

Introduction to Greenhouse Gas Inventory

Training Module

Reading time: 25min

Overview

In this module, you will learn:

- What we mean by greenhouse gas (GHG) inventory
- Sources of greenhouse gases
- Conducting a GHG inventory
- Data sources
- The GHG Protocol Calculator
- Next Steps: Emissions reductions
- Reporting your results

Greenhouse Gas (GHG) Inventory

Understanding environmental impact starts by measuring greenhouse gases

Greenhouse Gases & Business Risks

Risks from climate change are huge and costly. Even small shifts lead to societal disturbances and negative economic impacts—and significant business risks.

Business consequences from climate related events include:

- Resource shortages from raw materials to finished goods
- Supply chain disruptions and complicated logistics
- Unexpected business costs and rising cost of goods
- Higher insurance premiums

Climate change has been identified as the number one long-term threat to the world economy—and an issue with potentially the most severe impacts to come over the next decade.

Greenhouse Gas Inventory

Preparing **a greenhouse gas GHG inventory** (also called carbon accounting) is the **process of measuring and accounting for your businesses' environmental impacts.**

With a GHG inventory, businesses can make informed changes to reduce their carbon emissions—and mitigate associated business risks.

A GHG inventory provides an essential foundation for strategic thinking about reducing emissions.

It allows a business to identify the biggest “hot spots” in their value chains—the activities that generate the most emissions.

Language of Greenhouse Gas (GHG) Emissions

Activities like burning fossil fuels or clearing forests release atmospheric gases that trap heat in the atmosphere—like a greenhouse—raising temperatures and influencing weather patterns. This process is known as climate change or global warming, and the resulting atmospheric gases are called “greenhouse gases.”

Carbon Dioxide CO_2 From burning fossil fuels or clearing land	Methane CH_4 From burning fossil fuels, waste decomposition, agriculture, industrial sectors	Perfluorocarbons PFC From industrial manufacturing process	Sulfur Hexafluoride SF_6 From industrial manufacturing process	Nitrous Oxide N_2O From industrial manufacturing process	Hydrofluorocarbons HFC From coolants and refrigerants
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Carbon dioxide is the most commonly known GHG, but there are many other types. Collectively, these gases are referred to as “carbon emissions” or a “carbon footprint.”

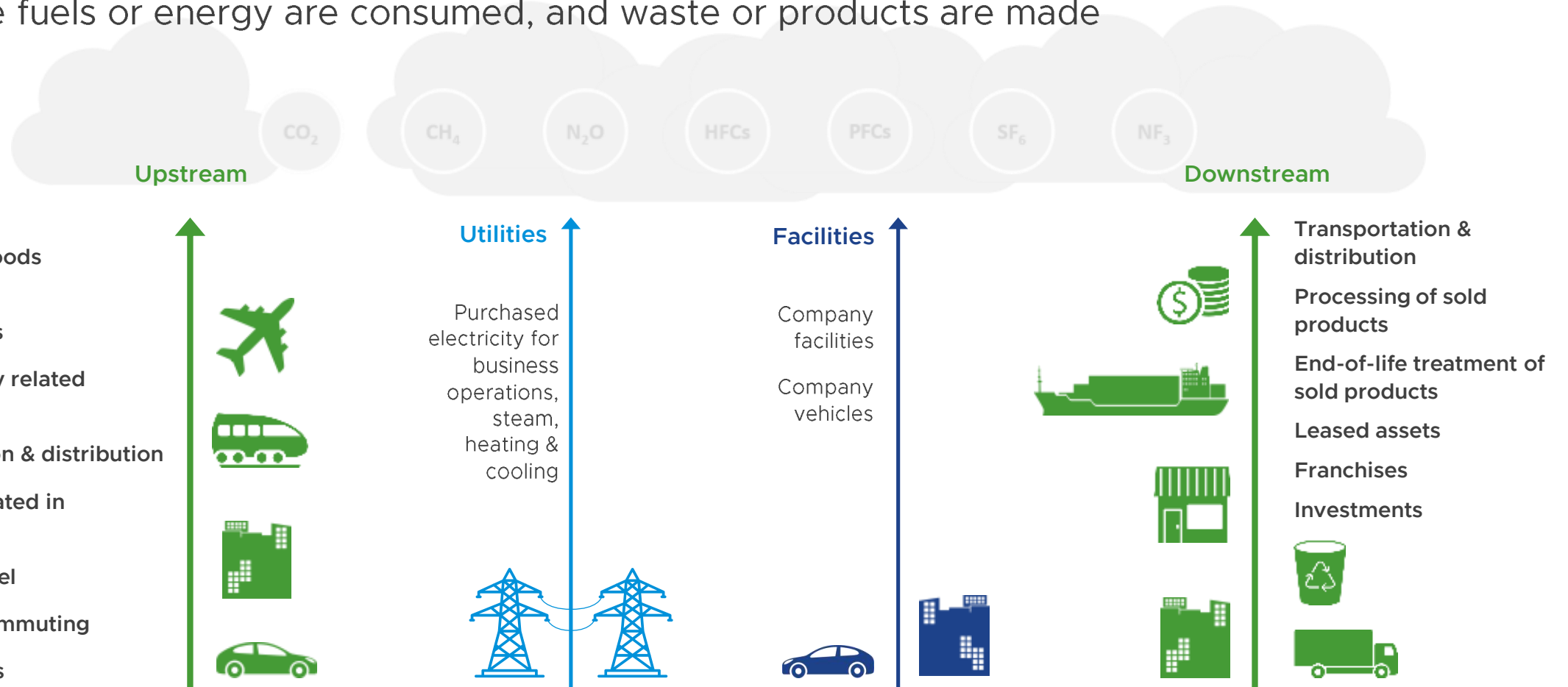
A GHG inventory reveals a business’s operational practices that result in the release of GHGs of all kinds—and identifies places to reduce or mitigate them



Driving a mid-size gasoline fueled car annually emits 4.7 mt CO_2

GHG Activities Surround Business

Greenhouse gas emissions come from internal and external sources across your organization—anywhere fuels or energy are consumed, and waste or products are made



All activities associated with your business, even those outside of your direct control, are part of your company's carbon footprint. Upstream and downstream activities are often the largest areas of impact

Why Inventory Your GHG Emissions?

Data informs action—you need to measure your GHGs to manage and reduce them



The first step in reducing GHG emissions is to understand your impacts.

By undertaking a GHG inventory, you will find your largest emissions sources—and often uncover surprise contributions from categories like remote working or e-waste. This data helps identify **opportunities to reshape current activities to reduce your carbon footprint and locate cost savings.**

Greenhouse gas inventory data allows you to communicate the scope of current operations to employees, customers, suppliers, and investors who demand more responsible practices.

Environmental transparency and publicly available sustainability or environmental reports are increasingly expected from businesses. Your GHG inventory is the starting point for environmental reporting of all kinds.

Accounting for GHG Emissions: Starting an Inventory

Preparing a Greenhouse Gas Inventory

A few important steps will help you get ready to begin your GHG inventory

Gather resources and tools to help you

Identify important resources from GHG Protocol and US EPA.

These websites provide information, training, tools, and answer to frequently asked questions.

ghgprotocol.org/
www.epa.gov/ghgemissions

Identify key stakeholders to manage this process

Authorize a person or team to manage the process, timelines, and data for your GHG inventory.

Note: this process can be resource intensive—a designated GHG leader or green team is key.

Determine a baseline year for your inventory

Pick a recent year that you can find comprehensive environmental data for.

NOTE: There are no penalties for changes in emissions as you return to pre-pandemic business models. Your baseline is simply as starting point. It reflects the changes in the world that every business is grappling with.

Calculating Your Greenhouse Gases (GHG)

Calculation involves 1) Gathering data, and 2) Doing multiplication for all your activities in a baseline year. Using the GHG Protocol Calculator will help you do most of these steps in one place

Define Your Boundaries	Emissions Sources & Data Gathering	GHG Calculation		
<p>Your operational boundaries include your facilities, but also expand into products and services, like waste disposal and shipping.</p> <p>Once you have your boundaries, measure GHGs from each aspect of your business inside this boundary</p>	<p>Locate emissions both upstream and down. Identify emissions sources by reviewing operations bills and receipts.</p> <ul style="list-style-type: none">• Utility bills (gas, power, water, oil)• Waste bills• Business travel records (miles, type of vehicle)• Employee commuting• Purchased Supplies	<p>After compiling bills and receipt use data, the GHG Protocol calculator to determine GHGs.</p> <p>It's an Excel-based tool. You input usage data from receipts and bills.</p>	<p>The calculator estimates CO₂, CH₄, and N₂O emissions (and any other applicable GHGs) by multiplying the results of the previous steps with carbon emission factors to get the full GHG footprint of your business</p>	<p>The calculator converts GHGs to carbon dioxide equivalents or CO₂e- giving you a “carbon footprint”</p> <p>This as translates all types of GHG emissions into a universal carbon equivalent, providing a common denominator for calculation.</p>

Steps you take with your internal staff

The GHG Protocol Calculation Tool will help you with these 3 steps

Significance of a Baseline Year

Create a realistic snapshot of carbon emissions across operations

During the COVID-19 pandemic, global GHG emissions slowed for a time, but they quickly reversed and are currently rising unabated.

During the pandemic, a hybrid work model became more common. Rather than save emissions, they shifted from corporate offices to employees' homes.

Learn more here:
www.nature.com/articles/d41586-021-03036-x

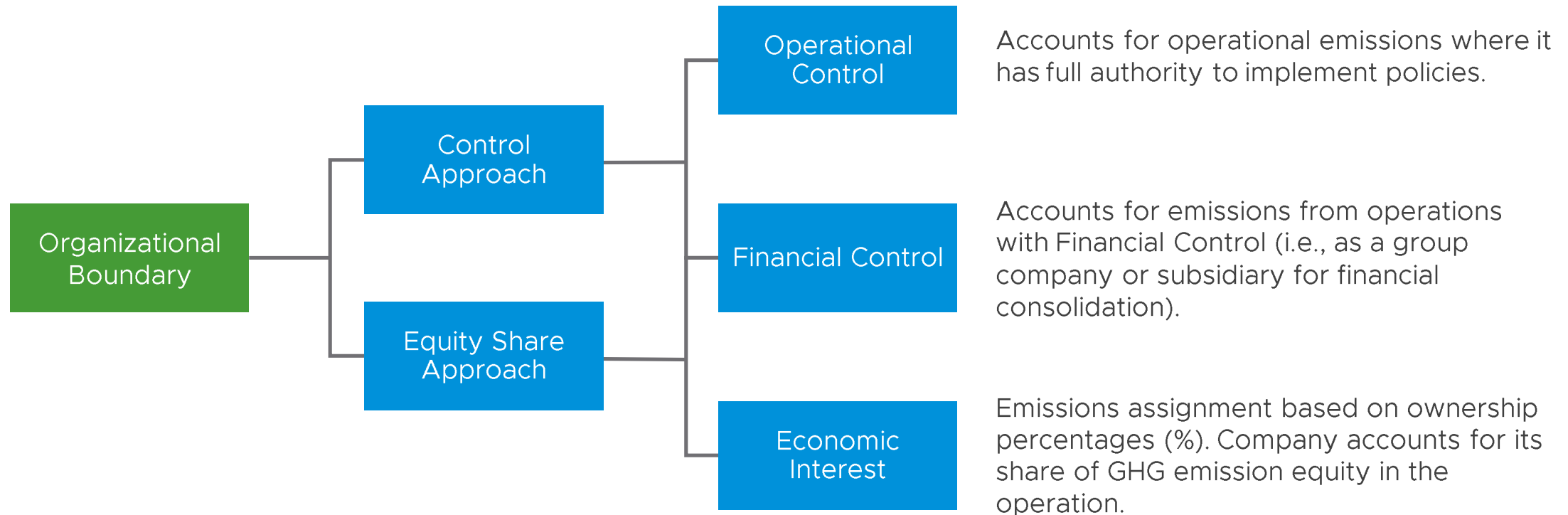
Organizations need to track GHG emissions over time to measure progress—this requires setting a baseline year, or a reference point in the recent past to compare current emissions.

To maintain consistency year over year, your baseline will be recalculated if structural/operational changes occur that adjust the established inventory boundary (e.g., acquisitions or divestments).

Best Practice: Choose a baseline that is 1) recent and 2) reflects your business model accurately. As business conditions shift, the carbon footprint reflects these changes—and reduction strategy evolves.

Define Your Organizational Boundary

Companies must outline their organizational boundaries for consolidating GHG emissions. A wide lens includes operational, financial, and economic influences. These establish GHG inventory boundary, ensuring you capture GHGs across all aspects of business



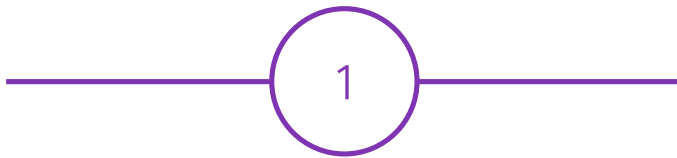
Consider all these types of organizational parameters for your company

Identifying GHG Sources

This is a time/resource-intensive task. GHG emissions categories are broken down into a common framework known as “Scopes.” This organizes carbon emissions and helps with calculations

Scope 1 Emissions

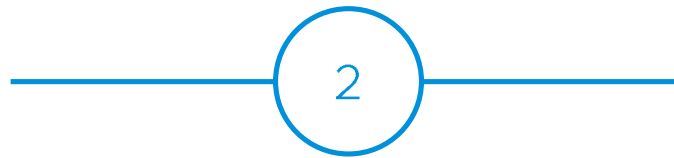
(Direct emissions you control in your facilities, distribution, fleet vehicles)



Usually businesses start with Scope 1 & 2 emissions, which encompass emission sources under direct ownership or control. Improvements here build operational momentum.

Scope 2 Emissions

(Emissions associated with purchased energy from your utility)



Addressing Scope 3 emissions requires developing a more complex a value chain inventory.

Scope 3 typically represents a company’s biggest GHG impacts. It offers real opportunities to measure improvements.

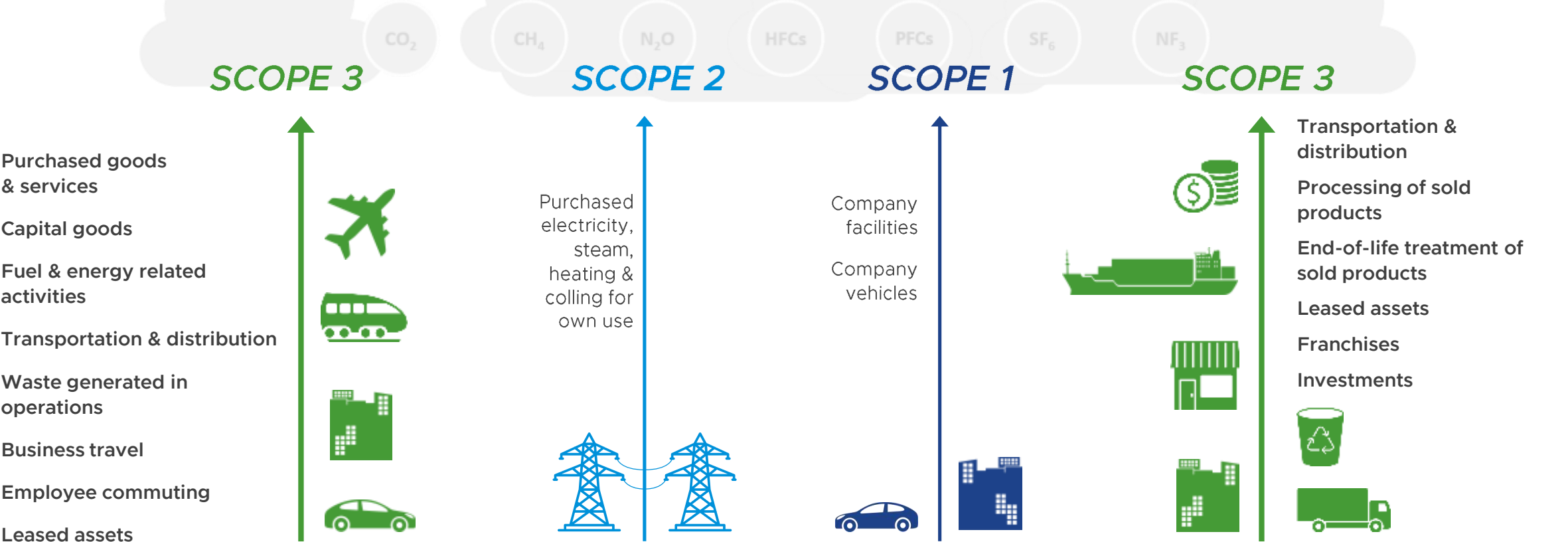
Scope 3 Emissions

(Supply chain, sales channel, employee commuting, business travel)



GHGs Come from Many Activities, Both Inside & Outside the Company

For each category below, identify your emissions in these scopes of your organization. Your emissions data is located in bills, receipts, databases, and in some cases, may not be currently tracked in your company.



Every activity, even those that you don't directly control, generates greenhouse gases and contributes to your company's carbon footprint. Upstream and downstream activities often represent the largest areas of impact.

Collect Your Data

GHG data can be found in both internal accounting and external vendor sources. You might need to get creative to find the emissions data related to operations, products, service usage and other activities that you don't track today.

To calculate your GHGs, you need to know your usage, frequency, and type of GHG for a baseline year. For example, for business travel, you need mileage, how often you traveled, and whether a car, train, plane or other conveyance was used. This data goes into the GHG calculator where an emissions factor is applied, and your carbon footprint is generated.

Primary Data

Utility bills, vendors receipts, data from office managers

Quantity (kWhs, therms, reams, miles, etc.)

What happens if you can't find data?

Sometimes data is not available, so you can get creative and find **proxy sources** that will help you model your usage for the GHG calculator.

Occasionally, there is data that you can use to **estimate impact areas** where it's hard to get direct GHG Information. Over time, you can develop ways to get more refined data as you manage your carbon footprint.

Proxy Data

Financial data from a specific vendor, like shipping or waste disposal

Industry averages (published databases, gov. statistics, studies, industry associations)

Public databases or models—for hybrid workforces or specific products

Estimates based on utility information

Calculate Your Emissions

Once you have set company boundaries and collected environmental data for each emissions category and activity, you will enter your information into the GHG Protocol Calculator to get your GHG footprint.

How it works: Data collected by emission source is entered in GHG Protocol Calculator's formula-based worksheets. EPA's Emission Factors Hub assigns each input a value and calculates GHG totals.

This is an industry standard free calculator. It offers a step-by-step process to estimate company emissions easily and accurately.

Each emission source type described in this section of the guide is divided into tabs and worksheets to help you collect data and calculate the emissions from that source.



For anyone new to the calculator, detailed instructions and calculation examples are provided [Excel based tool \(https://ghgprotocol.org/ghg-emissions-calculation-tool\)](https://ghgprotocol.org/ghg-emissions-calculation-tool)

After a GHG Inventory, What's Next?

It's time to make GHG reductions in your activities. If you are reporting on your GHG footprint, your reductions are one of the most important parts of your story to tell. Customers, investors, employees and other stakeholders want to know your plans to reduce emissions.

Make an Emission Reduction Plan

An emissions reduction plan typically includes larger goals outlining direction, intermediate milestones to validate progress, and operational activities to guide execution

While there is no one way to create an emissions reduction plan, setting a schedule for consistent monitoring, evaluation, and adjustments are considered best practices

Acknowledge change difficulties

Companies have a spectrum of cultural and operational readiness. Steps taken to reduce emissions may not be linear. Businesses can find success by initiating operational activities and then building intermediate milestones and macro-level end goals around them.

Build an Emissions Reduction Road Map

Develop a plan to tackle large impact areas. Road maps with milestones and KPIs sustain momentum—and offer a sequence of operations-focused actions to drive progress.

Consider two types of emission reduction goals:

Operations-focused emissions reductions

- On-site renewable energy infrastructure (e.g., solar panels)
- Mandatory training of facility and fleet managers
- Low-carbon logistics options: route optimization, fleet electrification, right-sizing fleets, alternative transportation
- Sustainability requirements to supplier code of conduct
- Supplier engagement programs in collaboration with procurement functions
- Building energy efficiency standard certification (e.g., Leadership in Energy and Environmental Design (LEED) in the US)

Broader % reduction targets & timelines

- Transition to 100% electric fleet by 2025
- Offset all residual emissions (those which can't be reduced) by 2035
- Engage 25% of suppliers with science-based targets (SBTs) for reducing GHGs by 2025 and 75% by 2030
- By 2023, facilitate quarterly supplier workshops on emissions reduction opportunities
- Reduce off-site, in-person meetings by 50% from 2019 levels
- Increase percentage of recycled waste by 25% by 2025
- Require 100% of new leased vehicles to be electric in 2022

Complete Your GHG Inventory and Tell Your Story

Once you've calculated GHG emissions and created a road map to reductions, share this data in your company's annual report or sustainability report. Many sustainability reporting platforms let you respond to your suppliers and customers directly—select the ones that apply to your stakeholders.

Customers and suppliers are increasingly asking for sustainability information. Once you have your GHG inventory, you have an important asset to support strategic change in your company

You also have:

- The ability to make reductions in your emissions—capture those wins and tell your story
- Opportunity for enhanced brand and competitiveness in markets where sustainability information is a differentiator
- Public reporting shows leadership among your peers and in your industry and is a requirement of some investors.
- Recognition for early voluntary action = brand preference Halo effect



We Learned:

Preparing a greenhouse gas inventory is the process of measuring and accounting for your businesses' environmental impacts. It identifies areas of impact and opportunities to make reductions.

Once you know where your emissions are located, there are a few key steps to conduct a GHG inventory—all of which require you to track your emissions sources and collect data in the form of bills and receipts.

Calculations are done with the GHG Protocol Calculator, which determines your carbon footprint for you.

From there, you can build an emissions reduction road map and report publicly to your customers, investors, and stakeholders.