ENVIRONMENTAL ACCOUNTING TOOLKIT

Partnering for Progress on Environmental Accounting, Target Setting and Disclosure

Learn more about our supplier responsibility guidance through all our supplier toolkits at **sigmaaldrich.com/suppliertoolkits**

DISCLAIMER

The materials in this toolkit are intended to serve as general guidance and background information only.

We have compiled the content of this toolkit carefully and in accordance with its current state of knowledge.

However, we give no warranty, either expressly or tacitly, for the completeness or correctness of the details provided on this toolkit. Please be aware, in particular, that the details we provide may no longer be up-to-date. Access to and use of this toolkit and of any associated sites or sites connected via links take place at the user's own risk. We accept no liability for loss, damage or compensation claims due to missing or incorrect details.

TABLE OF CONTENTS

What You'll Find

The Environmental Accounting Toolkit is designed to assist organizations in establishing a reliable method to calculate the environmental impact of their operations and value chain activities. This toolkit provides a structured approach to get started - including key activity data needed to quantify impact, setting targets, and disclosing progress.

Learn more about our sustainability strategy and 2030 goals here.

SUPPLIER EXPECTATIONS

- Establish an environmental accounting system
- Disclose emissions to us
- We encourage suppliers to set reduction targets and recommend to align targets with the Science Based Targets initiative.

We set supplier expectations across a variety of impact areas. **Click here** to view them all.

WHY DOES ENVIRONMENTAL ACCOUNTING MATTER?

Environmental Accounting is the basis of any sustainability program, ensuring credible methodologies are in place to measure, manage, and ultimately reduce environmental impact.

Stakeholder Engagement and Reporting

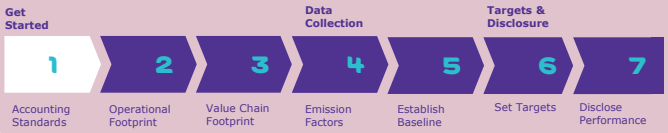
Environmental accounting supports transparency in sustainability reporting, allowing companies to quantify and communicate their environmental performance and initiatives effectively to customers, investors, and the community. This transparency builds trust, demonstrating a commitment to sustainability and enhancing the company's brand value in an increasingly sustainability-focused market.

As environmental regulations become more stringent, effective environmental accounting helps companies ensure compliance with laws and standards. Transparency will not just be "nice-to-have", but a requirement to do business in the future.

Enhanced Decision-Making

Environmental accounting provides companies with valuable data on their impacts, enabling change through informed decision-making. By understanding the costs associated with resource consumption, waste generation, and emissions, organizations can identify areas for improvement and implement more sustainable practices that increase efficiency and lead to potential cost savings.

We started our environmental accounting journey in 2008. With a strong foundation, we leverage our experience to drive change and reduce our emissions footprint, a key business driver for future growth.



GET STARTED

1. Environmental accounting standards

The first step is to understand the basics. This includes the emission sources that contribute to Scope 1, Scope 2, and Scope 3, as well as how to compile this information to develop your emissions inventory.

The Greenhouse Gas (GHG) Protocol is the most widely used environmental accounting standard. It is issued by the World Business Council for Sustainable Development (WBCSD) and the World Resource Institute. For corporations, two parts are most relevant:

- Corporate Standard (Scope 1 & 2)
- Corporate Value Chain Standard (Scope 3)

If you're getting started, focus on the Corporate Standard as this addresses Scope 1 and 2 (emission from your own operations), then move on to the Corporate Value Chain Standard as this addresses Scope 3 (upstream and downstream value chain).

One of the first things you'll want to define is your organizational boundaries. This will define what data is in or out of scope for your accounting methodology. These include:

- Operational Control (most commonly used)
- Equity Share
- Financial Control

More information can be found in the GHG Protocol.

Looking for inspiration?

WBCSD publishes their ClimateDrive toolkit to help companies along their decarbonization journey. Small and medium-sized enterprises may want to consider the SME Climate Hub as a supplement to our toolkits.

TOGETHER FOR SUSTAINABILITY

Looking for trainings?

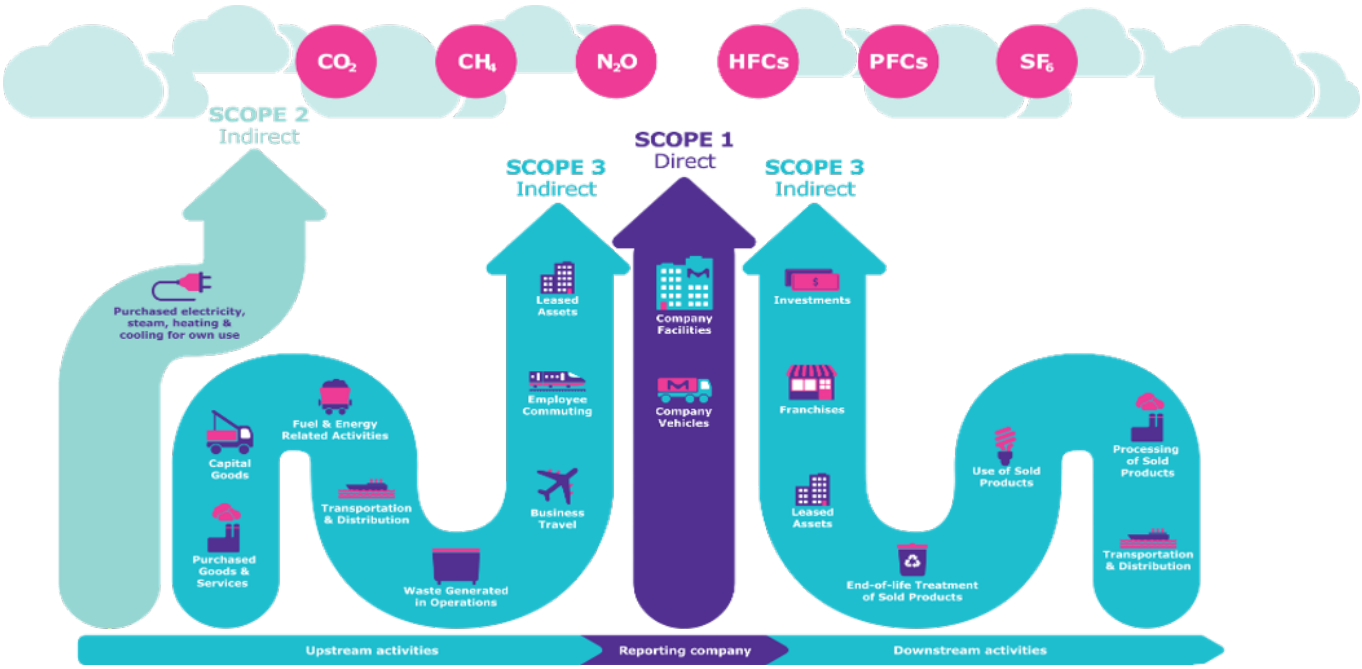
We're a member of Together for Sustainability (TfS)!

Our suppliers have access to training materials at no cost. Build your skills with the TfS Academy.

GET STARTED

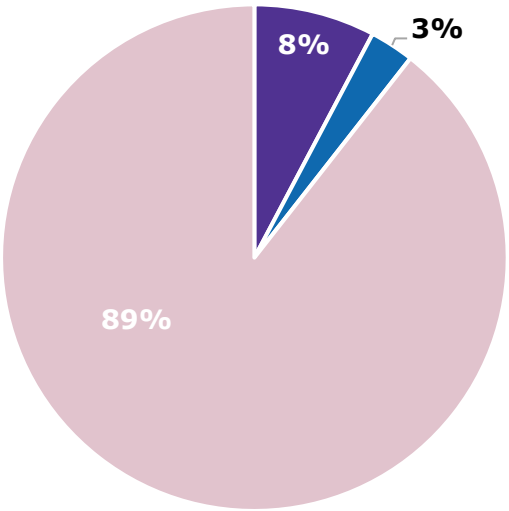
1. Environmental accounting standards

Greenhouse Gas Emissions (GHG) are comprised of 3 Scopes of emissions: Scope 1, Scope 2, and Scope 3, as described below. Scope 3 emissions contain 15 unique categories that are grouped by upstream and downstream activities.



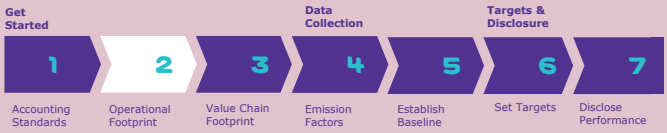
- **Scope 1:** On-site emissions from combustion of fuels (like natural gas) and release of refrigerants, process gases, and company owned/controlled vehicles
- **Scope 2:** Off-site emissions from purchased electricity, heat, and chilled water
- **Scope 3:** Value chain emissions upstream and downstream of your operations

89% of our 2024 GHG emissions was in Scope 3



in metric tons CO_2eq	
Scope 1	133,109
Scope 2	48,708
Scope 3	1,538,000

Full 2024 GHG footprint of the Life Science business of Merck



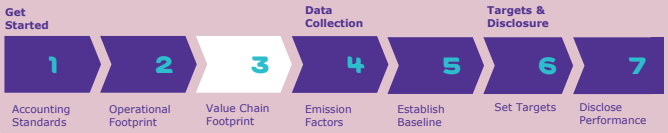
DATA COLLECTION

2. Operational Footprint

To accurately quantify your operational footprint, collecting activity data is essential. The table below provides an overview of various types of activity data. For specific details on Scope 1 & 2 GHG accounting, refer to the GHG Protocol Corporate Standard (Scope 1&2).

Impact Area	Key Activity Data
Scope 1 – Fuel consumption in owned/controlled vehicles	• Fuel type (e.g., gasoline, diesel, propane) • Annual fuel consumption • Fuel efficiency and annual distance traveled by each vehicle
Scope 1 – Refrigerants and process gases	• Service records indicating the type (e.g., R-134a, CO_2), and mass of each gas used to recharge refrigeration systems, chillers, and air conditioners • Purchasing or process records indicating type and mass of bottled gases used
Scope 1 – On-site fuel combustion	• Amount of each fuel consumed (e.g., natural gas, diesel, propane, oil) represented in units of volume or energy
Scope 2 – Purchased electricity, steam, heat, and cooling	• Purchased standard grid electricity • Purchased renewable electricity • Self-generated renewable electricity • Energy attribute certificates obtained • Purchased steam, heat, or cooling
Water - Intake and Discharge	• Water intake by source (e.g., rainwater, tap water, groundwater, surface water, water recycled/reused) • Water discharged by receiving body (e.g., to own wastewater treatment plant, to municipal wastewater plant, to rivers/lakes/ocean, etc.)
Waste – Type and Disposal Method	• Waste type (e.g., paper, plastic, metal, general) • Classification (e.g., hazardous vs. non-hazardous) • Disposal method (e.g., landfill, incineration, waste-to-energy, recycling, compost, avoidance)

We recommend maintaining granularity at the site address-level. If submetering data is available, collect that too – it can be used to understand where energy is consumed in your facility.

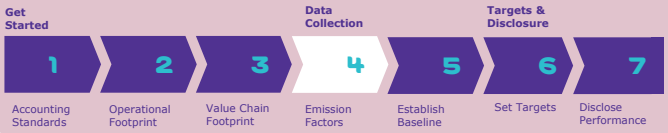


DATA COLLECTION

3. Expand to your value chain

Companies looking to assess their value chain (upstream and downstream) footprint must organize activity data related to Scope 3 categories. The table below outlines the types of data required for this evaluation. For comprehensive guidance, see the **GHG Protocol's Corporate Value Chain Accounting and Reporting Standard**.

Scope 3 Category	Key Activity Data
Category 1 – Purchased goods and services	• Annual spend on purchased goods and services (by category) • Quantities and weight of all purchased goods • Supplier names and manufacturing location • Advanced: Supplier provides product carbon footprints (PCF)
Category 2 – Capital goods	• Annual spend on capital equipment, buildings, vehicles, etc., by purchasing category • Advanced: Supplier provides PCF
Category 3 – Fuel- and energy-related activities	• Electricity, steam, heating, or cooling data for energy-related upstream emissions not captured in Scope 1 and 2
Category 4 – Upstream transportation and distribution (paid by reporting company)	• Shipment level data, including weight, volume, and/or units transported • Transportation modes (truck, rail, sea, and air) and providers • Transport conditions (e.g., cold-chain) • Origin and destination
Category 5 – Waste generated in operations	• Waste quantities by disposal method (e.g., landfill, incineration, recycling) • Waste compositions (e.g., food waste, plastic, paper)
Category 6 – Business travel	• Travel records, including mode, distance, class of travel and hotel stays
Category 7 – Employee commuting	• Employee commuting routine including round trip distance traveled, frequency, and mode of travel (e.g., car, public transit, bicycle)
Category 8 – Upstream leased assets	• If not already reported in Scope 1 & 2, utility bills from buildings where you are the tenant
Category 9 – Downstream transportation and distribution	• Not paid by reporting company, see Category 4 for data needs
Category 10 – Processing of sold products	• Types and quantities of intermediate products sold that require downstream processing • Customer or downstream processor's location
Category 11 – Use of sold products	• Quantity sold, and region sold to, for products that consume energy or cause emissions when in use. • Product lifespans and energy consumption during use
Category 12 – End of Life Treatment of Sold Products	• Quantity sold, and region sold to, for each product • Disposal method (e.g., recycling, incineration, waste-to-energy, landfill)
Category 13 – Downstream leased assets	• If not already reported in Scope 1 & 2, utility bills from buildings where you are the landlord
Category 14 – Franchises	• Scope 1 & 2 data from Franchisee or request utility data, location, etc.
Category 15 - Investments	• Investor's equity or debt share and value of total project • Scope 1 & 2 data from project or request utility data, location, etc. • Investment holding periods



DATA COLLECTION

4. Identify emission factors

Now that you collected activity data, the next step is identifying the appropriate emission factors. These factors convert activity data, such as energy consumption, into greenhouse gas emissions and carbon dioxide equivalents (CO_2e).

Explore the GHG Protocol's List of Available Emission Factors Databases. This comprehensive list contains links to the resources below.

- International Energy Agency (IEA): offers country-level emission factor sets for various energy sources.
- Association of Issuing Bodies (AIB) and the Center for Resource Solutions: provide residual mix emission factors to prevent double counting of renewable electricity.
- U.S. Environmental Protection Agency (EPA): offers multiple emission factor resources, including the GHG Emission Factors Hub and the eGRID Emission Factor Hub.
- U.K. Department for Energy Security and Net Zero (DEFRA): provides emission factors applicable to the U.K. The Scope 3 emission factors in this data set are frequently used by corporations globally.
- Intergovernmental Panel on Climate Change (IPCC) AR5 Synthesis Report: provides emission factors related to process gases and fugitive emissions, such as refrigerants used in cooling systems.
- Ecoinvent Database: provides secondary data for Scope 3 reporting and fills data gaps by providing regional and global average GHG emission factors.

What is a CO_2 Equivalent?

It's a unit of measure used to compare the Global Warming Potential (GWP) of different greenhouse gases including CO_2, CH_4, N_2O, HFC's and PFC.

DATA COLLECTION

4. Identify emission factors

Emission factors can be applied with varying degrees of accuracy. The emission factors you use may depend on the availability and granularity of your activity data, or the maturity of your program, and stakeholder requirements for accuracy.

Below are a few examples:

Scope 2, Purchased Electricity

Emissions Factor	Type of Factor	Example
International Energy Agency	Country-level mix	Emission factor for Germany
Regional	Sub-grid level mix	EPA eGRID Subregion CAMX
Supplier Specific	Supplier's mix	Emission factor for "Electric Company A"

Least Accurate ↓ Most Accurate

Scope 3, Category 1 – Purchased Goods & Services

Emissions Factor	Type of Factor	Example
Industry average emission factor	Spend-based	Emission factor for the packaging industry (all materials)
Material-level emission factor, industry-average	Spend-based or weight-based	Emission factor for cardboard boxes
Supplier specific Product Carbon Footprint (Cradle-to-Gate)	Weight-based or quantity-based	Emission factor for cardboard boxes made by "Supplier A"

Least Accurate ↓ Most Accurate

Scope 3, Category 4 – Logistics

Emissions Factor	Type of Factor	Example
Mode of Transportation, Industry Average	Ton-km based	Emission factor for sea freight per ton-km shipped
Mode of Transportation, Supplier Average	Spend-based or weight-based	Emission factor per ton-km shipped by a specific supplier
Shipment specific	Shipment-based	Emissions for shipment tracking ID 12345 based on actual package movements

Least Accurate ↓ Most Accurate

DATA COLLECTION

5. Build your inventory and calculate your baseline.

Define your baseline

Once activity data and emission factors are identified, define your baseline year. If you plan to align with a target framework, such as the Science Based Targets initiative (SBTi), you must select a baseline year no earlier than 2015. For those calculating their Scope 3 emissions, **some categories may not apply for your business – that's OK!** Document why and move to the next category.

Select an accounting solution

Next, your emissions inventory can be compiled, and baseline emissions can be calculated. There are many free resources available to help you, including:

- **U.S. EPA GHG Emissions Calculator**
- **SME Climate Hub Business Emissions Calculator**

General calculation approach:
*CO_2 emissions [kg] = Activity Data [e.g. kWh] * Emission Factor [kg CO_2/kWh]*

Large companies, or those who are seeking more advanced environmental accounting solutions, may need to source a more advanced software solution. Consider your current and future needs such as:

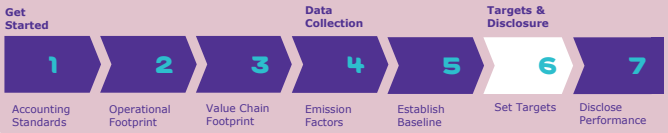
- Consulting support needed
- Business data availability
- Interface with other business applications
- Self-service vs. Vendor-service
- Emission reduction strategy support
- Impact areas (e.g., GHG emissions, water, waste)

Market vs. Location-based Scope 2 Accounting

When setting up an accounting solution and choosing emission factors, account for Scope 2 emissions using the **"location-based"** and **"market-based"** approach. For details, please see the GHG Protocol Scope 2 Guidance.

The **location-based approach** quantifies the emissions caused by the reporting company based on the location of its facilities. In a nutshell, it reflects the emissions intensity of the grid where the energy is consumed.

The **market-based approach** accounts for the emission reduction caused by the purchase of renewable electricity, even if the purchase is not from the local grid. This approach is commonly used when setting corporate targets.



TARGETS & DISCLOSURE

6. Set targets and monitor performance

We encourage organizations to set climate-related targets through SBTi, which provides guidance for companies to establish meaningful goals aligned with climate science. In 2022, SBTi confirmed that our near-term 2030 Scope 1, 2, and 3 targets align with the 1.5°C scenario*.

For organizations not yet ready to commit to a science-based target, we still expect our suppliers to set reduction targets. Use our targets as a foundation, and draw inspiration from benchmarking customers, competitors, and suppliers. To establish near-term targets, you can also use the SBTi target setting tool.

Some examples of target framing include:

- **Absolute targets** (best practice) – reduce below a defined baseline
- **Normalized targets** – adjusted for business performance such as revenue or profit
- For Scope 3, a **Supplier Engagement Target** could be a starting point, such as % of spend with suppliers who have set a science-based target.

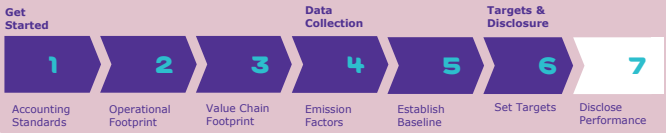
Our Environmental Targets

- **50%** reduction of **Scope 1 and 2** emissions by 2030 vs 2020
- **52%** reduction of **Scope 3** emissions per Euro value added by 2030 vs 2020
- **Achieve Climate Neutrality** Scope 1, 2 & 3 by 2040
- **80% Purchased Renewable Electricity** by 2030
- **57%** reduction in **water use per Euro gross profit** by 2030 vs 2020
- **67% Waste Circularity Rate** by 2030

Learn more about our **sustainability strategy and targets**.

*A 1.5°C climate scenario represents the level of warming that scientists agree is critical to avoid the most catastrophic impacts of climate change on people and ecosystems.

Note: SBTi has defined acceptable methodologies towards achieving targets. Learn more about SBTi guidelines here.



TARGETS & DISCLOSURE

7. Disclosure and reporting

Now that you have established your environmental accounting system and targets, we encourage you to publicly disclose on your progress.

Many companies publish an annual Sustainability Report, and in some cases, this report should be integrated with the company's Financial Report—for example, European companies subject to the Corporate Responsibility Reporting Directive). You can view our report here.

Additionally, several voluntary reporting channels are available. We use platforms such as the Carbon Disclosure Project (CDP) and EcoVadis to evaluate the performance of our suppliers, and we encourage you to disclose through these channels as well.

SCIENCE BASED TARGETS

ecovadis

CDP

Customer Disclosures

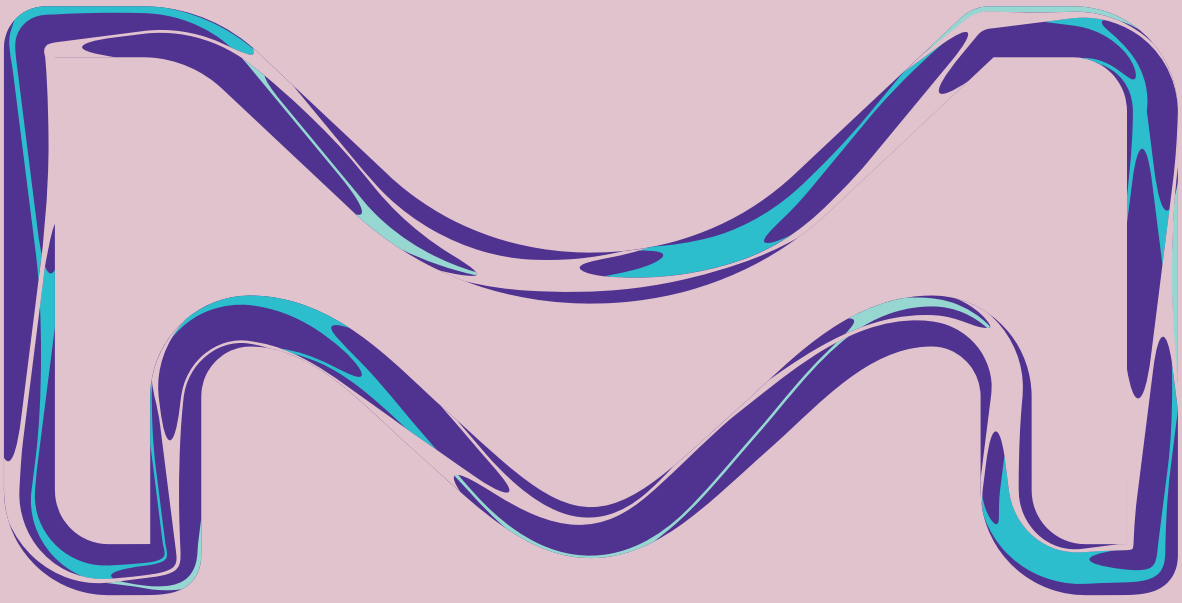
Disclosing environmental performance to customers is a sign of an advanced supplier on sustainability. Sharing company performance and customer-specific data builds stronger trust between companies:

- Complete customer surveys
- Disclose company emissions
- Calculate customer-specific footprints
- Develop product/service carbon footprints

RESOURCES

Explore additional resources to enhance environmental accounting strategy and take further action.

GUIDELINES AND STANDARDS	**GHG Protocol Corporate Standard (Scope 1&2)** **GHG Protocol Scope 2 Guidance** **GHG Protocol Corporate Value Chain Standard (Scope 3)**
EMISSION FACTORS	**International Energy Agency (IEA)** **Association of Issuing Bodies (AIB)**: EU residual mix emission factors **Center for Resource Solutions**: U.S. residual mix emission factors **U.S. Environmental Protection Agency (EPA)** **U.S. EPA GHG Emission Factors Hub** **U.S. EPA eGRID Emission Factor Hub** **U.K. Department for Energy Security and Net Zero (DEFRA)** **IPCC AR5 Synthesis Report**: For global warming potentials of refrigerants **Ecoinvent**: Life cycle analysis emission factor database
CALCULATION TOOLS	**U.S. EPA GHG Emissions Calculator** **SME Climate Hub Business Emissions Calculator**
TARGETS & DISCLOSURE	**Science Based Target Initiative (SBTi)** **SBTi Target Setting Tool** **EcoVadis** **Carbon Disclosure Project (CDP)**



The Life Science business of Merck operates as MilliporeSigma in the U.S. and Canada.