Green Deal and its associated set of policies and workstreams, as well as activity at the Member state-level, continues to set standards for companies with business operations across Europe and the world. Emerging and existing regulations touch a variety of topics including greenwashing, carbon emissions, circularity, waste, and more. Regulations and efforts that fall under the Corporate Sustainability Reporting Directive (CSRD), the French Climate and Resilience Law (FCRL), and others highlight evolving requirements for reporting on scope 3 category 1 emissions.

Corporate Sustainability Reporting Directive (CSRD)

Background:

In Europe, there is a growing demand for corporate sustainability information in part driven by investors. Investors are becoming more aware of the risks and opportunities resulting from environmental issues and are interested in investment products that explicitly seek to meet sustainability standards. At the same time, all EU Member States are committed to transforming the EU into the first climate-neutral continent under the European Green Deal. These ambitious goals are achieved by ensuring net zero emissions of GHG by 2050, economic growth decoupled from resource use, and no person and no place left behind in a just transition to a sustainable economic system.¹⁰

EU regulators have discovered many companies do not disclose material information on all major sustainability-related topics, including climate-related information such as GHG emissions, and factors that affect biodiversity.¹¹ Regulators also identified a lack of generally accepted metrics and methods for measuring, valuing, and managing sustainability-related risks. Consequently, the European Commission introduced the EU CSRD proposal in April 2021 which entered into force on June 5th, 2023, as a part of the European Green Deal.¹²

The CSRD aims to provide corporate sustainability information that is comparable and reliable across Member States so that investors, customers, and other stakeholders can better evaluate companies' sustainability performance and the related business impacts and risks. The Directive also levels the playing field for companies operating in the EU internal market by requiring both EU and non-EU companies, including small and medium-sized enterprises (SMEs), to disclose their environmental and societal footprints. It expands the scope, sustainability disclosures, and reporting requirements of its predecessor, the Non-Financial Reporting Directive (NFRD).

¹⁰ European Commission, n.d. a

¹¹ Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards Corporate Sustainability Reporting (2022). <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022L2464>

¹² Council of the European Union, 2022

Reporting under the CSRD is based on the concept of “double materiality,” which was first introduced by the European Commission in 2019. Under this concept, companies must report both on the impacts of their business activities on people and the environment, as well as how sustainability matters affect the business’ financial health.¹³

Scope and Timeline:

As mentioned above, the CSRD also applies to non-EU companies and SMEs with varying capacities and resource levels compared to large EU companies. Therefore, in 2024, the CSRD will initially apply to large EU companies already subject to the NFRD. Gradually, the CSRD will apply to more companies over the next four years to give non-EU companies and SMEs more time to prepare. The scope and timeline for the CSRD application stages can be seen below.

Table 1. The Scope and Timeline of CSRD Application Stages:

	Category	Description	Timeline	
			Financial Year	Reporting In
1	<i>Large EU companies already subjected to the NFRD</i>	Any large EU company which: a) is a 'public interest entity'; and b) has more than 500 employees	2024	2025
2	<i>Large EU companies and EU parent companies of large groups (other than those in category 1)</i>	Any listed or non-listed company that meets two of the following three criteria on any two consecutive balance sheet dates: a) At least 25 million euros in total assets b) At least 50 million euros in net turnover c) At least 250 employees (average) during the financial year	2025	2026
3	<i>Listed SMEs, small and non-complex credit institutions, and captive insurance companies</i>	Companies listed on an EU-regulated market that meet at least two or three of the following criteria: a) At least 5 million euros in total assets b) At least 10 million euros in net turnover c) At least 50 employees on average during the financial year	2026	2027
4	<i>Third-country companies</i>	Non-EU parent companies with net turnover of at least 150 million euros in the most recent two years, who also own: a) An EU-based subsidiary that meets the criteria under category 2 or 3 above; or b) An EU branch office with at least 40 million euros in net turnover	2028	2029

¹³ IBM, 2024

Disclosure Requirements:

In implementing the sustainability reporting obligations of the CSRD, the European Financial Reporting Advisory Group (EFRAG) is tasked with providing technical advice to the European Commission in the form of draft European Sustainability Reporting Standards (ESRS). The ESRS outlines metrics companies must report and information about how to report. In developing the standards, EFRAG conducted public consultations with a range of stakeholders including investors, civil society organizations, and consumers.¹⁴ EFRAG also fosters coordination between the EU sustainability reporting standards and international initiatives to ensure consistency of standards globally.¹⁵

To date, EFRAG has developed 12 ESRS covering the full range of sustainability issues with a double materiality approach. ESRS E1 on Climate Change and ESRS E5 on Resource Use and Circular Economy are the most relevant standards in regard to scope 3 category 1 emissions at the product level and the only standards that will be discussed in this report. ESRS E1 relates to how companies affect climate change through emissions generated from their purchased goods. ESRS E5 relates to the efficiency or productivity of resource use of the companies' own operations and their value chain, which is key for adopting circularity in the production process. Circularity is an important approach as the EU decouples economic growth from resource use per the European Green Deal.¹⁶

- *ESRS E1 on Climate Change*: Under ESRS E1, companies are required to disclose the following information¹⁷:
 - Gross GHG emissions (CO₂, CH₄, N₂O, HFCs, PFCs, SF₆, and NF₃) in CO₂eq from each significant scope 3 category
 - Companies should consider the principles and provisions of the Greenhouse Gas Protocol (GHG Protocol) Corporate Value Chain (scope 3) Accounting and Reporting Standard and requirements for the quantification of indirect GHG emissions from ISO 14068:2018
 - Companies may disaggregate their scope 3 emissions by country, operating segments, economic activity, subsidiary, GHG category, or source type as appropriate
 - GHG emissions from purchased cloud computing and data center services, if it is material for companies' scope 3 emissions
 - Biogenic emissions of carbon from the combustion or biodegradation of biomass that occur in companies' value chain and other emissions of CO₂ that occur in the life cycle of biomass other than from combustion or biodegradation
 - Carbon uptakes and emissions (CO₂, CO, CH₄) from land use and land use change in companies' value chain
 - GHG emissions intensity, or total GHG emissions (t CO₂eq) per net revenue (monetary unit e.g., euros), in metric tonnes of CO₂eq, and present the results for the market-based and location-based method
- *ESRS E5 on Resource Use and Circular Economy*: Under ESRS E5, companies are required to

¹⁴ European Commission, 2023a

¹⁵ European Financial Reporting Advisory Group, n.d. a

¹⁶ Organisation for Economic Co-operation and Development, 2008

¹⁷ European Financial Reporting Advisory Group, 2022a

disclose the following information¹⁸:

- Material resource inflows, which refer to all products and materials used for the production and packaging of products and services including materials (raw, associated process materials, and semi-manufactured goods or parts), products, packaging, plant property, and equipment. Companies shall provide the following data:
 - The overall total weight (in tonnes or kilos) of products and materials
 - The weight in both absolute value (in tonnes or kilos) and percentage of renewable input materials from regenerative sources used to manufacture the companies' products and services including packaging
 - The weight in both absolute value (in tonnes or kilos) and percentage, of reused or recycled products and materials (non-virgin) used to manufacture the companies' products and services including packaging
- Material resource outflows, which refer to all materials and products that leave the companies' production process and that companies put on the market, designed along circular principles, including durability, reusability, repairability, disassembly, remanufacturing, refurbishment, recycling, or other optimization of the use of the resource. Companies shall provide the following data:
 - The total weight (in tonnes) and percentage of materials that leave the companies' production processes including packaging that has been designed with circular principles
 - The weight (in tonnes) and percentage of materials and products that leave the companies including packaging that is designed to enhance or enable the circular economy for customers further down the value chain

The Role of Product-Level Emissions Measurement and Reporting

Under ESRS E5, companies are required to disclose material resource inflows and outflows at the product level to demonstrate their contribution to the circular economy in the EU. This shows that measuring and reporting product-level emissions — specifically based on resource use — helps companies comply with climate-disclosure regulations such as the CSRD. Furthermore, product-level emissions measurement and reporting can support companies in applying principles of circularity which reinforce companies' climate change mitigation and adaptation strategies.

¹⁸ European Financial Reporting Advisory Group, 2022b

Current Status:

Given the CSRD has entered into force, the European Commission is mandated to adopt a second set of sustainability reporting standards amending the CSRD for certain sectors and for certain third-country companies by June 30th, 2024. Sectors include oil and gas; coal, quarries, and mining; road transport; agriculture, farming, and fisheries; motor vehicles; energy production and utilities; food and beverages; and textiles, accessories, footwear, and jewelry.¹⁹ However, in February 2024, the European Council and European Parliament provisionally agreed to push the timeline out by two years to June 2026.²⁰ This delay is to provide more time for companies to implement the first set of ESRS and prepare for the upcoming ones, especially for the sectoral ESRS. Note that EFRAG can publish the new reporting standards even before the deadline.²¹ Additionally, the new standards for third-country companies will be reduced by 25%²² based on the European Commission proposal.²³

Despite the current development at the regional level, Member States need to transpose the CSRD as explained more in the below section. By April 30th, 2029, and every three years thereafter, the European Commission will review the implementation of the CSRD and submit the report to the European Parliament and the European Council, including the convergence of reporting practices between Member States.²⁴

Transposition:

Given EU processes, Member States must transpose the CSRD by July 6th, 2024 — that is, states must find ways to integrate the law into their national legal and procedural landscape. Transposition will lead to variations in how the CSRD is understood in national laws. The stringent outcomes stated in the CSRD must be achieved, however, Member States may implement the Directive in ways that are more stringent than the CSRD requires. While some states may more directly transfer the text of the CSRD into their laws, other states may attempt to change the law further, or rely more on existing local laws that are already more stringent. Variations in the application of the CSRD may include, but are not limited to differences in:

- Auditing/investigative processes
- Sanctions
- Companies required to report
- Timelines for implementation

The processes and timelines to transpose a Directive differ by state, therefore understanding the status of the CSRD's transposition requires tracking at the Member State-level. As of April 2024, France, Finland, Hungary, Czech Republic, and Romania are the only states with implementing legislation approved, while other states are at various stages of the process of transposing.²⁵ Tracking how the Directive is transposed in each state is critical for companies as they work to understand the most stringent reporting requirements.

¹⁹ European Financial Reporting Advisory Group, n.d. b

²⁰ Council of the European Union, 2024

²¹ Protiviti, n.d.

²² Ibid.

²³ Council of the European Union, 2024

²⁴ Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards Corporate Sustainability Reporting (2022). <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022L2464>

²⁵ Ropes & Gray, 2024

A detailed overview of the status of transposition can be found in Table 2.

Table 2. Status of Transposition (data from Ropes & Gray)²⁶:

**Transposition in progress means steps have been taken such as ‘consultations held’ or ‘implementing legislation introduced’*

Member State	Status
Austria	No Action Taken
Belgium	No Action Taken
Bulgaria	Transposition in Progress
Croatia	Transposition in Progress
Republic of Cyprus	No Action Taken
Czech Republic	Implementing Legislation Approved
Denmark	Transposition in Progress
Estonia	Transposition in Progress
Finland	Implementing Legislation Approved
France	Implementing Legislation Approved
Germany	Transposition in Progress
Greece	No Action Taken
Hungary	Implementing Legislation Approved
Ireland	Transposition in Progress
Italy	Transposition in Progress
Latvia	Transposition in Progress
Lithuania	Transposition in Progress
Luxembourg	Transposition in Progress
Malta	No Action Taken
Netherlands	Transposition in Progress
Poland	No Action Taken
Portugal	No Action Taken
Romania	Implementing Legislation Approved
Slovakia	Transposition in Progress
Slovenia	Transposition in Progress
Spain	Transposition in Progress
Sweden	Transposition in Progress
European Economic Area EFTA Countries	Iceland - No Action Taken Liechtenstein - Transposition in Progress Norway - Transposition in Progress

²⁶ Ibid.

Watchpoints:

As the regulatory landscape in the EU continues to shift, companies need to monitor key issues and actors that may influence the CSRD and ESRS. To stay ahead of emerging potential sustainability reporting requirements, companies may consider the following watchpoints:

- **Backlash from EU Lawmakers:** Not all EU lawmakers support robust sustainability reporting as required under the CSRD. The center-right party pushed for a weakening of ESRS as can be seen in the motion objecting to the Delegated Act for the ESRS by the European Parliament's largest party, the European People's Party, on October 18th, 2023.²⁷ The party argues that the standards put a high administrative burden on companies. Even though the European Parliament voted to reject the motion, the political dynamic between the center-right and the left, including The Greens/European Free Alliance, is a deciding factor in the adoption of future sustainability-related regulations.²⁸
- **Corporate Sustainability Due Diligence Directive (CSDDD):** The CSRD goes hand in hand with the CSDDD, as they both are key axes of the European sustainable framework. In this context, the development of the CSDDD will directly affect the CSRD. The delay in adopting the CSDDD and its watering down from the original agreement, could potentially result in the weakening of the CSRD and ESRS in the near future.²⁹
- **Climate Disclosure Regulations in the U.S.:** Although the European Union is often a leader in sustainability regulations and standards, regulations in other parts of the world, such as the U.S., also influence the political dynamics in the EU. The diluted and delayed climate-related disclosure rule by the SEC could be ammunition for the center-right to oppose any rigorous sustainability disclosure standards.
- **Member States National Legislation:** The implementation of the CSRD hinges on Member States' national legislation, especially how Member States choose to implement penalties for infringements. One instance is France, the first EU Member State to transpose the CSRD. France introduced fines and possible jail times for non-compliance with sustainable disclosure. Additionally, companies need to pay attention to countries that have adopted and will potentially adopt national reporting requirements that are more stringent than regional ones.

²⁷ Jones, 2023

²⁸ BDO Global, 2023

²⁹ McGowan, 2024

French Climate & Resilience Law (FCRL)

Background:

In addition to requirements the CSRD imposes on Member States, states have also taken action to develop national-level requirements that detail obligations around scope 3 category 1 reporting. France’s efforts come in the context of an array of regulations and other efforts established to support broader climate and sustainability-related goals within the country (more below under “France’s Regulatory Landscape”).

The French Climate and Resilience Law (FCRL), “LOI n° 2021-1104 du 22 août 2021 portant lutte contre le dérèglement climatique et renforcement de la résilience face à ses effets,” emerged in this context and with the specific goal of supporting the EU’s ambition to cut GHG emissions by 55% (at a minimum) by 2030.³⁰ The FCRL is cited as a byproduct of the Citizen Climate Convention of 2019, which eventually led to the identification of five key focus areas later reflected in the FCRL: consumption, production/work, travel, housing, and food.³¹

France’s Regulatory Landscape - Spotlight on Digital Technologies:

The FCRL comes in the context of other existing French laws related to GHG emissions reporting such as the Grenelle II law.

However, there has proven to be a regulatory appetite for targeting the environmental impact of the digital sector specifically.

Other relevant regulations that specifically outline expectations for digital technology companies include the “REEN” law of November 15th, 2021 which sets out to decrease the environmental footprint of digital technologies, and “focuses on raising awareness, promoting reuse and recycling, adopting sustainable digital practices, and encouraging energy-efficient data centers.”³² The Anti-Waste and Circular Economy Law (AGEC), which also discusses digital technologies, focuses on “informing consumers about the environmental impact of their digital [and data] consumption, alongside mandatory repairability and durability indexes for digital products.”³³ AGEC resulted in labeling for electronic/electrical devices including repairability and sustainability indexes on the French market.³⁴

These specific regulations are foregrounded by ongoing initiatives within France about how to decarbonize the digital sector. These include the creation of a roadmap for decarbonization created by a variety of stakeholders and a “Digital Task Force” focusing on a “Sobriety Plan,” targeting ways to decrease energy consumption in the sector.³⁵ Notably, in France’s “France 2030” plan, made up of many initiatives to move France forward towards 2030, there is a focus on digital technology and its

³⁰ Vie Publique, 2021

³¹ Ibid.

³² Ministère de la Transition écologique et de la Cohésion des territoires, 2024a

³³ Ibid.

³⁴ République Française, 2024

³⁵ Ministère de la Transition écologique et de la Cohésion des territoires, 2024b

environmental footprint as well as a forward-looking view on mitigating issues through eco-design.³⁶

This is an overview of some of the main initiatives currently taking place. However, it is important to highlight the increased prevalence of initiatives, studies, and laws in France focused on finding solutions to the environmental impacts of digital products.

Scope:

The FCRL covers five key focus areas — consumption, production/work, travel, housing, and food — setting out requirements for the state, as well as for companies with products on the French market.³⁷

The applicability of the FCRL will vary across sectors based on decrees and recommendations, some of which are outstanding. Variations across sectors are unclear at this time though may include differences in reporting requirements, sizes of companies required to report, and more.

Note that other articles within the FCRL detail spare parts/repair obligations for IT companies but this is not specific to scope 3 category 1 emissions and therefore will not be detailed in the below disclosure requirements review.

Disclosure Requirements:

As it relates to scope 3 category 1 emissions reporting, the FCRL outlines requirements for two main activities — labeling and advertising of products — by which businesses must abide. Additionally, there is an article concerning transport that may be relevant to companies reporting on scope 3 category 1 emissions depending on the interpretation of the law.

Requirements around labeling and advertising both live within the first thematic section of the FCRL, which focuses on consumption. Given the complexity of the legal interpretation of the FCRL, please also reference the full legal text provided in the citations and footnotes to understand the context.

- *Labeling*: Labeling requirements are detailed in article 2 of chapter 1, which includes requirements for building awareness and education about the origins and environmental impact of products.
 - **Article 2**

Article 2 updates the existing Environmental Code with the inclusion of required labeling for products/services on the French national market. Labeling must provide customers with information regarding the environmental impact of that product/service over its life cycle. In this context, this life cycle environmental impact should be understood as including GHG emissions, the use of natural resources (e.g., water), and negative impacts on the

³⁶ Ministère de la Transition écologique et de la Cohésion des territoires, 2024b

³⁷ LOI n° 2021-1104 du 22 août 2021 portant lutte contre le dérèglement climatique et renforcement de la résilience face à ses effets (2021). <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000043956924>

environment (e.g., impacts to biodiversity). Required labeling must be clearly visible to customers at the time they are making a purchase and information must be communicated in a way that is easy to understand.

Article 2 also discusses the role decrees will play in specifying which sectors of goods and services will be impacted, the calculation methodology, and the selected display format. Importantly, the FCRL states this information will vary based on the type of goods/services. For those sectors not specifically identified, disclosure in the form of labeling is voluntary — but other forms of disclosure in labeling are forbidden.

The final calculation and labeling methodology is to be identified through experimentation phases that article 2 specifies should last no longer than five years. The law outlines priority sectors whose experimentation phases should begin six months after the FCRL is promulgated, with a specific emphasis on the fashion/textile sector. Other industries cited that should also promptly begin experimentation phases include food and electronic products, among others. See below box “Current Status of FCRL-mandated Industry-Specific, Environmental Labeling Schemes” for more detail.

Current Status of FCRL-mandated Industry-Specific, Environmental Labeling Schemes:

According to the French Government’s website, the textile and food industries are both actively in pilots and closest to the adoption of standard calculation and display.³⁸ The French Agency for Environment and Energy Management (ADEME) has said their 2024 priority is for finalized labeling to be in use for food and textiles. ADEME states that both food and textiles will leverage an “enriched PEF” (Product Environmental Footprint) calculation. Databases for environmental values for each sector are available.³⁹

The French Government states furniture and cosmetics are entering pilot phases in 2024.⁴⁰ The timeline for pilots around electronics is not yet clear.

**It is important to note that other labeling schemes in the French market already exist for electronics and other products based on AGEC and other regulations.*

Accordingly, there may be circumstances in which, based on decree, the back-up data used to create the environmental labeling may need to be shared in a way that is accessible. Further detail has yet to be provided in relation to this expectation.

A lack of labeling, or instances in which labeling does not meet these requirements, may result in fines no greater than 15,000 euros to legal entities and no greater than 3,000 euros

³⁸ ADEME, n.d. a

³⁹ ADEME, n.d. b

⁴⁰ Gouvernement, n.d.

to individuals.

- *Advertising*: Requirements concerning advertisements are detailed in article 7-22 of chapter 2 within the consumption section of the FCRL. These articles cover a range of topics including the banning of greenwashing, regulation around fossil fuel advertising, and more. Article 7 and 12 are the most relevant to scope 3 category 1 emissions, therefore these will be the focus of the below section.

- **Article 7**

Article 7 amends the existing Environmental Code. Per article 7, in advertisements for the outlined relevant products, information should be displayed regarding the environmental impact of that good or service across its entire life cycle. This applies to goods and services that will have required labeling under decrees for article 2 of the FCRL, as well as to products that are already required to have energy labeling based on article 16 of EU Regulation 2017/1369 (or an additional code concerning vehicles). Fines associated with a lack of compliance include 20,000 euros for individuals and 100,000 for legal entities – however, these fines are subject to increases in certain circumstances, including instances of continued offense. However, legal interpretation is required to identify if this article sets out additional requirements for companies or if this is only required in cases in which this information is accessible.

Article 7 also explains that those products subject to labeling required by article 2 of the FCRL as well as by article 16 of EU Regulation 2017/1369 (or an additional code concerning vehicles), and who spend more than or equal to 100,000 euros each year on advertising, must ensure they specifically report to the Responsible Advertising platform run by the French government. Lack of compliance may lead to a fine of up to 30,000 euros. According to the Responsible Advertising website, it appears Dell is already reporting according to its obligations.⁴¹

- **Article 12**

Article 12 also amends the existing Environmental Code by prohibiting the use of the words “carbon neutral” or other equivalent claims unless additional information is provided (all equivalent claims are encapsulated in the term “carbon neutral” for the remainder of this section). Decree 2022-539 went into effect in January 2023 in support of article 12, which outlines the specific reporting requirements for cases in which companies do claim their products are carbon neutral.⁴²

In accordance with Decree number 2022-539, for cases in which companies wish to make carbon neutral claims regarding their products, companies must:

⁴¹ République Française, 2023a

⁴² Décret n° 2022-539 du 13 avril 2022 relatif à la compensation carbone et aux allégations de neutralité carbone dans la publicité (2022). <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000045570611>

- Ensure the company’s online public communication or mobile application provides access to a report outlining the carbon footprint associated with that product/service, with details regarding how the company has avoided emitting GHG emissions as well as tactics leveraged to decrease and compensate for emissions. Customers should be able to access this report from the advertisement.
 - This report should be updated annually while the product is being marketed with the carbon neutral claim.
- The report should also contain additional back-up information including:
 - A balance sheet that details the GHG emissions associated with the product/service across its life cycle.
 - This information must be updated on an annual basis and reported with regard to NF EN ISO 14067 standards (or equivalent). Information about how this balance sheet was created and calculated should also be included with detailed information regarding, but not limited to, information about where emissions occurred (e.g. which country), the data used in calculating gas and electricity consumption, information regarding employed units, and more.
 - Annual product/service-level reduction targets for GHG emissions with targets for ten years, updated on a five-year cadence.
 - Information regarding compensation efforts to address residual GHG emissions, including information regarding costs associated with compensation efforts in three levels: less than 10 euros/tCO₂, greater than 40 euros/tCO₂, and between 10 euros and 40 euros/tCO₂.

An additional Decree No. 2022-538 outlines the sanctions for instances of non-compliance with the above Decree 2022-539 concerning article 12.⁴³ Decree No. 2022-538 states the Minister of the Environment will first provide notice to companies who fail to comply with the outlined requirements, giving them a period of time to comply. After this, a failure to comply will result in fines at 100,000 euros for legal entities and 20,000 euros for natural persons — with the possibility of increases in certain circumstances.

- *Transport*: Updates to the existing French Commercial Code’s requirements regarding extra-financial performance reporting are detailed in article 138 of the FCRL.

- **Article 138**

Article 138 refers to the existing Commercial Code which outlines reporting on the impacts of climate change in part based on the use of the company’s produced goods and services. This article adds language that provides clarity on the specific information that needs to be provided in extra-financial reporting to detail the impacts of climate change. Specifically, extra-financial reporting must provide detail regarding the amount and reduction strategies

⁴³ Décret n° 2022-538 du 13 avril 2022 définissant le régime de sanctions applicables en cas de méconnaissance des dispositions relatives aux allégations de neutralité carbone dans la publicité (2022). <https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000045570594>

in relation to GHG emissions associated with a given activity (both upstream and downstream). Reduction strategies might specifically address examples of rail/waterway use, among others, to decrease GHG emissions.

According to the FCRL, the updated extra-financial reporting required by article 138 was first enforced for financial reporting years beginning on July 1st, 2022.

Timeline:

The FCRL was promulgated on August 22nd, 2021, and came into force on August 24th, 2021.

Current Status:

The FCRL is published in the Official Journal meaning it has entered into force. However, as mentioned above, various decrees which are still in progress may set-out differing enforcement dates for their scope.

Watchpoints:

To ensure continued compliance with the strictest reporting requirements around scope 3 category 1 emissions, specifically in the context of labeling and advertising, companies should be mindful of the following watchpoints as indications of potential new or changing requirements:

- **Additional Decrees:** As the FCRL discusses, decrees can provide detail about how to apply a specific article, as well as provide information about the enforcement protocols and sanctions. Given the important role of decrees, it is critical to monitor the advancements of any decrees that may develop in accordance with the above relevant articles.
- **Monitoring Cross-Industry:** Given the high environmental impact of the textile and food industries, and the fact that both industries have been identified as priorities in the FCRL, it is advised to track the final calculation and display methodologies identified for these sectors as expected in 2024. Understanding the reference to the PEF/Product Environmental Footprint Category Rules (PEFCR) frameworks, as well as the role of ADEME in this decision, will be instrumental in anticipating the way in which the ICT sector may be expected to follow.
- **Additional French Regulation:** Given France's history of outlining obligations for the ICT sector in a variety of regulations and initiatives, it will be crucial to monitor the evolving expectations in this regard. The ICT sector is identified as important given its negative impacts on the environment and therefore is unlikely to become less regulated. Given France's strict requirements, it is important to ensure the ICT sector continues to monitor France as a leader in strict reporting requirements, especially as it relates to those reporting requirements that involve consumer-facing applications (e.g., labeling, advertising, and consumer awareness initiatives).
- **EU-Level Regulation:** Tracking how advancements in regulations at the EU-level may impact the enforcement of the FCRL will remain critical. Given the EU-wide focus on greenwashing, repairability, and reporting, it will be important to continue to monitor the ways in which France transposes relevant EU regulation, as well as how these EU regulations may impact the ways in which French law is operating today.

The Carbon Border Adjustment Mechanism (CBAM)

Background:

The Carbon Border Adjustment Mechanism (CBAM) legislation was passed by the European Union on May 10th, 2023 to support the goal of achieving climate neutrality by 2050.⁴⁴ Introduced to ensure that the price of imports reflects their carbon content, CBAM is designed to level the playing field between European producers who are subject to the EU Emissions Trading System (a cap and trade system), and producers from outside the EU who were previously not burdened by the cost of carbon. The goal is to encourage sustainable practices worldwide to align with long-term climate goals as envisioned by the Paris Agreement.

CBAM will work alongside other measures in the “Fit for 55” package and will reduce the risk of carbon leakage. CBAM will apply to the following sectors: aluminum, cement, electricity, fertilizers, hydrogen, as well as iron and steel.

Disclosure Requirements:

The reporting declarant in the context of CBAM for the aluminum sector is crucial for ensuring compliance with CBAM’s regulatory framework, focusing on the tracking, and reporting of embedded emissions in specific goods. This role is particularly important during the transitional phase of CBAM, which ends in December 2025, where the focus is on monitoring and reporting without financial adjustments or the need for purchasing certificates.

Reporting declarants can be either the importers themselves or an indirect customs representative acting on behalf of the importer. In situations where an indirect customs representative is utilized, this representative assumes the responsibility for reporting obligations.

During the transitional phase, there is a simplified process aimed at easing stakeholders into the CBAM framework. Key interactions involve:

- *Operators in Third Countries:* Operators in third countries provide data related to direct and indirect emissions from the production processes.
- *Reporting Declarants:* Reporting declarants are responsible for compiling and submitting detailed CBAM reports based on data received, ensuring accuracy and compliance with CBAM requirements.
- *Customs Authorities:* Customs authorities offer automatic information provisioning to declarants about their obligations and collaborate closely with the European Commission.
- *The European Commission:* The European Commission reviews the CBAM reports and communicates with competent authorities to fine-tune CBAM’s implementation.
- *Competent Authorities:* The competent authority designated as National Competent Authorities (NCAs) for CBAM varies by Member State within the European Union. They are responsible for granting authorization to importers established in their respective Member States, allowing them access to the CBAM Transitional Registry. For example, Germany has designated the German Emissions Trading Authority (Deutsche Emissionshandelsstelle) as its competent authority for

⁴⁴ European Commission, 2023b

CBAM. Competent authorities verify CBAM reports and provide feedback to declarants, and from 2025, will authorize CBAM declarants.

Key features of the CBAM process for calculation of carbon emissions are outlined below, focusing on iron and steel⁴⁵ goods, as well as aluminum⁴⁶ products, given the ICT sector focus of the report.

- **Establishing System Boundaries**
 - Define the scope of processes and production routes involved in production processes of specific products that fall under CBAM.
 - System boundaries include all relevant production processes directly or indirectly linked to the production of aluminum, excluding mining and transport activities. Production processes may include but are not limited to primary smelting, secondary smelting, aluminum products forming processes such as extrusion, casting, rolling, forging, and drawing, iron and steel products specific processes like sintered ore production, ferrous alloy production, and more.
- **Performing Monitoring**
 - Monitor direct emissions at the installation level, including emissions from fuel combustion, electrode decomposition, and materials used for flue gas cleaning (scope 1 emissions).
 - Monitor flows of net measurable heat and electricity consumption (scope 2 emissions).
 - Monitor the consumption of precursors used in the production processes (scope 3 emissions).
 - Methodologies such as the Calculation-based method, Standard method, Mass Balance Method, and Measurement-based methodology are all viable methods for the purpose of monitoring emissions. More information on this is available in Annex A.
- **Attributing Emissions to Production Processes and Goods**
 - Allocate emissions to the responsible production processes.
 - Multiply net measurable heat by the relevant emissions factor to consider emissions from heat consumption/production.
 - Emissions from the production of precursors are also included for complex goods.
- **Embedded Emissions of Precursors (Scope 3 Emissions)**
 - Simple goods (unwrought aluminum) are considered to have zero embedded emissions from input materials. For determining the specific actual embedded emissions of simple goods produced in a given installation, direct and, where applicable, indirect emissions shall be accounted for. These factors consist of specific embedded emissions of goods, attributed emissions of goods, activity level of the goods, and the quantity of the goods. For additional information regarding the calculation please see Annex A.
 - For complex goods like iron and steel products, other aluminum products include the embedded emissions of relevant precursors. Emissions will be calculated based on attributed emissions of goods, activity level of the goods, and quantity of goods produced in the reporting period in that installation and the embedded emissions of the input materials. For additional information regarding the calculation please see Annex A.

⁴⁵ European Commission, 2023c

⁴⁶ European Commission, 2023d

- **Indirect Emissions (Scope 2)**

- Multiply electricity consumption by the relevant emission factor, using either the average emission factor of the country of origin or a specific factor demonstrated through a direct technical link or a power purchase agreement.

Timeline:

The transition phase for CBAM began on October 1st, 2023 and will last until December 2025. CBAM requires EU importers of carbon-intensive goods with the highest GHG emissions and/or carbon leakage to report the embedded emissions of these goods on a quarterly basis. Initially, the regulation will cover sectors like aluminum, cement, iron and steel, fertilizers, hydrogen, and electricity, with expectations to expand to include all products covered by the EU Emissions Trading System (ETS) in the future.

Companies will have the choice between reporting in one of three ways until the end of 2024:

- Full reporting according to the new methodology (EU method)
- Reporting based on an equivalent method (three options)
- Reporting based on default reference values (only until July 2024)

As of January 1st, 2025, only the EU method will be accepted, and estimates (including default values) can only be used for complex goods if these estimations represent less than 20% of the total embedded emissions.

In 2025, the European Commission will use the reported information for general analysis and review of CBAM in a process that will be repeated every two years. The conclusions will be presented in reports to the European Parliament and the Council before the end of the transitional period. CBAM will apply in its definitive regime from 2026 to 2034, while the current transitional phase lasts between 2023 and 2026. Each year after January 1st, 2026, authorized CBAM declarants (importers or indirect customs representatives) will have to buy and surrender CBAM certificates that correspond to the embedded emissions in imported goods.

Current Status:

The European Union adopted CBAM on May 10th, 2023, and it entered into force on May 17th, 2023. However, as mentioned above, reviews are planned every two years which may or may not lead to amendments.

Watchpoints:

In order to ensure continued compliance with the strictest reporting requirements around scope 3 category 1 emissions, specifically in the context of CBAM, companies should be mindful of the following watchpoints as indications of potential new or changing requirements:

- **Amendments:** With the governing body reviewing the performance of CBAM regulations every two years, and the first review coming in 2025, there is always a possibility that changes might be made to the reporting process. Further, it is likely that CBAM, if successful, will be expanded to more sectors to cover the entirety of the EU ETS regulation sectors.
- **EU-Level Regulation:** There remains a remote possibility of further EU legislation that could impact CBAM. Currently, there are no indications of this happening.
- **Ripple Effect:** Other countries are in various stages of considering their own carbon price mechanisms, to capture the tax themselves.

UNITED STATES

Anti-ESG sentiment is on the rise in the U.S. presenting challenges for the adoption of federal ESG legislation, including climate disclosure rules. After intense debate, the Securities Exchange Commission's (SEC) Climate Disclosure Rule was finally approved on March 6th, 2024, albeit with a significantly reduced scope. Despite the historic ruling, the Rule has been met with multiple legal challenges. As of April 4th, 2024, the Rule has been stayed as the SEC awaits judicial review. Despite these challenges, California recently passed two comprehensive climate disclosure bills, Senate Bill No. 253 - Climate Corporate Data Accountability Act and Senate Bill No. 261 - Greenhouse Gasses: Climate-Related Financial Risk. The uncertain status of the SEC Climate Disclosure Rule places the California Senate bills at the forefront of environmental regulations in the U.S. market.

SEC Climate Disclosure Rule

Background:

Investors in the U.S. are increasingly demanding information on the climate risks of their investments. GHG emissions have emerged as a useful measure of a company's exposure to and management of transition risks, as well their existing progress towards climate goals.

Against this backdrop, in March 2022, the SEC first proposed its climate disclosure rule titled, "The Enhancement and Standardization of Climate-Related Disclosures for Investors." The rule required SEC registrants to disclose climate-related data in their registration statements and annual reports. The original proposal required companies to disclose climate-related risks reasonably likely to have material impacts on their operations and material scope 1, 2, and 3 GHG emissions.⁴⁷ On March 6th, 2024, after significant debate, the SEC adopted its final rule, a significantly diluted version of its March 2022 proposal. Notably, the adopted rule no longer requires companies to disclose scope 3 emissions.

Scope:

The SEC Climate Disclosure Rule applies to large accelerated filers and accelerated filers. Large accelerated filers are companies in which the public holds more than \$700 million in shares. Accelerated filers are those in which public investors hold between \$75 million and \$700 million in shares.⁴⁸ Per these definitions, Dell falls into the accelerated filer category. Consistent with Regulation S-K, which indicates how filers should disclose material qualitative data, the Climate Disclosure Rule applies to filers in all sectors and industries.⁴⁹ The SEC has stated they do not believe industry classification is necessary.

⁴⁷ U.S. Securities and Exchange Commission, 2024a

⁴⁸ U.S. Securities and Exchange Commission, 2020

⁴⁹ U.S. Securities and Exchange Commission Final Rule: The Enhancement and Standardization of Climate-Related Disclosures for Investors (2024). <https://www.sec.gov/files/rules/final/2024/33-11275.pdf>.

Disclosure Requirements:

The final rule does not require scope 3 emissions disclosures. However, registrants must disclose⁵⁰:

- Scope 1 and scope 2 GHG emissions, if they are material⁵¹
- Material climate-related risks, risk management, mitigation processes and activities, as well as potential impacts of climate risks on the company
- Details on the filer’s oversight and management of climate-related risks
- Material climate targets and objectives

For material scope 1 and scope 2 GHG emissions, registrants must make their disclosures in⁵²:

- **Gross aggregate terms** (in terms of CO₂e but excluding the impact of purchased or generated offsets)
 - Registrants are not required to disclose in terms of intensity (i.e., GHG emissions per unit of total revenue). Investors should be able to calculate this metric by dividing a registrant’s gross GHG emissions by its total revenues.
 - If the disclosed GHG emissions include a material constituent gas, the registrant must disclose that specific constituent gas *disaggregated* from the total emissions.⁵³ For example, if a registrant has a specific emissions reduction target for methane because methane is material to its business, then it must disclose methane emissions on its own.

Registrants must also disclose the methodology, inputs, and assumptions they used to calculate their GHG emissions. This includes disclosing⁵⁴:

- The method employed to define organizational boundaries (e.g., methods included in GHG Protocol for defining control)
 - If the boundaries materially differ from the scope of entities and operations used in financial statements, the registrant must explain this difference.
- The type and source of any emission factors
- The calculation approach or method (e.g., location-based method, market-based method, both)
- The calculation tools utilized (e.g., tools in GHG Protocol, ISO standards)
- The standard or protocol used to report GHG emissions (e.g., GHG Protocol’s Corporate Accounting and Reporting Standard, Environmental Protection Agency regulation, applicable ISO standards)

⁵⁰ U.S. Securities and Exchange Commission, 2024c

⁵¹ Per the SEC, materiality refers to “whether a reasonable investor would consider the disclosure of an item of information important when making an investment or voting decision or such a reasonable investor would view omission of the disclosure as having significantly altered the total mix of information made available”

⁵² U.S. Securities and Exchange Commission Final Rule: The Enhancement and Standardization of Climate-Related Disclosures for Investors (2024). <https://www.sec.gov/files/rules/final/2024/33-11275.pdf>.

⁵³ The SEC recognizes seven gasses as constituent gasses: carbon dioxide (“CO₂”); hydrofluorocarbons (“HFCs”); methane (“CH₄”); nitrous oxide (“N₂O”); nitrogen trifluoride (“NF₃”); perfluorocarbons (“PFCs”); and sulfur hexafluoride (“SF₆”). These are the seven gasses that are included in total greenhouse gas emissions calculations.

⁵⁴ U.S. Securities and Exchange Commission Final Rule: The Enhancement and Standardization of Climate-Related Disclosures for Investors (2024). <https://www.sec.gov/files/rules/final/2024/33-11275.pdf>.

Timeline:

Implementation of the final rules will take a phased approach, with the compliance date varying based on the registrant’s status. Registrant’s can fall under one of the following status categories: large accelerated filer (LAF), accelerated filer (AF), non-accelerated filer (NAF), smaller reporting company (SRC), or emerging growth company (EGC). LAF are the first group mandated to disclose, starting with fiscal year 2025, making 2026 the first year companies in which the public holds more than \$700 million in shares make GHG disclosures. Please see Table 3 for the full compliance timeline.

Table 3. SEC Climate Disclosure Final Rules Compliance Dates⁵⁵

Registrant Type	Disclosure and Financial Statement Effects Audit		GHG Emissions / Assurance			Electronic Tagging
	<i>All S-K and S-X Disclosures, except as noted in this table</i>	<i>Item 1502(d)(2), 1502(e)(2), & 1504(c)(2)</i>	<i>Item 1505 (Scopes 1 & 2 GHG emissions)</i>	<i>Item 1506 - Limited Assurance</i>	<i>Item 1506 - Reasonable Assurance</i>	
LAFs	FYB 2025	FYB 2026	FYB 2026	FYB 2029	FYB 2033	FYB 2026
AFs (other than SRCs and EGCs)	FYB 2026	FYB 2027	FYB 2028	FYB 2031	N/A	FYB 2026
SRCs, EGCs, and NAFs	FYB 2027	FYB 2028	N/A	N/A	N/A	FYB 2027

**FYB – fiscal year beginning in the stated calendar year*

Current Status:

As of April 4th, 2024, the SEC has temporarily halted implementation of its Climate Disclosure Rule due to legal challenges from states and private companies. The lawsuits include petitions filed by a total of 25 Republican state attorneys general.⁵⁶ The most compelling lawsuit is spearheaded by Attorney General Brenna Bird of Iowa, alongside nine Republican attorneys general who have initiated legal action in the U.S. Eighth Circuit Court of Appeals. They argue the Climate Disclosure Rule exceeds the SEC’s authority. 18 Democratic attorneys general have submitted a request to join the Eighth Circuit case in support of the regulation. In total, the SEC has received nine legal challenges to the rule in six different U.S. Court of Appeals circuits.⁵⁷

⁵⁵ U.S. Securities and Exchange Commission, 2024c

⁵⁶ Mirza & Johnson, 2024

⁵⁷ Ibid.

Watchpoints:

Given the U.S.' rapidly evolving climate regulation landscape, the future of the SEC's Climate Disclosure Rule remains uncertain. However, to stay ahead of potential regulatory requirements, companies should continue preparing for GHG emissions disclosures that may emerge across the country. To remain informed about the latest federal reporting mandates, companies should monitor the following watchpoints:

- **Outcome of Litigation:** The SEC Climate Disclosure Rule is currently stayed, awaiting the outcome of judicial review. Given the early stages of legal challenges, companies should continue to closely monitor developments related to the circuits' rulings, particularly the Eighth Circuit. Existing challenges could also escalate to the U.S. Supreme Court.
- **Political Environment:** The 2024 U.S. presidential elections are poised to impact the trajectory of the SEC Climate Disclosure Rule. Should the Biden administration secure a second term, the Rule is likely to have greater political support — this may also increase the probability of expanding the scope to include scope 3 emissions over time and increase the likelihood of smoother implementation. Conversely, a victory for Trump could lead to intensified resistance against sustainability regulations, negatively impacting the SEC Climate Disclosure Rule's progress and enforcement.
- **Investor Sentiment and Action:** Investors have continuously emphasized the financial implications of climate risk, with many calling for more robust corporate disclosures. Although there was minimal investor pushback to the final diluted Rule, given the increasingly challenging legal and political environment, it will be critical to monitor investor sentiment going forward and whether investors take action in defense of the Rule.

It is important to note that while the final version of the SEC Climate Disclosure Rule has a narrower scope and is currently stayed, the outlook for multinational companies remains largely unchanged. Multinational companies will still be required to adhere to the California law and, if present in the EU, the CSRD, which have stricter and more ambitious disclosure requirements.

Climate Corporate Data Accountability Act (CCDAA)

Background:

On October 7th, 2023, California Governor Gavin Newsom signed SB-253, the CCDAA into law. Covered companies (see below for scope) must prepare for the forthcoming reporting obligations, which will include reporting on all three categories of GHG emissions (scope 1, 2, and 3) and detailed risk reports related to climate change and risk mitigation plans. The legislation represents a significant shift towards greater corporate accountability for climate-related impacts.

Scope:

Companies, both public and private, with annual revenue over \$1 billion are required to report scope 1 and 2 emissions annually starting in 2026 for emissions in the prior fiscal year and to report scope 3 emissions annually starting in 2027 for the prior fiscal year. It covers companies formed in California or any other state. The timeframe of required reporting (per the below) is determined according to the reporting entity's revenue for the prior fiscal year.

Disclosure Requirements:

For scope 1 and scope 2 emissions, the CCDAA requires that reporting entities should report all direct GHG emissions that stem from sources that a reporting entity owns or directly controls and all indirect GHG emissions from consumed electricity, steam, heating, or cooling purchased, or acquired by a reporting entity.⁵⁸

For scope 3 disclosures, the CCDAA requires that a reporting entity reports its emissions of GHG in conformance with the GHG Protocol standards and guidance, including the GHG Protocol Corporate Accounting and Reporting Standard and the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard developed by the World Resources Institute (WRI) and WBCSD. No detailed calculations and requirements are included in the Act.⁵⁹

CCDAA mandates that both primary and secondary data sources are acceptable, including the use of industry average data, proxy data, and other generic data in its scope 3 emissions calculation.

CCDAA is designed to streamline the emissions reporting process by avoiding unnecessary repetition. It allows entities required to report their emissions to submit documents they have already prepared for other national and international obligations. This includes any reports mandated by the federal government, provided these submissions meet the specific requirements outlined in this section.

According to the CCDAA, a company's public disclosure should include the name of the reporting entity and any fictitious names, trade names, assumed names, and logos used by the reporting entity.

⁵⁸ SB-253 Climate Corporate Data Accountability Act. (2023).
https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=202320240SB253

⁵⁹ Ibid.

Timeline:

Reporting for scope 1 and 2 emissions under the CCDAA will begin in 2026 for 2025 fiscal year emissions, while disclosure of scope 3 emissions will follow in 2027 for 2026 fiscal year emissions. Businesses will therefore need to track their scope 1 and 2 emissions beginning in 2025, as well as scope 3 in 2026 on an annual basis thereafter. Moreover, the bill clarifies that companies' scope 1 and 2 emissions must be audited by independent verifiers at a limited assurance level beginning in 2026, and at a reasonable assurance level beginning in 2030. Please see Table 4 for the compliance timeline.

Table 4. Timeline for CCDDA Requirements

	Scope 1 and 2	Scope 3
Disclosing Timeline	2026	2027
Assurance at Limited Level	2026	2030
Assurance at Reasonable Level	2030	To be reviewed

Current Status:

The CCDAA is passed and in effect. With the SEC retreat from requiring companies to report scope 3 emissions, the CCDAA is now the leading and strictest law or standard in effect in terms of emission disclosure in the U.S.




Watchpoints: The California Air Resources Board (CARB) is in the process of promulgating implementing regulations, as well as developing a digital platform for public access to disclosures under the law. Given that the Act is still in the implementation process, and many critical details have been delegated to that CARB process, companies should monitor the following watchpoints in order to remain informed of the latest reporting mandates:

- **Implementation Process:** The CCDAA directs the CARB to promulgate detailed implementing regulations before January 1st, 2025. The deadline could slip. Moreover, the CARB process may modify or clarify, possibly in material ways, the law's disclosure requirements.
- **Be Cautious of Assurance Requirements:** Obtaining assurance for emissions, particularly for scope 3 emissions can be challenging for companies. Currently, there is a lack of standardized approaches to scope 3 emissions reporting and commonly acknowledged assurance organizations. The Act itself only requires assurance at a limited/reasonable level and offers no specific rules for assurance. Rather, the CARB is directed and empowered to review and evaluate trends in third-party assurance requirements for scope 3 emissions in developing rules and guidance for implementation.
- **Potential Amendments and Changes to the Act:** The Act states that starting in 2033 and every five years thereafter, the CARB may survey and assess currently available GHG accounting and reporting standards. With these potential updates may come changes to which Dell will need to adjust. Therefore, it is important for Dell to monitor the emerging emissions disclosing trends.

REGULATORY COMPARISON ACROSS PRINCIPAL JURISDICTIONS

Across the four principal regulations – the CSRD, the FCRL, the SEC Climate Disclosure Rule, and the CCDAA – the CSRD remains the most stringent and comprehensive regulation. Per the CSRD, companies are first required to make disclosures in 2025 for fiscal year 2024, one or two years before the United States’ regulations. Among the CSRD, the SEC Climate Disclosure Rule, and the CCDAA, the CSRD is also the only regulation in the process of developing sector-specific requirements. A detailed comparison of the CSRD, the SEC Climate Disclosure Rule, and the CCDAA can be found in Table 5 below. Given the FCRL’s unique focus on specific disclosure settings (e.g., advertising and labeling), it was not included in the subsequent comparison.

Table 5. Comparison of Principal Regulations

	 CSRD	 SEC	 CCDAA
Who is required to report?	<ul style="list-style-type: none"> • EU-based large companies, listed or not • “Third-country” companies • Small and medium-sized entities 	<ul style="list-style-type: none"> • Large accelerated filers • Accelerated filers 	<ul style="list-style-type: none"> • Companies, both public and private, with annual revenue over US\$1 billion
Are Scope 3 disclosures required?	<ul style="list-style-type: none"> • Yes 	<ul style="list-style-type: none"> • No, only Scope 1 and Scope 2 	<ul style="list-style-type: none"> • Yes
How must companies disclose Scope 3 GHG emissions?	<ul style="list-style-type: none"> • Gross GHG emissions • GHG emissions intensity 	<i>For Scope 1 and 2 emissions:</i> <ul style="list-style-type: none"> • Aggregate terms, in terms of CO₂e • Gross terms 	<ul style="list-style-type: none"> • In conformance with GHG Protocol standards and guidance
Must companies disclose estimate methods and data sources used?	<ul style="list-style-type: none"> • Yes 	<ul style="list-style-type: none"> • Yes 	<ul style="list-style-type: none"> • No, but the regulation provides guidelines for the reporting methodology
Does the regulation have sector-specific requirements?	<ul style="list-style-type: none"> • Not currently, but expected to release sector-specific standards by June 2026 	<ul style="list-style-type: none"> • No 	<ul style="list-style-type: none"> • No
What is the required reporting format?	<ul style="list-style-type: none"> • Electronically 	<ul style="list-style-type: none"> • In registration statements and Exchange Act annual reports • Electronically tag disclosures with XBRL 	<ul style="list-style-type: none"> • Digital platform
Does the regulation require third-party auditing?	<ul style="list-style-type: none"> • Yes 	<ul style="list-style-type: none"> • Yes 	<ul style="list-style-type: none"> • Yes
What is the earliest reporting date?	<ul style="list-style-type: none"> • 2025 for FY2024 for EU companies already subjected to NFRD 	<ul style="list-style-type: none"> • 2026 for FY2025 for large accelerated filers 	<ul style="list-style-type: none"> • Scope 1 and 2: 2026 for FY2025 • Scope 3: 2027 for FY2026
Status	<ul style="list-style-type: none"> • Member States must transpose the Directive by July 6th, 2024 	<ul style="list-style-type: none"> • As of April 4th, 2024, the SEC has temporarily halted implementation due to legal challenges 	<ul style="list-style-type: none"> • CCDAA has passed and is in effect, subject to the CA state implementation process
What are the penalties for non-compliance?	<ul style="list-style-type: none"> • Depends on the national legislation of each Member State 	<ul style="list-style-type: none"> • SEC has not proposed penalties 	<ul style="list-style-type: none"> • Fine of up to US\$500,000 per year

OTHER KEY MARKETS

Recently, additional geographies such as China, Japan, South Korea, Singapore, Taiwan, and Vietnam have introduced climate disclosure rules for companies. These are key regions where Dell or Dell suppliers operate. This section will map and assess additional climate-related disclosure rules in these markets.

China

Background:

On February 8th, 2024, China's three major stock exchanges — the Shanghai Stock Exchange, the Shenzhen Stock Exchange, and the Beijing Stock Exchange — published the new sustainability reporting draft guidelines for listed companies.

Scope:

The guidelines require Shanghai Stock Exchange 180 Index, Science and Technology Innovation 50 Index, Shenzhen Stock Exchange 100 Index, Growth Enterprise Market (GEM) Index sample companies and companies listed simultaneously in China and abroad to disclose ESG reports in accordance with the guidelines. As of February 9th, 2024, a total of 458 A-shares listed in Shanghai and Shenzhen met the mandatory disclosure requirements⁶⁰.

Timeline: In scope companies (per the above) are required to release their ESG report for 2025 before April 30th, 2026.

Disclosure Requirements:

The reporting framework is mostly consistent with the Task Force on Climate-Related Financial Disclosures (TCFD). The Guidelines require disclosure entities to disclose GHG scope 1 emissions and scope 2 emissions, and qualified disclosure entities may disclose GHG scope 3 emissions though it is strictly voluntary to do so.⁶¹

⁶⁰ Shanghai Stock Exchange Listed Company Self-regulatory Supervision Guidelines No. 14 - Sustainable Development Report (Trial) (Draft for Comment) (2024). http://www.sse.com.cn/lawandrules/publicadvice/c/c_20240208_5735507.shtml

⁶¹ Ibid.

Japan

Background:

In March 2023, the Financial Services Agency (FSA) rules mandating sustainability disclosure in Japan were implemented. Thereafter, the SSBJ (Sustainability Standards Board of Japan) — launched in July 2022 after the formation of the ISSB — will be drafting the new rules. Recently, three exposure drafts were approved for issuance on March 21st, 2024.⁶²

- Universal Sustainability Disclosure Standard Exposure Draft “Application of the Sustainability Disclosure Standards”
- Theme-based Sustainability Disclosure Standard Exposure Draft No. 1 “General Disclosures”
- Theme-based Sustainability Disclosure Standard Exposure Draft No. 2 “Climate-related Disclosures”

Currently, the exposure drafts are only available in Japanese (released on March 29th, 2024) — however, additional documentation in English detailing the differences with the ISRS standards will be released.

Scope:

Under these rules, all corporate entities in Japan listed on the Tokyo Stock Exchange, including foreign companies, are currently required to disclose sustainability-related information using the TCFD pillars. The current rules do not prescribe specific standards, nor do they require third-party assurance.

Timeline:

The current regulation process is expected to continue until 2025. April 2025 is set as the tentative date for implementation.⁶³

Disclosure Requirements:

The standards are expected to be consistent with the initial standards developed by the ISSB in the IFRS 1 & 2. Scope 3 GHG emissions disclosure is required of reporting entities that participate in one or more of the following activities and therefore, if applicable, they must disclose additional information about financed emissions⁶⁴:

- Asset management activities
- Commercial banking activities
- Insurance activities

Whether there will be any relief from scope 3 emissions reporting is yet to be finalized.

⁶² Sustainability Standards Board of Japan, 2024a

⁶³ Hamada, n.d.

⁶⁴ Sustainability Board of Japan, 2024b

Singapore

Background:

The Accounting and Corporate Regulatory Authority (ACRA) and Singapore Exchange Regulation (SGX RegCo) have devised mandatory climate-related reporting requirements for listed and large, non-listed companies in line with the IFRS' ISSB standards. This will begin to be enforced from 2025 to support Singapore's national agenda on sustainable development under the Singapore Green Plan 2030.⁶⁵

Scope:

Listed Issuers will have to report and file ISSB aligned CRD which will include scope 1 and 2 GHG emissions from FY2025 onwards. Large NLCos (Non-listed Companies), which are defined primarily by two criteria – annual revenue of at least 1 billion Singapore dollars and total assets of at least 500 million Singapore dollars (Large NLCos) — will also be required to mandatorily disclose scope 1, 2, and 3 emissions. The timeline is clarified in the next section.

The annual revenue and total assets threshold for NLCos are measured using company-level financials, unless the NLCos is a parent, in which case, both criteria are measured based on group-level financials. The criteria are assessed based on the financials for two fiscal years immediately preceding the current fiscal year, unless the company has either a) not reached its third fiscal year after incorporation, or b) is in the first or second fiscal year when the proposed reporting obligations commence, in which case, both criteria are assessed based on the current fiscal year.

For scope 3 emissions, listed companies will be required to report from 2026 onwards.⁶⁶ Large, non-listed companies will follow suit soon thereafter and scope 3 reporting will begin for these companies after 2029.

Timeline:

In 2027, the regulatory body ACRA will review whether the reporting requirements will be extended to smaller NLCos. If ACRA does extend reporting requirements to smaller NLCos, it will be from 2030 onwards. ACRA will also grant a three-year period to transition to ISSB standards if the parent company is already using other international standards like Global Reporting Initiative (GRI) or TCFD. Please see Table 6 for the compliance timeline.

⁶⁵ Climate reporting and assurance roadmap in Singapore. (2024). <https://www.acra.gov.sg/docs/default-source/default-document-library/legislation/listing-of-consultation-papers/climate-reporting-and-assurance-roadmap/climate-reporting-and-assurance-roadmap-in-singapore-infographic.pdf>

⁶⁶ Accounting and Corporate Regulatory Authority, 2022

Table 6. Implementation Timeline for Listed and Non-Listed Companies in Singapore⁶⁷

Timeline for Requirements	Listed Issuers	Large NLCos
ISSB-aligned CRD, including Scope 1 and 2 GHG emissions	FY2025	FY2027
Scope 3 GHG emissions	FY2026	No earlier than FY2029
External limited assurance on Scope 1 and 2 GHG emissions	FY2027	FY2029

Disclosure Requirements:

The reporting framework is consistent with the IFRS' ISSB standards although companies using other international standards will be granted additional transitional time. Entities are required to disclose GHG scope 1 emissions and scope 2 emissions, and GHG scope 3 emissions in a phased manner and the requirements are mandatory.

South Korea

Background:

There are currently no mandatory disclosure regulations in place in South Korea. In May 2023, the Korea ESG Standards Institute (KCGS), Sustainvest, and the Korea ESG Research Institute developed the ESG Evaluation Agency Guidance. This Guidance is voluntary and refers to guidelines and best practices in the ESG space.⁶⁸ The Corporate Governance Report has adopted a comply-or-explain approach to voluntarily describe compliance with this guidance. In the near future, mandatory guidelines will be announced, but as of now the exact scope of required ESG disclosures is undisclosed.

Scope:

As of now, the Financial Services Commission (FSC) of Korea has stated that ESG disclosures will be mandatory for KOSPI-listed companies with assets of 2 trillion South Korean won or more from 2026 onwards. Further, by 2030 the scope will expand to all KOSPI-listed companies. However, this is not necessarily set in stone and is subject to change as mandatory ESG regulations are announced.⁶⁹

Timeline:

In 2021, the FSC announced that ESG disclosures will be mandatory 2025 onwards. In October 2023, the FSC announced that the mandatory disclosure requirements will be postponed beyond 2026, citing the need to keep pace with the rest of the world. As of 2024, there are no clear indications of whether the FSC is on track or not.

⁶⁷ Climate reporting and assurance roadmap in Singapore. (2024). <https://www.acra.gov.sg/docs/default-source/default-document-library/legislation/listing-of-consultation-papers/climate-reporting-and-assurance-roadmap/climate-reporting-and-assurance-roadmap-in-singapore-infographic.pdf>

⁶⁸ Kwack, 2023

⁶⁹ Song & Jang, n.d.

Disclosure Requirements:

Disclosure of GHG emissions — as per article 44 of “Framework Act on Low Carbon, Green Growth” and article 24, 25, and 26 of “Act on the Allocation and Trading of Greenhouse-gas Emission Permits” — emitted by the place of business in a verifiable, measurable, and reportable manner is required but there is no disclosure obligation for scope 3 GHG emissions as of now.^{70,71} Penalties exist for a failure to report accordingly.

Taiwan

Background:

On August 17th, 2023, Taiwan’s Financial Supervisory Board released its sustainability development roadmap for GHG emissions disclosures.

Scope:

Companies of varying sizes (measured by their paid-in capital) will need to meet sustainability information disclosure requirements at different time horizons. The scope focuses on companies specifically reporting sustainability information.

Timeline:

Listed companies with capital exceeding 10 billion Taiwan dollars must disclose sustainability information for fiscal year 2026. Listed entities with capital exceeding 5 billion Taiwan dollars will need to report sustainability information for fiscal year 2027. Every listed entity will be required to disclose sustainability information in line with ISSB standards for fiscal year 2028.

Disclosure Requirements:

The Financial Supervisory Commission of Taiwan’s goal is to align regulation with the IFRS standard. However, due to differing capabilities across listed companies regarding sustainability data, Taiwan authorities provide sufficient flexibility for companies to prepare for adoption of IFRS Sustainability Disclosure Standards. There is a temporary waiver from disclosing scope 3 GHG emissions and comparative data in the first disclosing year.

⁷⁰ Framework act on low carbon, green growth: 국가법령정보센터: 영문법령 > 본문. FRAMEWORK ACT ON LOW CARBON, GREEN GROWTH | 국가법령정보센터 | 영문법령 > 본문. (2010).

<https://www.law.go.kr/LSW/lsInfoP.do?lsiSeq=98467&viewCls=engLsInfoR&urlMode=engLsInfoR#0000>

⁷¹ Act On The Allocation And Trading Of Greenhouse-gas Emission Permits. 대한민국 영문법령. (2012). https://elaw.klri.re.kr/kor_service/lawView.do?hseq=49480&lang=ENG

Vietnam

Background:

In Vietnam, ESG disclosures are governed by legislation applicable to specific regimes, principally environmental laws and corporate governance laws. The primary legal framework for emissions regulations includes but is not limited to:

- Decision No. 1775/QĐ-TTg (2021)⁷²: This decision approves the National Strategy on Climate Change until 2050, which includes targets for GHG emissions reductions and initiatives for climate change adaptation and mitigation.
- Law on Environmental Protection (2020)⁷³: This law establishes general principles and requirements for environmental protection, including provisions for monitoring and reporting of GHG emissions.
- Decree No. 06/2022/ND-CP⁷⁴: Enacted on January 7th, 2022, this law establishes regulations on Reduction of Greenhouse Gas Emissions and Protection of the Ozone Layer. Article 5 through 15 of the Decree provide detailed provisions for article 91 of the Law on Environmental Protection 2020, “reduction of greenhouse gas (GHG) emissions.”
- TCVN ISO 14067:2000⁷⁵(2020⁷⁶): The Directorate of Standards, Metrology, and Quality issued TCVN ISO 14067:2000 which provides upwards of 10 guiding principles for the assessment of GHG or the quantification of carbon footprint (CFP) or partial CFP (see below for more detail).

An additional, important standard in Vietnam is the Vietnam Sustainability Index, which is the index of the top 20 listed companies by sustainability scores on the Ho Chi Minh Stock Exchange. This requires emissions disclosures to be featured and is as of now completely voluntary.

Scope:

On January 18th, 2022, Prime Minister’s Decision No. 01/2022/QĐ-TTg was issued which lists the GHG emitting facilities that must conduct GHG inspections. The sectors that must conduct GHG inspections are energy, transportation, construction, industrial processes (which includes the electronic industry), agriculture, forestry and land use, and finally waste.⁷⁶ Facilities that emit GHG equivalent to or more than 3,000 tons of CO₂ also must conduct GHG inspections.⁷⁷

Timeline:

As of March 31st, 2023, information and data on the previous year’s activities was required in accordance with the guidance from the competent ministries — this process will be repeated every two years. From 2024 and every two years thereafter, GHG inspections of facilities shall be conducted and reports shall be prepared and submitted to the local People’s Committee by March 31st of the respective year. From 2025,

⁷² Decision No. 896/QĐ-TTg on Approving the National Strategy for Climate Change Until 2050, 2022

⁷³ Law on protection of the environment. (2001). <https://haiduong.eregulations.org/media/Law%20on%20Environment.pdf>

⁷⁴ Kenji, 2022a

⁷⁵ Dao, 2023

⁷⁶ Kenji, 2022b

⁷⁷ Kenji, 2022c

another report shall be completed and submitted to the Ministry of Natural Resources and Environment by December 1st of every year.

By December 31st, 2025, companies shall prepare and submit a GHG reduction plan for 2026-2030 to the competent ministries, local People's Committee, and Ministry of Natural resources. Starting in 2027 and every year thereafter, a report on the GHG reduction of facilities in the previous year shall be prepared and submitted to the authorities by March 31st.

Disclosure Requirements:

The following standards inform the basis of sustainability reporting in Vietnam — GRI Standard, International Finance Corporation, International Integrated Reporting Council, TCFD, GHG Protocol, UN SDG 13, and ISO 26000:2010.

The TCVN ISO 14067:2000 standard, which is primarily based on the ISO 14067 standard, is focused on product-level carbon footprinting. It sets standards for data quality, requiring both quantitative and qualitative approaches. Organizations are required to conduct a life cycle inventory analysis (LCI) for CFP and synthesize and quantify the inputs and outputs for a product throughout its life cycle. However, additional research is required to confirm the exact reporting requirements for scope 1, 2, and 3.

Decision No. 01/2022/QD-TTg emphasizes the importance of reducing GHG emissions and transitioning towards a low-carbon economy. Similar to the TCVN ISO 14067:2000 standard, additional research is required to confirm the exact reporting requirements for scope 1, 2, and 3.

Summary

In summary, other key markets are in the nascent stages of developing reporting requirements. Among these markets, Taiwan and Singapore have the strictest reporting requirements. Both countries have finalized regulations requiring scope 3 emissions disclosures. However, disclosure timelines vary. Japan on the other hand is currently in the process of drafting regulations for scope 3 GHG emissions disclosures. South Korea and Vietnam have yet to adopt mandatory disclosure requirements for scope 3 emissions. Lastly, scope 3 emissions disclosures are currently voluntary in China. See below for a high-level overview of each market.

- **Taiwan:** Emissions disclosures are relatively more advanced than in other key markets — scope 1, scope 2, and scope 3 disclosures are required for publicly listed firms, but disclosing timelines vary according to the company's market value.
- **Singapore:** In February 2024, Singapore's ACRA finalized mandatory regulations requiring scope 3 emissions disclosure from both listed and non-listed large companies in a phased manner over the next few years.
- **Japan:** Processes are ongoing for the development of regulations regarding scope 3 emissions — initial drafts will be finalized over the next few months — though no mandatory rules for scope 3 emissions are in place today.
- **China:** Emissions disclosure requirements are currently not extensive — the guidelines published only involve approximately 10% of listed firms. Even for companies subject to the requirements, only scope 1 and scope 2 disclosures are required, while scope 3 emissions disclosures are voluntary.

- **South Korea:** South Korea does not have any mandatory reporting requirements for scope 3 emissions, but the country plans to develop such regulations before 2026.
- **Vietnam:** There are no specific scope 3 emissions disclosure requirements. Disclosure of product-level carbon footprint emissions is required. Further research is needed to determine with precision the current regulatory scope, but as the requirements date to 2020, it is unlikely that they cover scope 3.

C. FRAMEWORKS, TECHNOLOGIES, AND TOOLS

INDUSTRY-AGNOSTIC FRAMEWORKS

Frameworks

European Commission Product Environmental Footprint (PEF)

Background:

The European Commission’s PEF is a framework to complete standardized life cycle assessments and calculate environmental performance of products. Guidance for the use of environmental footprints — PEF and Organizational Environmental Footprint (not focused on in the scope of this paper) — were outlined in the European Commission’s Recommendation adopted in December 2021. This replaced a previous recommendation from 2013. The 2021 guidance was a culmination of steps that began in 2011 and has involved testing, learning, and establishing best practices.⁷⁸

The PEF method will allow for a singular, unified way of conducting life cycle assessments. This brings benefits to businesses through the standardization of reporting as well as streamlined data collection and resourcing. Equally the PEF method brings benefits to external stakeholders who can more easily compare across companies/industries and use this information to inform investment or consumption decisions.

Product Environmental Footprint Category Rules (PEFCR), previously discussed in this report in the context of the FCRL, are a set of rules at the product category-level that are additional to broader PEF standards.⁷⁹ PEFCR have the potential to bring about cost efficiencies for corporations as well as additional comparability within industries. More detail about PEFCRs, as well as information about an IT sector-specific PEFCR, can be found in the “Details” section below.

The PEF method is currently voluntary, though may become required or tied to regulatory requirements in the future.

Timeline:

As of April 2024, the PEF method is in a transition/pilot phase that began in 2019. During this phase, the European Commission hopes to do the following: “provide a framework for monitoring the implementation of existing Product Environmental Category Rules (PEFCRs) and Organisational Environmental Footprint Sector Rules (OEFSRs),” “develop new PEFCRs/OEFSRs,” and “new methodological developments.”⁸⁰

Reports about the culmination of the transition phase are inconsistent, with expected finalization dates ranging from 2024-2026.⁸¹

⁷⁸ European Commission, n.d. b

⁷⁹ European Commission, 2018

⁸⁰ European Commission, n.d. b

⁸¹ European Climate, Infrastructure and Environment Executive Agency, 2024

Scope:

A reporting framework that allows for the creation of a single score to represent environmental impact, accompanied with product-specific PEFCRs.

Details:

The PEF method is based on 16 environmental impact categories. A score is calculated leveraging a calculation methodology which includes weights for each of the below categories and serves to ‘normalize’ across units.⁸²

- Impact categories and example units: climate change (e.g., kg CO₂eq), EF-particulate matter (e.g., disease incidence), water use (e.g., M³ world eq), resource use, fossils (e.g., MJ), land use (e.g., pts), resource use, minerals, and metals (e.g., kg Sb eq), ozone depletion potential (e.g., kg CFC-11 eq), acidification (e.g., mol H⁺eq), ionizing radiation (e.g., kBq U²³⁵ eq), photochemical ozone formation (e.g., kg NMVOC eq), eutrophication terrestrial (e.g., mol N eq), eutrophication marine (e.g., kg N eq), eutrophication freshwater (e.g., kg P eq), human toxicity, cancer (e.g., CTUh), ecotoxicity freshwater (e.g., CTUe), and human toxicity, non-cancer (e.g., CTUh).

The Joint Research Centre (JRC) has produced technical reports for those conducting PEF analyses to inform stakeholders of the types of considerations that must be made in data collection and PEF calculation, among others. These reports are not updates to the regulation but nevertheless can serve as guidance.

As outlined by the JRC, conducting a PEF analysis requires four major steps: making clear the scope/goal, gathering life cycle inventory (LCI), completing a life cycle impact assessment (LCIA), and lastly reporting the environmental footprint (EF).

- *LCI Step*: Process by which the necessary inventory data is pulled together.
 - The JRC specifically notes the “iterative” nature of the LCI step, due to the need to constantly collect and refine data/processes.
 - LCI should include both elementary flows and non-elementary flows (modeled up to the level of elementary flows).
 - LCI should include “raw material acquisition and pre-processing (including production of parts and unspecific components)”, “manufacturing,” “distribution,” “use stage,” “end of life.”⁸³
- *LCIA Step*: Leveraging data pulled in the LCI Step, the LCIA works to classify emissions into impact categories and then characterize them to common units.
 - The LCIA step ensures that emissions are classified into one of the sixteen impact categories and with the associated units.
 - Steps include “classification, characterisation, normalization and weighting.”⁸⁴
- *EF Reporting Step*: Final reporting should include, “general information”, “goal of the study”, “scope of the study”, “life cycle inventory analysis”, “life cycle impact assessment rules”,

⁸² European Commission et al., 2019

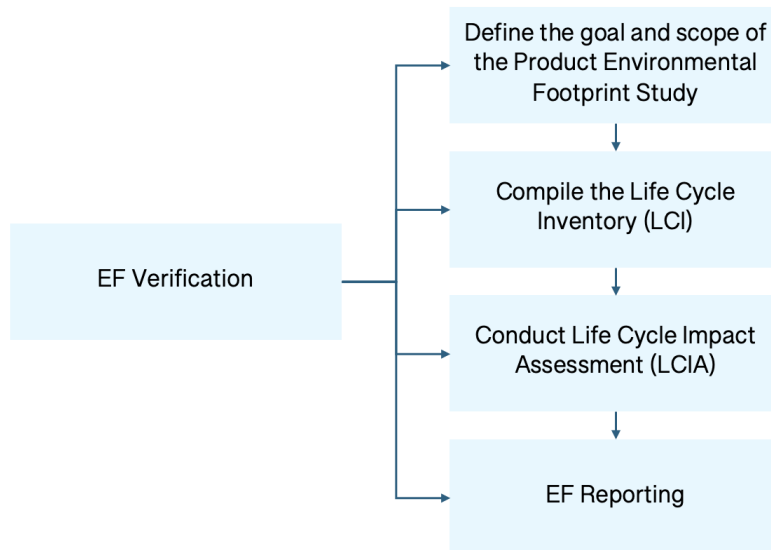
⁸³ Ibid.

⁸⁴ Ibid.

“interpreting PEF results.”⁸⁵

Please refer to Figure 1 for a graphic reproduction of PEF Study steps.

Figure 1. Graphic Reproduction of PEF Study steps from JRC’s “Suggestions for updating the Product Environmental Footprint (PEF) method.”⁸⁶



- *PEFCR*: EU Environmental Footprint documentation from 2022 includes 19 existing PEFCRs including IT equipment (see more detail below), beer, dairy, household liquid laundry detergents, decorative paints, hot and cold water supply pipe systems, intermediate paper product, feed for food producing animals, pasta, packaged water, metal sheets, leather, pet food, photovoltaic electricity production, rechargeable batteries, t-shirts, thermal insulation, uninterrupted power supply, and wine.⁸⁷

Other PEFCRs are in progress including a cross-Apparel & Footwear PEFCR which is expected to be adopted in 2024.⁸⁸ The current transitional phase of the PEF methodology will reportedly lead to the development of additional PEFCRs as discussed above. Please refer to Figure 2 for a graphic reproduction of the steps of the impact assessment from the JRC’s “Understanding Product Environmental Footprint and Organisation Environmental Footprint methods.”

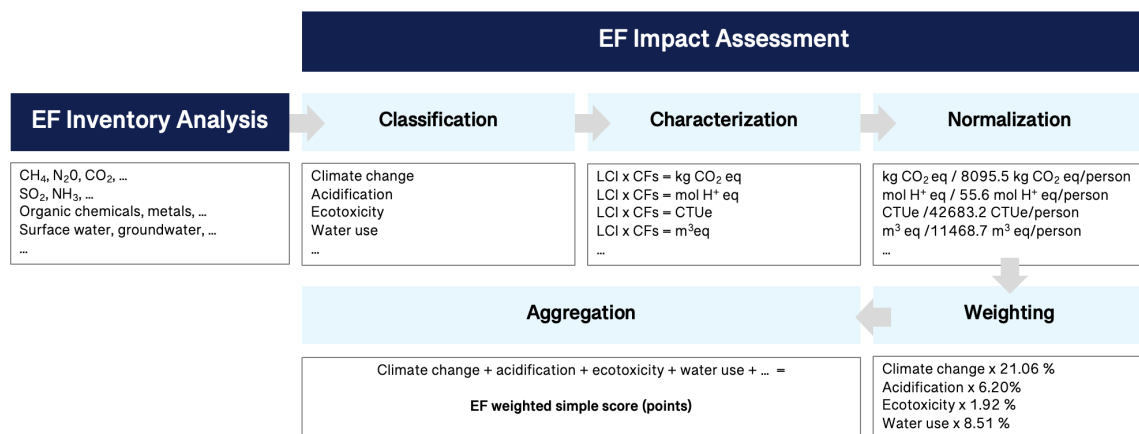
⁸⁵ Ibid.

⁸⁶ Ibid.

⁸⁷ European Commission et al., 2022

⁸⁸ PEF Apparel & Footwear, n.d.

Figure 2. Graphic Reproduction of Steps of the impact assessment phase from the JRC's "Understanding Product Environmental Footprint and Organisation Environmental Footprint methods." Reference for the numbers seen in the normalization and weighting section linked in the JRC's document.⁸⁹



⁸⁹ European Commission et al., 2022

IT Equipment PEFCR (Storage)⁹⁰:

Information regarding the existing IT equipment PEFCR is accessible through archived versions of the European Commission site. Given available information is limited regarding this PEFCR, it is important to conduct additional analysis to determine if this is still in use given the cited expiration of 2021. Regardless, it serves as important information in understanding requirements in the context of PEFCR.

The published PEFCR specifically addresses PEF methodology for storage subsystems that leverage hard disk storage — this focus on storage means the exclusion of other IT equipment or network equipment. Accordingly a storage subsystem is “an integrated collection of: a) storage controllers and/or host bus adapters, b) storage devices such as disk drives, CD-ROM drives, tape drives, and libraries, and c) any required control software, which provides storage services to one or more computers.” The PEFCR importantly calls-out the life cycle stages and data that must be collected in accordance with the PEFCR.

Documentation guidelines detail how to model each life cycle stage (see list of stages below), as well as calculations and data necessary to do so.

Accordingly, a completed PEF report on IT equipment will include: a “full life cycle inventory,” “characterised results in absolute values for all impact categories (including toxicity; as a table),” “normalised and weighted result results in absolute values, for all impact categories (including toxicity, as a table),” and “the aggregated single score in absolute values.”

Importantly, “the compliance with the present PEFCR is optional for PEF in-house applications, whilst it is mandatory whenever the results of a PEF study or any of its content is intended to be communicated.”

See Table 7 below as well as Annex B for additional information regarding this IT equipment PEFCR.

Table 7. Graphic Reproduction of “Life cycle stages,” from the “Product Environmental Footprint Category Rule” report covering IT equipment.⁹¹

Life Cycle Stage	Short Description of the Processes Included
Raw Material Acquisition and Pre-processing	<ul style="list-style-type: none">• Materials that constitute components of, accessories for, and packaging for IT equipment• Transport of materials
Production of Main Product	<ul style="list-style-type: none">• IT equipment assembly
Storage and Distribution	<ul style="list-style-type: none">• Transport of IT equipment
Use	<ul style="list-style-type: none">• Use of IT equipment• Consumables• Transport of consumables
End of Life	<ul style="list-style-type: none">• Recycling of end-of-life IT equipment and used packaging• Refurbishment of end-of-life IT equipment• Disposal of consumables

⁹⁰ Product Environmental Footprint Category Rule, 2018

⁹¹ Ibid.

The Partnership for Carbon Transparency's (PACT) Pathfinder Framework

Background:

PACT, facilitated by the WBCSD, has developed the Pathfinder Framework in collaboration with over 50 entities, including businesses, standard setters, regulatory bodies, and industry groups. This initiative extends the GHG Protocol's longstanding collaboration with WRI, adopting a cross-sectoral approach to facilitate the development and exchange of product carbon footprints (PCFs) grounded in primary data across value chains.

Timeline:

Initiated at COP26 in 2021, the Pathfinder Framework has evolved, with version 2.0 launched in January 2023.⁹²

Scope:

The Pathfinder Framework provides a methodology for calculating PCFs, assessing the life cycle impact of products on climate change by tracking GHG emissions from cradle-to-gate. This includes stages from material acquisition to production, and distribution to storage, aligning with the GHG Protocol to include key gasses such as CO₂, CH₄, N₂O, among others.

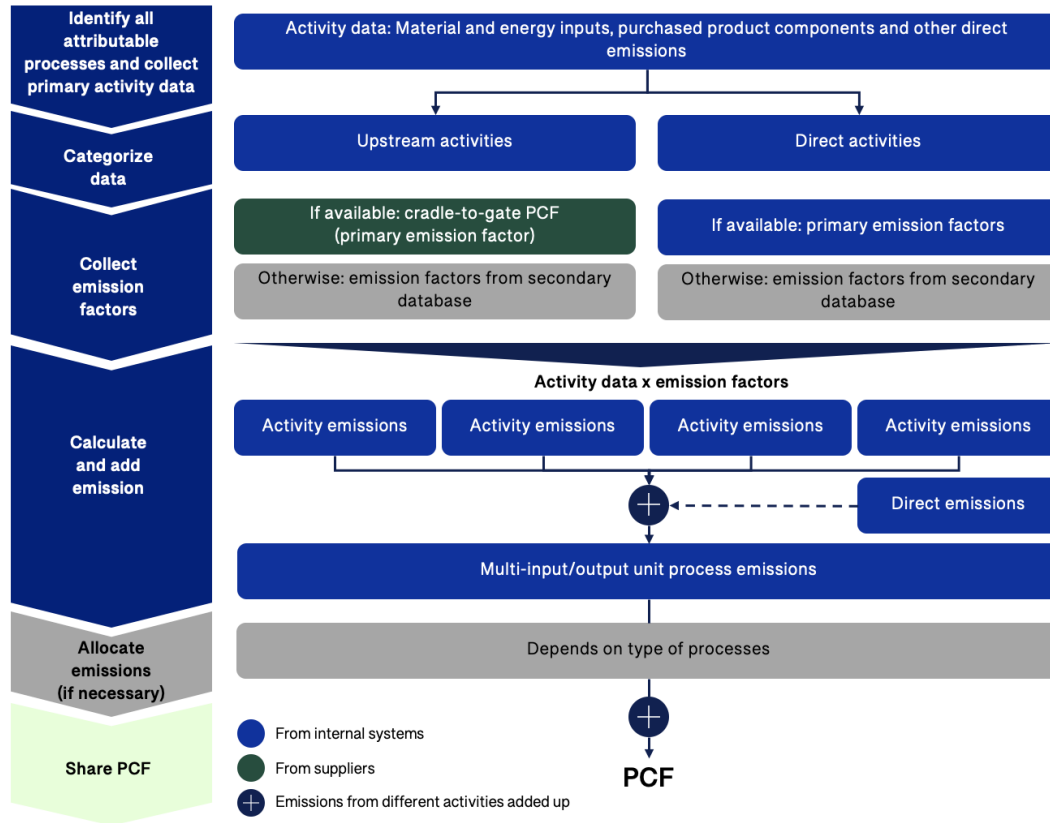
Details:

- **PCF Calculation:** The calculation of a PCF involves a systematic process that includes (i) identifying and collecting necessary data, (ii) calculating emissions using relevant emission factors, and (iii) allocating these to specific products or materials.⁹³ Figure 3 provides a detailed overview of the process for PCF calculation.

⁹² World Business Council For Sustainable Development (WBCSD), 2023a

⁹³ World Business Council For Sustainable Development (WBCSD), 2023b

Figure 3. Overview of Pathfinder Framework's Steps for PCF Calculation



- **Data Identification:** This initial phase entails pinpointing all processes linked to the product and determining the necessary data for collection. The gathered activity data are categorized into direct or upstream activities.
 - Primary data emissions factors are prioritized for direct activities, while secondary data are utilized when primary data are unavailable.
 - For upstream activities, cradle-to-gate PCF data from suppliers are employed where possible, with secondary or alternative data as substitutes.
 - Inventory data for PCF calculations should cover material and energy inputs (like steel, aluminum, and electricity), purchased materials or feedstocks, inbound transport and storage, as well as waste treatment and other direct emissions (like CO₂ formed during the production process). The inclusion of packaging in the PCF depends on its contribution to the PCF and should be clearly stated in the product description if considered.⁹⁴
- **Calculation:** GHG emissions for each process are calculated by multiplying the activity data with appropriate emission factors, expressed in CO₂ equivalent per unit. This step yields the activity emissions, which, combined with direct emissions from processes controlled or owned by the reporting entity, result in the total GHG emissions for the

⁹⁴ Ibid.

product. Please refer to Table 8 for an example of a Pathfinder Framework PCF calculation.

Table 8. Example of Pathfinder Framework's PCF calculation

Example of PCF calculation

<Direct Activities>										
Amount of activity				Emission factor		Source of emission factor		Amount of emission		
Fuel	A-grade heavy oil	1	L	x	2.71	kg-CO2e/L	Act on Promotion of Global Warming Countermeasures	=	2.71	kg-CO2e
	City gas	3	Nm3	x	1.18	kg-CO2e/Nm3	Act on Promotion of Global Warming Countermeasures	=	3.54	kg-CO2e
	Hydrogen (Company A)	0.1	Nm3	x	0	kg-CO2e/Nm3	Emission factor provided by Company A	=	0	kg-CO2e
Purchased energy	Electric power (Company B)	15	kWh	x	0.443	kg-CO2e/kWh	Emission coefficient by electric power company Company B adjusted emission factor (residue)	=	6.65	kg-CO2e
	Electric power (Company C)	10	kWh	x	0.000	kg-CO2e/kWh	Emission factor provided by Company C	=	0	kg-CO2e
Total									12.9	kg-CO2e
<Upstream Activities>										
Amount of activity				Emission factor		Source of emission factor		Amount of emission		
Raw material	Aluminum	5	kg	x	10	kg-CO2e/kg	Secondary Data DB	=	50	kg-CO2e
	Recycled resin (Company C)	3	kg	x	1.5	kg-CO2e/kg	PCF supplied by C	=	4.5	kg-CO2e
	Plain steel	2	kg	x	2	kg-CO2e/kg	Secondary Data DB	=	4	kg-CO2e
	Motor (Company D)	1	kg	x	3	kg-CO2e/kg	PCF supplied by D	=	3	kg-CO2e
Total									61.5	kg-CO2e

- **Allocation:** Adhering to the life cycle assessment (LCA), International Standard (ISO 14044), and the GHG Product Standard, emissions allocation should be minimized by subdividing common processes into distinct subprocesses. However, when allocation is necessary, it should align with established standards such as the ISO 14067 and the GHG Protocol, ensuring emissions are apportioned accurately across products and co-products. Please refer to Table 9 for an overview of allocation methods.

Table 9. Allocation methods presented by ISO and the GHG Protocol by order of priority

Method	Definition
Physical allocation	Allocating the inputs and emissions of the system based on an underlying physical relationship between the quantity of product and co-product and the quantity of emissions generated
Economic allocation	Allocating the inputs and emissions to the product and co-product(s) based on the market value of each when they exit the common process
Other relationship	Allocating the inputs and emissions to the product and co-product(s) based on established and justifiable relationships other than physical or economic

- **PCF Data Exchange:**

- **Standardized Data Model:** The PACT Pathfinder Framework integrates with the Pathfinder Network to standardize the technical requirements for data exchange. The Pathfinder Network Technical Specifications provide detailed guidelines on data semantics, standards, API usage, and licensing for data sharing, facilitating a standardized approach to GHG emission data management at the product-level. This setup, aligned with Pathfinder Framework Version 2, ensures an interoperable protocol for exchanging GHG emission data.⁹⁵
- **Technology Solution:** PACT initiated the PACT Catalog, an online platform which serves as a repository for solutions, tools, and data extensions and facilitates the calculation and exchange of PCF across various industries. By offering a comprehensive suite of conformant solutions and data model extensions, the PACT Catalog helps to streamline the process of carbon accounting and ensures interoperability of emissions data. As a result, this aids businesses in their sustainability and decarbonization efforts.

The Institute for Information Industry

The Institute for Information Industry (III), a non-government organization that supports the development of the information industry as well as information society in Taiwan, is actively engaged in creating the Transparent Carbon Data Collaboration Cloud ecosystem.⁹⁶ This initiative aligns with the PACT Pathfinder Framework and the detailed technical requirements outlined in the Pathfinder Network Technical Specifications. III is set to formulate PACT Extension standards that cater to the unique aspects of Taiwan's electronics and IT sector. These standards will facilitate more effective and sector-specific data exchange practices. Alongside the standards, III will also focus on creating PACT compliant digital tools to enhance the efficiency and accuracy of carbon data collection, analysis, and reporting within Taiwan's electronics and IT sectors. These tools will be featured in both the PACT Catalog and the Tcloud Marketplace — Taiwan's official digital transformation matchmaking platform — to facilitate broader adoption by industry stakeholders.

⁹⁵ Pompéry & Valeri, 2024

⁹⁶ Institute for Information Industry, n.d.

GHG Protocol

Background:

The GHG Protocol was established by the WBCSD and WRI to create a standardized framework to measure and report GHG emissions from both private and public sector organizations' operations and value chains. The GHG Protocol provides the most commonly used GHG accounting standards.⁹⁷ The GHG Protocol has seen high adoption rates — more than 9 in 10 Fortune 500 companies that report to the Carbon Disclosure Project (CDP) used GHG Protocol directly or indirectly.⁹⁸

Scope:

The GHG Protocol has published guidance and standards to help businesses, governments, and other organizations track their progress towards their climate goals. The standards that are most pertinent to this report include:

- ***The Corporate Accounting and Reporting Standard:*** Provides guidance on preparing a corporate-level GHG emissions inventory.
- ***The Corporate Value Chain (Scope 3) Standard:*** Allows companies to measure emissions from 15 categories of upstream and downstream activities and understand which areas to prioritize for reduction.
- ***The Product Standard:*** Considers the full life cycle emissions of a product from raw material extraction to disposal.

Details:

Scope 3 category 1 includes all upstream emissions from the production of products and services, regardless of whether it was purchased or acquired. Companies can calculate their scope 3 category 1 emissions using the following methods:

- ***Supplier-specific method:*** The supplier-specific method requires companies to collect product-level GHG inventory data from their suppliers through a cradle-to-gate process.
- ***Hybrid method:*** The hybrid method combines supplier emissions data with secondary data to calculate final emissions and fill in the gaps when supplier-specific data is not available.
- ***Average-data method:*** The average-data method collects primary data on the mass of purchased goods or service and multiplies this with secondary data (e.g., industry average data on average emissions per unit of goods or service) to estimate emissions.
- ***Spend-based method:*** The spend-based method collects data on the economic value of purchased goods or service and multiplies this with secondary data (e.g., industry average data on average emissions per monetary value of goods or service) to estimate emissions.

⁹⁷ GHG Protocol, n.d.

⁹⁸ Ibid.

IFRS Sustainability Disclosure Standards

Background:

In June 2023, the ISSB launched the IFRS Sustainability Disclosure Standards to consolidate several existing voluntary sustainability reporting initiatives and enable companies to disclose comparable information. The ISSB merged recommendations from the Climate Disclosure Standards Board (CDSB), TCFD, and the Sustainability Accounting Standards Board (SASB). Thus, the IFRS Sustainability Disclosure Standards incorporate the four pillars of the TCFD: governance, strategy, risk management, and metrics and targets.⁹⁹ As more companies, governments, and other organizations are seeking a consistent and comparable sustainability reporting framework, it is expected that local jurisdictions will adopt these standards.

Scope:

The ISSB has issued two reporting standards under the IFRS Sustainability Disclosure Standards: IFRS S1 and IFRS S2 as discussed in the opening section of this report. IFRS S1 is a core framework that companies can utilize to disclose information about sustainability-related risks and opportunities across their value chain. IFRS S2 is the first thematic standard, which focuses on disclosing information related to climate risks and opportunities. As of April 2024, there are no product-level standards.

Details:

- **IFRS S1:** The General Requirements encourage companies to disclose information on their sustainability-related risks and opportunities that can be helpful when making business decisions and creating financial reports and statements. These risks and opportunities can influence the company's cash flows, access to financing, and cost of capital. Through IFRS S1, the ISSB seeks to demonstrate the connection between sustainability and a company's financial performance.
- **IFRS S2:** IFRS S2 builds on IFRS S1 and incorporates the TCFD recommendations regarding climate-related financial disclosures. In addition to evaluating climate-related risk and opportunities, companies are required to share their scope 1, 2, and 3 emissions data in accordance with the GHG Protocol, as well as their transition plans. As of December 2023, around 400 organizations from 64 jurisdictions have committed to advancing or using IFRS S2.¹⁰⁰

⁹⁹ PwC, 2023a

¹⁰⁰ IFRS, 2023

Carbon Disclosure Project (CDP)

Background:

Established in 2000, CDP is a global non-profit organization that provides a platform for companies to disclose and reduce their environmental impacts. Every year, companies and organizations complete the CDP questionnaire on their environmental performance and the report is publicly available on CDP's website. Upon reviewing each questionnaire, CDP gives a score and publishes the 'A list' — a list of companies and cities that received an 'A' for their transparency and performance on climate change, deforestation, and water. In 2023, over 23,000 companies used CDP to disclose sustainability information, and more than 400 companies were designated with an 'A' rating.¹⁰¹

Scope:

CDP has four main focus areas: climate change, forests, water security, and plastics and biodiversity.

In 2024, CDP is rolling out a new format for its annual questionnaire to create one integrated version combining the currently separate questionnaires on climate change, forests, and water security. As part of this 2024 update, companies will also be asked questions related to plastics and biodiversity. This new format intends to expand the questionnaire to cover a wider range of environmental issues, while removing repeated questions across different questionnaires for a more holistic approach.

Additionally, CDP is aligned with the TCFD recommendations, and the organization is reviewing its alignment with the ESRS and U.S. SEC Climate Disclosure Rule.¹⁰²

Details:

- **CDP Questionnaire:** Companies that want a CDP score must complete the full version of the questionnaire, which includes sector-specific questions in addition to general questions and data points on the company's performance. The new format for the 2024 questionnaire will be available on April 30th so although we have yet to see what the integrated format will look like, it is expected that questions on climate change, water security, and forests will remain the same.¹⁰³ Questions on GHG emissions, energy use, and water use across the supply chain are most pertinent for Dell. After companies complete their questionnaires, CDP gives a score based on their performance in each focus area.
 - For the 2024 questionnaire, CDP is expanding its criteria to measure environmental performance. To be named in the 2024 A List, companies are expected to demonstrate 100 percent verification of their scope 1 and 2 emissions data and 70 percent of at least one scope 3 emission category.¹⁰⁴
- **CDP Score:** The CDP score illustrates whether companies and their stakeholders are aligned with the 1.5°C target from the Paris Agreement. CDP gives companies a score from D- to A for each focus area to show the level of action they are taking to evaluate and reduce their environmental

¹⁰¹ CDP, n.d. a; CDP, n.d. b

¹⁰² CDP, n.d. c

¹⁰³ CDP, n.d. d

¹⁰⁴ CDP, 2024a

impact. Under the new format, companies will still receive separate scores on each focus area. In its inaugural year, CDP will not score questions related to plastics and biodiversity from the 2024 questionnaire.

Stakeholder Engagement

As stakeholders demand more accountability from businesses to become more sustainable, companies are faced with increased pressure to set ambitious goals and disclose their environmental performance. In response, companies that value sustainability have engaged in a range of initiatives to position themselves as leaders in the space, including:

CDP Supply Chain Program: The CDP Supply Chain Program helps companies assess and reduce the environmental impact of their supply chains. Through this initiative, member companies engage their suppliers by encouraging suppliers to measure their environmental performance through the CDP questionnaire and promote more sustainable practices. With over 330 member organizations and \$6.4 trillion in purchasing power, the program has driven emissions reduction initiatives totaling 70 million tCO₂e in 2022 alone.¹⁰⁵ Members from the ICT sector include Dell, HP, Lenovo, and Microsoft.

World Business Council for Sustainable Development (WBCSD) and its regional affiliates: WBCSD brings together 225 CEOs from leading companies across the globe with the mission of creating a more sustainable world for people and the planet by 2050. Software and computer services make up 5 percent of total membership — ICT member companies include Apple, Google, IBM, and Microsoft.¹⁰⁶ WBCSD's most relevant focus area for the SER team is the Products & Materials pathway, which looks at the entire product life cycle and seeks to improve the sustainability of a company's supply chain. Furthermore, WBCSD has a strong global network with national and regional affiliates which engage local businesses to advance their sustainability efforts.¹⁰⁷ Within the global network, Dell and Dell suppliers may benefit from further collaboration on emissions and emissions reporting with affiliates in key regions, such as the China Business Council for Sustainable Development (CBCSD), Korea BCSD (KBCSD), BCSD Taiwan, and Vietnam BCSD (VBCSD). Singapore hosts WBCSD's Asia Pacific Headquarters, and in Japan the WBCSD network partner is the Japan Business Federation, Keidanren.

¹⁰⁵ CDP, n.d. e

¹⁰⁶ World Business Council for Sustainable Development, n.d. c

¹⁰⁷ World Business Council For Sustainable Development, n.d. d

INDUSTRY-SPECIFIC FRAMEWORKS

Catena-X Product Carbon Footprint (CX-PCF) Rulebook

Introduction:

The CX-PCF Rulebook, designed for the automotive industry, is a pioneering effort to streamline the calculation of PCFs across the industry's complex supply chain. Developed by the Catena-X Automotive Network, it stands as a comprehensive guideline for manufacturers and suppliers in the automotive sector, focusing primarily on the production stage of vehicle life cycles.¹⁰⁸

General Structure:

The CX-PCF Rulebook offers detailed guidance on establishing a PCF, identifying and prioritizing data sources and hierarchies, and defining essential elements for PCF data exchange.

Scope & Boundary:

The cradle-to-gate PCF of the CX-PCF Rulebook includes all attributable upstream and direct emissions of producing a product, including all upstream transportation activities. Specific areas covered include: resource extraction and raw material sourcing, production of materials and semi-finished products, fabrication of vehicle parts and components, packaging for vehicle parts and components, management and disposal of production waste, and logistics extending to the supplier gate (including internal logistics).

Existing Methods and Standards Leveraged:

The CX-PCF Rulebook aligns with established standards like ISO 14067, ISO 14040, and ISO 14044, ensuring its adherence to internationally recognized LCA practices. It refines these standards by integrating sector-specific guidance and product category rules applicable to automotive supply chains, with a strategic alignment towards the WBCSD Pathfinder Framework. Collaborations with sector initiatives like Together for Sustainability (TfS) and the Global Battery Alliance (GBA) underscore the CX-PCF commitment to broader sectoral integration.

Engagement with Diverse Stakeholders:

The development of the CX-PCF Rulebook involved a wide array of stakeholders, including the WBCSD, representatives from the technology sector, industry groups, as well as associations, in order to ensure a comprehensive and inclusive approach.

PCF Data Exchange Solution:

The CX-PCF Rulebook capitalizes on the Catena-X network's ecosystem to facilitate data-driven value chains, allowing for the efficient exchange of data while preserving data sovereignty. This ecosystem is poised to host sensitive company-specific information securely.

¹⁰⁸ Catena-X Automotive Network, 2023a

Catena-X aimed to finalize the initial software applications that will facilitate the accurate measurement of carbon emissions across various tiers, from the primary supplier (Tier-1) to the car manufacturer (OEM) by 2023. The first version of applications is based on SiGREEN and SAP Technology.¹⁰⁹

The Product Carbon Footprint Guideline for the Chemical Industry

Introduction:

Developed by TfS, the Product Carbon Footprint Guideline for the Chemical Industry is a pioneering document offering a standardized approach to carbon footprint calculation and reporting in the chemical sector. It aims to enhance transparency and comparability in GHG emissions data across the industry, focusing particularly on scope 3 category 1 emissions.¹¹⁰

General Structure:

The Product Carbon Footprint Guideline for the Chemical Industry provides comprehensive instructions on calculating scope 3 category 1 emissions at the corporate level and offers detailed specifications for suppliers' PCF calculations, facilitating a cradle-to-gate analysis of end products.

Scope & Boundary:

The primary focus of the guideline is on scope 3 category 1, targeting purchased goods and services. At the product-level, it guides companies in deriving the cradle-to-gate PCF for their end products.

Existing Methods and Standards Leveraged:

The guideline integrates a suite of established methodologies and standards, including:

- ISO Standards: 14064, 14067, 14040, and 14044
- GHG Protocol: Corporate Value Chain (Scope 3), Scope 3 Calculation Guidance, and Product Standard
- Sector-specific guidelines such as Lifecycle Metrics for Chemical Products and Global Logistics and Emission Council Framework
- Practical guidelines for data collection and GHG emissions calculation: Scope 3.1 Practical Guidelines for Data Collection and Calculation of Greenhouse Gas Emissions from Purchased Goods and Services

Engagement with Diverse Stakeholders:

The guideline's development involved a collaborative effort from experts across TfS member companies, supplemented by external specialists. Over 55 companies within the chemical sector reviewed the document, with TÜV Rheinland conducting the audit.

¹⁰⁹ Catena-X Automotive Network, 2023b

¹¹⁰ Together for Sustainability (TfS), 2024

PCF Data Exchange Solution:

TfS has initiated a pilot for a PCF data-sharing solution, utilizing Siemens' SiGREEN technology. This system facilitates secure sharing of PCF data among TfS members and suppliers, enhancing the ability to perform cross-industry emissions comparisons and manage emissions reporting comprehensively. The completion of this pilot project is anticipated in early 2024.¹¹¹

Steel GHG Emissions Reporting Guidance

Introduction:

The Steel GHG Emissions Reporting Guidance, developed by the Rocky Mountain Institute (RMI), is an in-depth framework designed to facilitate transparent and consistent reporting of GHG emissions in the steel sector. The primary aim is to support the differentiation of steel from other sectors based on embodied emissions, thus driving the demand for low-emission steel products.

General Structure:

The guidance is organized into sections covering an overview of the GHG emissions in the steel sector, requirements for emissions reporting, and detailed emissions calculation protocols.

Scope & Boundary:

It defines a cradle-to-gate boundary for products' emissions footprints, establishing a fixed system boundary to ensure consistent emissions disclosures across the industry. This fixed boundary defines all the process steps from which total emissions shall be reported, irrespective of the steel companies' ownership structure.¹¹²

Existing Methods and Standards Leveraged:

- **The World Steel Life Cycle Inventory Methodology:** Serves as the foundational basis for calculating the cradle-to-gate life cycle footprint of steel products.
- **ResponsibleSteel 2.0 Standard:** Provides detailed guidelines for GHG emissions calculations, allowing for benchmarking of emissions performance across common upstream points in steel production.
- **ISO 14044 Standard:** Dictates the procedures for conducting a comprehensive LCA, including the creation of a detailed LCI at the process level.

¹¹¹ de Rycke, 2023

¹¹² Wright et al., 2023

Engagement with Diverse Stakeholders:

The development of this guidance was supported by collaboration with the WBCSD team. Insights were also gained through working group discussions under WBCSD’s Automotive Partnership for Carbon Transparency (A-PACT) and were enriched by feedback from the broader PACT community.

PCF Data Exchange Solution:

RMI is advancing the development of open-source technologies to enhance product-level data exchange under the Horizon Zero initiative, part of RMI’s Climate Intelligence program. This technology effort is guided by three fundamental principles designed to improve the visibility and accessibility of GHG emissions data.

First, “Data Standards” involve establishing a consistent, agreed-upon, machine-readable schema to describe product-level emissions. Second, “Interoperability” ensures seamless integration between carbon management systems and other software platforms. This enables vendors to adopt a unified data format for various customers and allows buyers to receive standardized data, all using a consistent methodology, which facilitates effective comparisons. Lastly, “Track & Trace” leverages this standardized data, which can be transferred from node to node within a supply chain, serving as a foundation for tracking and tracing emissions across multiple supply chain tiers.¹¹³

¹¹³ RMI, n.d.

Scope 3 Category 1 GHG Assessment: Guideline for the Semiconductor Sector

Developed by the Semiconductor Climate Consortium (SCC) with support from the consulting firm Arthur D. Little, the Scope 3 Category 1 GHG Assessment Guideline provides a robust framework for the semiconductor industry to accurately measure and report upstream emissions from purchased goods and services. It outlines detailed methodologies for emissions accounting, boundary setting, quantification methods, along with a case study to facilitate practical application.

This industry-specific guideline, though not a product-level carbon footprint framework, holds significant relevance. For the ICT sector, which heavily relies on semiconductor components, the methodologies and standards set by the semiconductor industry for GHG emissions reporting directly impact the ability of ICT companies to calculate their own PCFs.

The guideline recognizes the complexity of the semiconductor industry's value chain and the vast array of products it includes — while also acknowledging that a widespread implementation of supplier-specific methods for calculating emissions may not be immediately feasible. Consequently, it recommends a transition from spend-based methods, which calculate emissions based on the economic value of purchases, to a more nuanced hybrid approach.¹¹⁴ This hybrid method combines detailed product-level data from suppliers with industry averages, allowing for a more accurate and realistic assessment of emissions across the semiconductor sector. In the short term, this transition could pose challenges for downstream ICT companies like Dell in accurately calculating their product carbon footprint due to potential gaps in the availability or accuracy of upstream emissions data from semiconductor suppliers.

¹¹⁴ Semiconductor Climate Consortium (SCC), 2024

Summary of Common Features

Given the diversity of frameworks within and across industries, it is important to take note of common features across frameworks and thus discern emerging trends and practices. This section delves into the prevalent attributes across various frameworks to elucidate how various sectors are converging towards unified standards and practices in PCF calculation and reporting.

- **Alignment with PACT’s Pathfinder Framework:** The industry-specific frameworks generally align well with PACT’s Pathfinder Framework, sharing methodologies for PCF calculation, allocation, and data requirements. This suggests a level of standardization in sustainability data management across different sectors.
- **Collaboration with WBCSD and Industry Players:** Most of the industry-specific frameworks mentioned in this section have been developed in collaboration with the WBCSD and various industry players, ensuring they cater to the unique needs of each sector while maintaining global sustainability standards.
- **Emphasis on Primary Data Sharing:** A common emphasis across these frameworks is the importance of sharing primary data within the industry supply chain. To support this, there is a concerted effort to develop and utilize necessary technological infrastructure to facilitate efficient and reliable data exchanges.
- **Additional Industry-Specific Guidance:** Each framework offers additional guidance tailored to the unique characteristics and requirements of its respective industry. For instance, the automotive industry receives specific guidance on PCF calculations related to component transportation and efficient calculation methods for homogeneous parts. The steel industry is provided with clear definitions of system boundaries and methodologies for calculating the scrap fraction, addressing the sector’s specific ambiguities and complexities.
- **Standardized Data Models:** These frameworks establish standardized data models that align with PACT’s guidelines but are also customized to reflect the specific characteristics and requirements of each industry. A standardized data model facilitates uniform GHG emission data exchange, ensuring consistency and comparability across different platforms and industries.
- **Consortia-led Initiatives to Develop Data Exchange System and Digital Tools:** The consortia developing the industry-specific PCF frameworks mentioned here are at the forefront of developing secure systems for data exchange and digital tools that support the detailed analysis, calculation, and reporting of GHG emissions. The data exchange systems are designed to protect sensitive company and product information while enabling the accurate and efficient transfer of PCF data among consortia members and even across different sectors. The digital tools often include features for data verification, analysis, and reporting, tailored to the specific needs of each industry.

ICT SECTOR FRAMEWORKS

Frameworks

ICT Sector Guidance

Introduction:

The ICT Sector Guidance, developed by the Carbon Trust and the Global e-Sustainability Initiative (GeSI) and published in July 2017, offers a detailed approach for calculating the life cycle GHG emissions of ICT products.¹¹⁵ Built upon the GHG Protocol Product Life Cycle Accounting and Reporting Standard, this guidance provides sector-specific methodologies for ICT companies, covering areas such as telecommunications network services, managed desktop services, cloud and data center services, hardware, and software. While it is not exclusively a product carbon footprint framework, it equips ICT companies with the tools to assess GHG emissions across product life cycles.

General Structure:

The guidance is organized into several chapters, beginning with an introductory chapter that offers overarching guidance, followed by detailed subject-specific chapters that provide tailored guidance for each area, including “Telecommunications Network Services”, “Desktop Managed Services”, “Cloud and Data Center Services”, “Hardware”, and “Software.”¹¹⁶

Existing Methods and Standards Leveraged:

- ISO 14040 and ISO 14044: Fundamental standards for life cycle assessment processes
- PAS 2050, GHG Protocol Product Standard, and ISO 14067: Standards specifically focusing on the life cycle GHG emissions assessment of products
- ITU-T L.1410: A methodology for evaluating the environmental impact of ICT goods, networks, and services
- ETSI ES 203 199: Methodology for environmental Life Cycle Assessment of Information and Communication Technology goods, networks and services
- IEC TR 62725: Standard for analyzing quantification methodologies of GHG emissions for electrical and electronic products and systems
- Industry Consortium Methodologies: Including those from the International Electronics Manufacturing Initiative (iNEMI) and the Product Attribute to Impact Algorithm (PAIA) project, tailored for the ICT sector.

¹¹⁵ Carbon Trust & Global e-Sustainability Initiative (GeSI), 2017

¹¹⁶ Ibid.

Product Carbon Footprint Calculation Methods:

The complexity of ICT hardware products and processes, extensive supply chains, rapid technological innovation, and data security challenges necessitate simplified methods for prioritizing primary data collection to accurately assess the GHG emissions across an ICT sector hardware product's life cycle stages.

- **Component Characterization Method:** The component characterization method employs algorithms that leverage commonalities in materials, processes, and components within the ICT industry to estimate GHG emissions of constituent components. GHG emissions from component manufacturing are calculated first, followed by applying a factor to estimate emissions from final assembly processes, utilizing available manufacturing facility data.
- **Hardware Parameterization Method:** The hardware parameterization method establishes parameterized relationships between product or supply chain features and their GHG emissions impact for cradle-to-gate processes. This allows for the scaling of emissions estimates across similar product categories such as varying sizes of resistors or notebooks. Developing these models involves defining the parameters and their interrelations, which can subsequently facilitate broader application across multiple products. Users — companies that leverage this method to calculate PCF — input specific product attributes into these models to calculate the emissions impact accurately, aligning with the analysis' objectives.
 - An example is the PAIA project, a collaborative effort in the computer industry, which streamlines LCAs by identifying and focusing on high-impact activities, thus optimizing data collection and reducing overall assessment uncertainty.

Engagement with Diverse Stakeholders:

The ICT Sector Guidance was developed by a Technical Working Group with over 50 members from ICT companies, government, standards bodies, NGOs, industry analysts, and academia. In the development process, two rounds of public consultations were conducted, including draft publications, public comment invitations, comment reviews, and draft updates. The working group also hosted webinars to detail the Guidance's scope and content, with a Stakeholder Advisory Group of more than 350 participants from 45 countries providing over 700 comments on the drafts.

The Guidance was reviewed and endorsed by WRI for alignment with the GHG Protocol Product Standard, incorporating valuable feedback.

Stakeholder Engagement

Responsible Business Alliance (RBA): Formerly known as the Electronic Industry Citizenship Coalition (EICC), the RBA is an industry coalition of over 230 electronics, retail, automotive, and toy companies that is committed to protecting the rights and well-being of workers across the supply chain.¹¹⁷ The RBA has several initiatives such as the Responsible Environment Initiative and provides assessment tools like RBA-Online, an online data management system to maintain and share sustainability information. RBA's Code of Conduct is a crucial industry standard that covers topics such as labor, health and safety, environment,

¹¹⁷ Responsible Business Alliance, n.d. a

and ethics, and it is often cited in ICT companies' ESG reports. The Code of Conduct is reviewed and updated every three years to ensure that it remains relevant.¹¹⁸

There are four tiers of RBA membership: supporter, affiliate, regular member, and full member. Both regular and full members must adhere to the Code of Conduct, but full members are considered to have a higher level of engagement since they are held accountable for their commitments. IBM, Lenovo, and Microsoft are regular members; Dell, Apple, HP are full members.

Global Electronics Council (GEC): The GEC is an environmental nonprofit organization that manages the Electronic Product Environmental Assessment Tool (EPEAT), a global ecolabel for electronics and technology products used in the ICT sector. EPEAT measures the effect of a product on the environment, focusing on four areas: climate change, chemicals of concern, circularity, and sustainable use of resources, as well as corporate ESG performance. GEC is currently in the process of updating the EPEAT criteria, which will be in effect from November 2025, and the organization has signaled that it would consider product-specific factors during its criteria revision process.¹¹⁹

Product categories that are eligible for EPEAT and relevant to Dell are computers, displays, and servers. In October 2023, Dell was named one of the first EPEAT Climate+ Champions.¹²⁰ Products with the EPEAT Climate+ designation go through a more rigorous verification process to ensure they are making progress in mitigating climate change.

Global e-Sustainability Initiative (GeSI): GeSI is a cross-sector multi-stakeholder organization which promotes ICT sector use of digital solutions to address environmental and social challenges. Members include 40 ICT companies such as Dell, Google, and IBM, as well as international organizations such as the United Nations Framework Convention on Climate Change (UNFCCC), WBCSD, and CDP. GeSI has developed several platforms and tools to leverage technology to promote sustainability. For example, GeSI partnered with Ecochain to develop an online sustainability data management platform that creates LCAs in minutes to help companies measure the emissions of their products. More recently, GeSI released a scope 3 guidance report for the telecommunications industry that includes best practices for emission calculations.¹²¹

Sustainable Electronics Recycling International (SERI): SERI, a nonprofit organization, is focused on reducing environmental and health risks linked to the use of electronics, while also aiming to promote reuse and recycling of electronics. SERI manages the Responsible Recycling (R2) Certification Program, the most widely adopted standard for used electronics, that sets criteria to promote best practices for reuse and recycling.¹²² R2 has updated its standards to keep up with the evolving landscape, and the most recent version R2v3 encourages increased transparency throughout supply chains. SERI takes a holistic approach to maximizing the value of products — however, given SERI's work is focused on recovering end-of-life products, downstream recycling chains remain a priority.

¹¹⁸ Responsible Business Alliance, n.d. b

¹¹⁹ Global Electronics Council, 2024

¹²⁰ Murphy, 2023

¹²¹ Destrée, 2023

¹²² Sustainable Electronics Recycling International, n.d.

VI. OPPORTUNITIES

This report is a comprehensive review of leading regulatory product-level emissions reporting requirements emerging across the EU, U.S., and Asia, as well as frameworks, technologies, and tools across and within industries. Reviewing watchpoints and emerging trends is critical to understanding future developments shaping reporting for scope 3 category 1 emissions.

From this research, several key interrelated opportunities emerge as ICT sector companies continue to manage the evolving and increasingly strict reporting landscape. These recommendations fall into the following categories.

Fostering Industry-Wide Collaboration:

Informed by current and emerging frameworks and tools, and collaborations across other industries, there is an opportunity for Dell to play a leadership role in:

- Driving collaboration amongst its peers through the development and implementation of harmonized frameworks. This might include spearheading initiatives to standardize and improve existing PCF practices across the ICT industry or developing a proprietary platform to measure and improve product energy efficiencies that could be rolled out to other ICT companies.
- Understanding where there may be opportunities to partner with other leading ICT sector companies, and to participate in regulatory development conversations or pilots, ensuring that ICT sector company concerns and unique features are voiced and accounted for.

Embracing Standardization:

Given the increasing patchwork of expectations around scope 3 category 1 emissions globally, Dell can take advantage of existing frameworks and initiatives, and opportunities to leverage ongoing regulatory processes, by:

- Adopting or aligning with standardized frameworks like PACT's Pathfinder Framework or PEF developments. This alignment can enhance the consistency and comparability of product-level sustainability reporting across sectors.
- Understanding developments in Product Environmental Footprint Category Rules that may impact the ICT sector.
- Tracking developments in labeling and advertising requirements in the French market, and others that may leverage PEF methodologies, while understanding if it makes sense to scale these tactics to other markets given regulatory progression.

Addressing Industry-Specific Challenges:

There's a critical need and opportunity for the ICT sector to identify and tackle its unique emissions reporting challenges. ICT sector efforts should include a focus on:

- Tailoring strategies to ICT specificities by taking cues from other industries and adapting additional guidance that caters to its specific needs, such as managing emissions from component transportation or addressing the challenges in calculating emissions for complex, multi-component products.
- Leveraging reporting and calculation to best target e-waste, enhancing the sector's ability to measure, report, and subsequently reduce its environmental impact.
- Developing strategies to consider durability, repairability, and recyclability in the context of product-level emissions reporting given the increased focus and regulatory attention on these capabilities in the ICT sector.

Keeping an Eye Towards the Future:

Given continuous changes in regulation and the landscape of available frameworks around product-level emissions reporting, Dell reporting compliance priorities and focus areas should include:

- Ensuring reliable capabilities to track and monitor on-going changes across internal teams such as road mapping upcoming enforcement dates as well as tracking implementation of key regulations such as the CSRD.
- Continuously considering how increased demands for customer-facing product-level emissions reporting may influence the development of data collection and reporting processes.
- Identifying strategies for managing voluntary reporting requirements in relation to existing and future required reporting.

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VIII. ANNEXES

A. The Carbon Border Adjustment Mechanism (CBAM) Additional Information

Embedded Emissions of Precursors (Scope 3 Emissions) Calculation

- For simple goods, the following equation is to be applied:

$$SEE_g = \text{AttrEm}_g / \text{AL}_g$$

Where: SEE_g are the specific embedded emissions of goods g , in terms of CO₂e per tonne, AttrEm_g are the attributed emissions of goods g , and AL_g is the activity level of the goods, being the quantity of the goods produced in the reporting period in that installation.

- For complex goods, for determining the specific actual embedded emissions of complex goods the following equation is to be applied:

$$SEE_g = (\text{AttrEm}_g + EE_{\text{InpMat}}) / \text{AL}_g$$

Where: AttrEm_g are the attributed emissions of goods g ; AL_g is the activity level of the goods, being the quantity of goods produced in the reporting period in that installation, and EE_{InpMat} are the embedded emissions of the input materials (precursors) consumed in the production process. Only input materials (precursors) listed as relevant to the system boundaries of the production process as specified in the implementing act adopted pursuant to article 7(7) are to be considered. The relevant EE_{InpMat} are calculated as follows:

$$EE_{\text{InpMat}} = M_i \cdot SEE_i$$

Where: M_i is the mass of input material (precursor) i used in the production process, and SEE_i are the specific embedded emissions for the input material (precursor) i . For SEE_i the operator of the installation shall use the value of emissions resulting from the installation where the input material (precursor) was produced, provided that that installation's data can be adequately measured.

Production Processes for Aluminium Products and Iron and Steel Products:

- **Primary Smelting:** Monitor CO₂ and perfluorocarbons (CF₄ and C₂F₆) emissions. Direct emissions result from the reaction of carbon electrodes with oxygen, and PFC emissions result from unwanted side reactions during electrolysis.
- **Secondary Smelting (Recycling):** Focus on CO₂ emissions only, primarily from fuel combustion

for re-melting scrap aluminum.

- **Aluminium Products Production:** Includes forming processes like extrusion, casting, rolling, forging, and drawing. Monitor indirect emissions from electricity and consider the embedded emissions of unwrought aluminum and other aluminum products as precursors.
- **Iron and Steel Products Production:** Sintered ore production, ferro-alloy production, pig iron production (both blast furnace and smelting reduction routes), DRI production, crude steel production (basic oxygen steelmaking and EAF routes), and the production of iron and steel products are detailed, each with specific considerations for embedded emissions.

Monitoring and Quantifying Emissions Methodology

- **Calculation-Based Methodology:** This approach involves determining the quantities of all fuels and input materials consumed and applying calculation factors to these quantities to determine the emissions.
- **Standard Method:** This method calculates emissions by determining the quantities of fuels and input materials consumed. These quantities are then multiplied by calculation factors like the net calorific value and emission factor, which are determined based on sampling and analysis or the use of standard factors.
- **Mass Balance Method:** Relevant where carbon remains in the produced goods (e.g., steel), this method calculates the difference between the amount of carbon entering and leaving the installation. This difference, considered to be converted into CO₂ equivalent emissions, accounts for emissions indirectly by balancing the inputs and outputs of carbon.
 - Despite its name, the calculation-based methodology also relies on measurements. However, instead of directly measuring emissions, it measures parameters such as fuel and material consumption and their carbon contents. Emissions are then calculated from this data.
- **Measurement-Based Methodology:** This methodology focuses on continuous measurements of emissions from emission sources at the installation level, providing direct data on the quantity of greenhouse gasses emitted. Emissions can be measured directly in the stack or using extractive procedures with a measurement instrument located close to the stack. This approach offers real-time data and is considered more accurate but can be more resource intensive.

Member States of the EU will impose and enforce penalties for infringements of this Regulation, the amount pursuant to article 16(3) and (4) of Directive 2003/87/EC.¹²³ The amount of those penalties will likely be higher depending on the jurisdictions where the goods have been introduced into the EU by a person who is not an authorized CBAM declarant — in order to be effective, proportionate, and dissuasive.

Collecting Data

- **Direct Emissions (Scope 1):** Includes emissions from production processes and consumption of pre-baked carbon anodes or green anodes paste during electrolysis.
- **Indirect Emissions due to Electricity Consumption (Scope 2):** Emissions associated with electricity production consumed during the manufacturing process.

¹²³ Directive - 2003/87 - en - EUR-lex. EUR. (2023). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32003L0087>

- **Indirect Emissions due to the Use of Precursors (Scope 3):** Includes embedded emissions of precursors (e.g., raw materials that are CBAM goods themselves).

B. Product Environmental Footprint (PEF) IT Equipment Additional Information

Screenshot of “List of impact categories to be used to calculate the PEF Profile,” from the “Product Environmental Footprint Category Rule” report covering IT equipment.¹²⁴

**Given this is from an archived version of the website, from a page that is cited to have expired, it is important to conduct additional analyses to understand the continued relevance of this document. Regardless, it is insightful to understand in the context of what was expected and may continue to be expected in the context of this PEFCR.*

¹²⁴ *Product Environmental Footprint Category Rule, 2018*

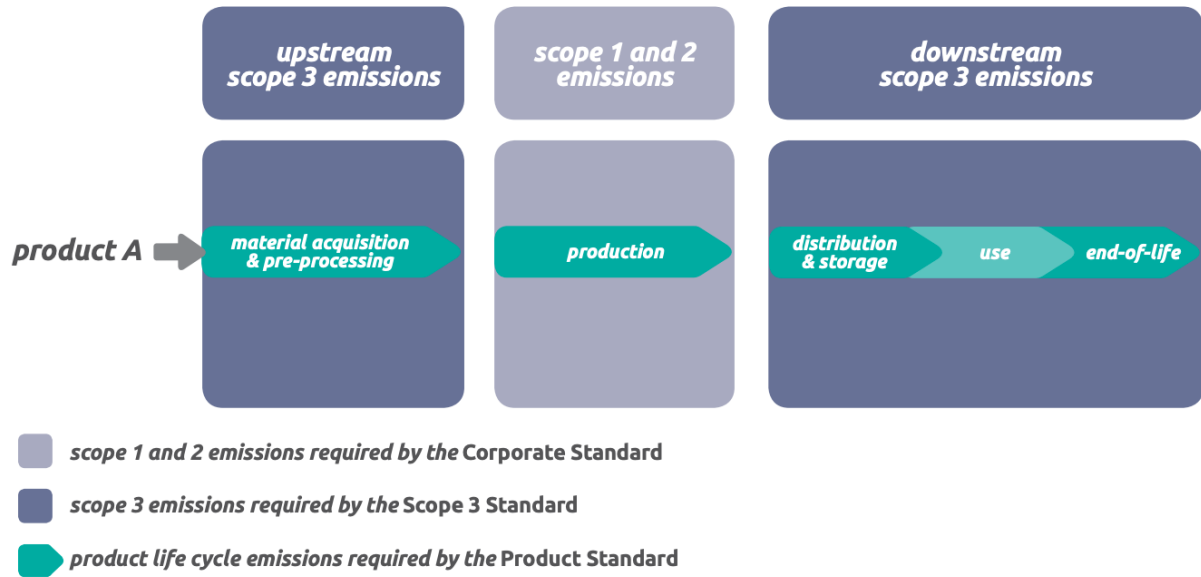
Table 3.5. List of the impact categories to be used to calculate the PEF profile

<i>Impact category</i>	<i>Indicator</i>	<i>Unit</i>	<i>Recommended default LCIA method</i>
Climate change	Radiative forcing as Global Warming Potential (GWP100)	kg CO ₂ eq	Baseline model of 100 years of the IPCC (based on IPCC 2013)
— Climate change - biogenic ⁹			
— Climate change - land use and land transformation			
Ozone depletion	Ozone Depletion Potential (ODP)	kg CFC-11 eq	Steady-state ODPs 1999 as in WMO assessment
Human toxicity, cancer*	Comparative Toxic Unit for humans (CTU _h)	CTUh	USEtox model (Rosenbaum et al, 2008)
Human toxicity, non-cancer*	Comparative Toxic Unit for humans (CTU _h)	CTUh	USEtox model (Rosenbaum et al, 2008)
Particulate matter	Impact on human health	disease incidence	UNEP recommended model (Fantke et al 2016)
Ionising radiation, human health	Human exposure efficiency relative to U ²³⁵	kBq U ²³⁵ eq	Human health effect model as developed by Dreicer et al. 1995 (Frischknecht et al, 2000)
Photochemical ozone formation, human health	Tropospheric ozone concentration increase	kg NMVOC eq	LOTOS-EUROS model (Van Zelm et al, 2008) as implemented in ReCiPe
Acidification	Accumulated Exceedance (AE)	mol H ⁺ eq	Accumulated Exceedance (Seppälä et al. 2006, Posch et al, 2008)
Eutrophication, terrestrial	Accumulated Exceedance (AE)	mol N eq	Accumulated Exceedance (Seppälä et al. 2006, Posch et al, 2008)
Eutrophication, freshwater	Fraction of nutrients reaching freshwater end compartment (P)	kg P eq	EUTREND model (Struijs et al, 2009b) as implemented in ReCiPe
Eutrophication, marine	Fraction of nutrients reaching marine end compartment (N)	kg N eq	EUTREND model (Struijs et al, 2009b) as implemented in ReCiPe
Ecotoxicity, freshwater*	Comparative Toxic Unit for ecosystems (CTU _e)	CTUe	USEtox model, (Rosenbaum et al, 2008)
Land use	<ul style="list-style-type: none"> • Soil quality index¹⁰ • Biotic production • Erosion resistance • Mechanical filtration • Groundwater replenishment 	<ul style="list-style-type: none"> • Dimensionless (pt) • kg biotic production¹¹ • kg soil • m³ water • m³ groundwater 	<ul style="list-style-type: none"> • Soil quality index based on LANCA (EC-JRC)¹² • LANCA (Beck et al. 2010) • LANCA (Beck et al. 2010) • LANCA (Beck et al. 2010) • LANCA (Beck et al. 2010)
Water use**	User deprivation potential (deprivation-weighted water consumption)	m ³ world eq	Available Water REMaining (AWARE) Boulay et al., 2016
Resource use, minerals and metals	Abiotic resource depletion (ADP ultimate reserves)	kg Sb eq	CML 2002 (Guinée et al., 2002) and van Oers et al. 2002.
Resource use, fossils	Abiotic resource depletion – fossil fuels (ADP-fossil)	MJ	CML 2002 (Guinée et al., 2002) and van Oers et al. 2002

⁹ The sub-impact categories 'Climate change - biogenic' and 'Climate change - land use and land transformation' shall not be reported separately because their contribution to the total climate change impact, based on the benchmark results, is less than 5% each.

C. GHG Protocol: Product Standard’s Relationship to Corporate and Scope 3 Standards¹²⁵

Figure [1.1] The relationship between the *Corporate, Scope 3, and Product Standards* for a company manufacturing product A



¹²⁵ GHG Protocol et al., n.d.

D. CDP Key Changes for 2024¹²⁶

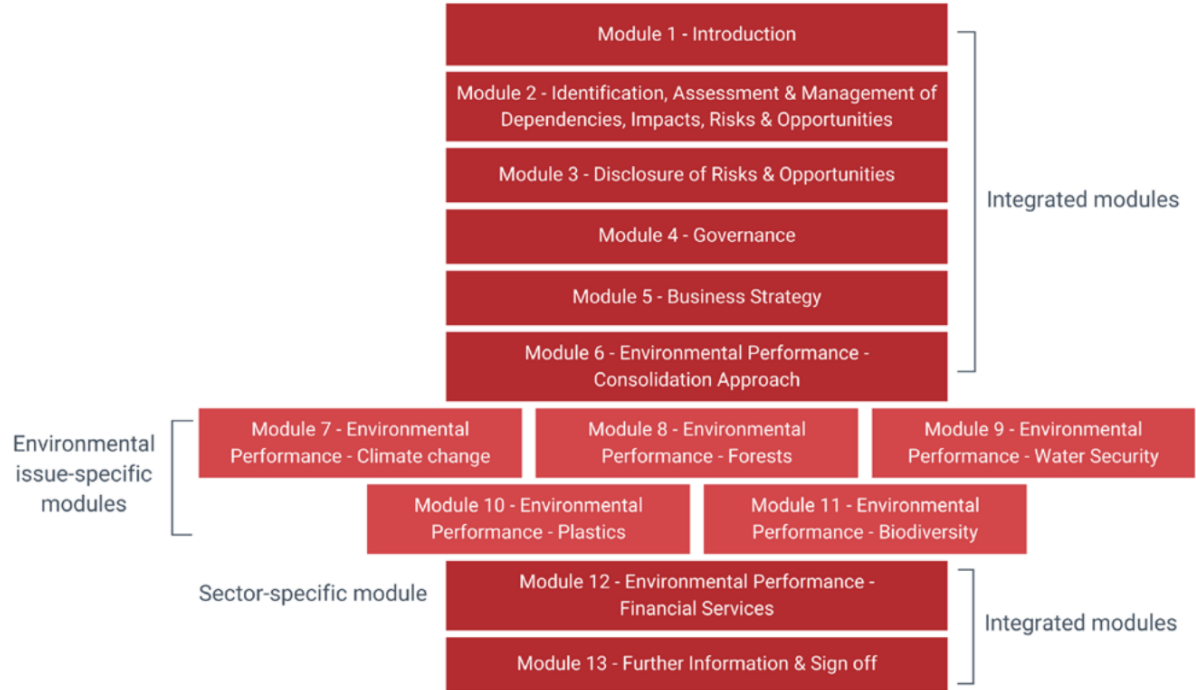
Key changes	Benefits for disclosing organizations
<p>One corporate questionnaire, integrated across all environmental topics</p>	<p>Replacing three separate questionnaires with a single, integrated one.</p> <p>All disclosing companies can access plastic and biodiversity questions.</p> <p>Companies reporting across several environmental issues can:</p> <ul style="list-style-type: none"> ▼ Provide holistic, comparable environmental data to global capital markets and procurement teams. ▼ Better assess environmental risks, impacts and opportunities in operations, supply chain, and financial decisions. ▼ Benefit from streamlined reporting, limiting duplication on core questions e.g. governance, strategy.
<p>Increased alignment with market and regulatory disclosure standards.</p> <p>Alignment with IFRS 2 climate disclosure standard, increased alignment with TNFD recommendations and European Sustainability Reporting Standards (ESRS).</p>	<p>Supporting organizations on their path to market and regulatory compliance.</p> <p>Disclose once and have data used many times by stakeholders and the market.</p>
<p>New, dedicated questionnaire for SMEs</p>	<p>With fewer questions, a simplified format and enhanced guidance, CDP's climate-focused SME questionnaire is well matched to the resources of SMEs.</p> <p>A tailored approach to focus your attention, build capacity and act.</p>
<p>Specialist performance modules on priority environmental topics</p>	<p>No one size-fits all approach. Environmental performance modules will remain theme or sector specific and be presented as is relevant to the disclosing organization.</p>
<p>Inclusion of emerging best practice stemming from alignment with key market and regulatory standards</p>	<p>Get ahead of future market and regulatory demands.</p> <p>Gain competitive advantage in the global market.</p> <p>Access decision-useful data to manage and reduce environmental impacts.</p>

¹²⁶ CDP, 2024a

E. CDP 2024 Full Questionnaire Layout¹²⁷

Questionnaire layout & structure

'Full' Corporate questionnaire



¹²⁷ CDP, 2024b