



Module 0

GHG Emissions Accounting 101



in partnership with



Welcome to Greenhouse Gas (GHG) Emissions Accounting 101

Before we start our training, please find the keys below to our interactive PDF:

| | | | |
|---|--|--|---|
|  Previous page |  Expand window |  Key concepts |  Further resources |
|  Home |  Minimize window |  Steps needed to prepare for accounting emissions | |
|  Next page |  Click here for more information |  Check out this video | |

Welcome to GHG Emissions Accounting 101

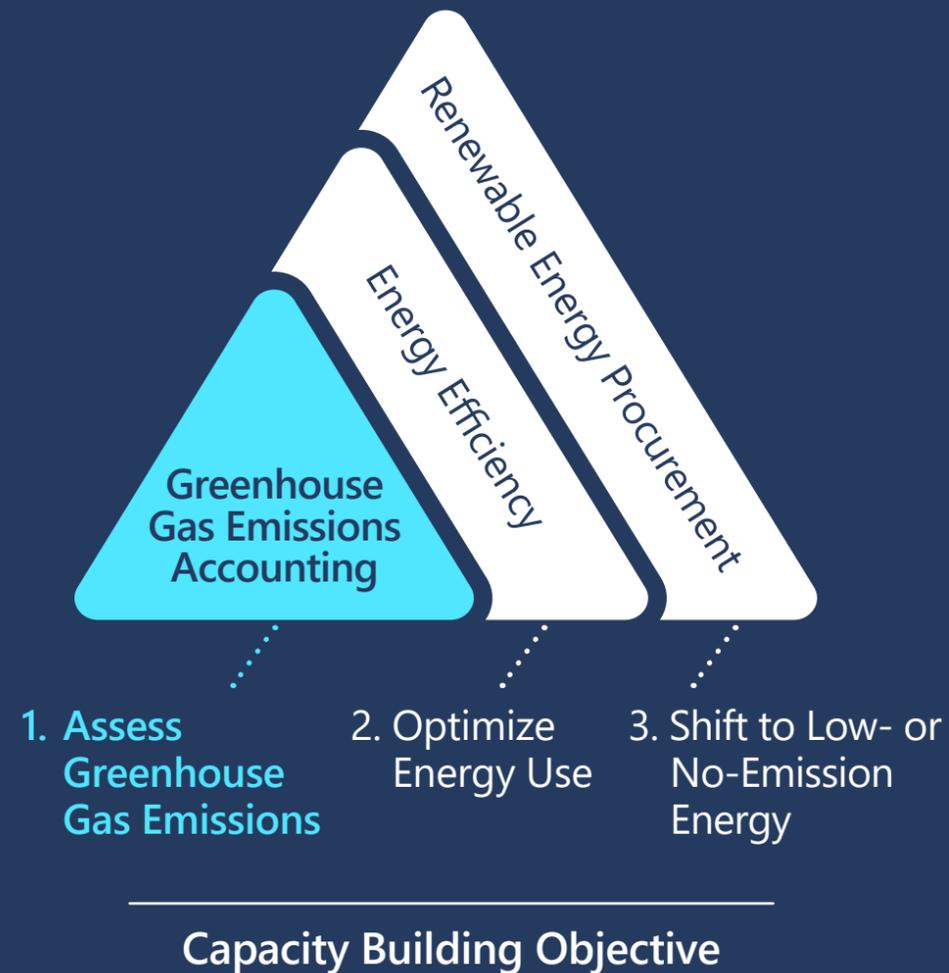
We estimate this module will take 35 minutes for a first read-through. It can then be used as a reference as you go through the process of accounting for Scope 1, 2 and 3 emissions for your company.

This is the first of five modules that will give you a foundation in the concepts and steps necessary to account for GHG emissions at your company. Welcome to the first step on the journey – we're excited to have you here.

Before you get started, it may be helpful to know that GHG emissions accounting can take time to complete. We recommend that you first read through each of these five modules to get a sense of the process. Each module can be used as a step-by-step guide as you complete the process of emissions accounting for your company.

It is also helpful to understand that GHG emissions accounting and disclosure is a journey. The ultimate goal is enterprise-wide GHG emissions accounting; however, it's perfectly fine if you need to start smaller with focusing on a portion of your emissions and work towards a more comprehensive disclosure over time.

Learning Objectives



This training is the first part of a capacity building series on reducing energy-related greenhouse gas emissions

In this module, you will learn:

- What the GHG Protocol means
- Why accounting for GHG emissions is good for your business
- The different types of GHG emissions
- What a base year means
- The three different scopes of emissions
- What a Life Cycle Assessment (LCA) is
- What an Organizational Boundary is and how to set one for your organization
- What an Operational Boundary is and how to set one for your organization

This module will prepare you for the following four modules:

Module 1

Scope 1
Emissions
Accounting

Module 2

Scope 2
Emissions
Accounting

Module 3

Scope 3
Emissions
Accounting

Module 4

Emissions
Reductions
101

Terms to know before you get started

Let's get started with a high level overview

This module is divided into two sections that will help you understand the fundamental concepts for GHG emissions accounting:



Which key concepts do I need to know?



Which steps do I need to take to prepare for accounting for my company's emissions?



Which key concepts
do I need to know?



What is climate change?

Climate change refers to large-scale shifts in the climate being driven by human activities that release carbon dioxide and other greenhouse gases to the atmosphere. These changes in the climate are impacting society in several ways such as an increase in extreme weather, greater frequency and severity of wildfires, and increase in food and water insecurity. The term “climate change” in general audiences refers to the human-made climate changes and is often used interchangeably with “global warming.”

Impacts of climate change include:



Water
reliability



Food
insecurity



Public health
(extreme
heat disease)



Increased
frequency and
intensity of
floods, droughts,
wildfires



What are people, governments and businesses doing about climate change?

The science is clear that the risks from climate change are huge and costly. In response to this, we are seeing unprecedented mobilization of governments, cities and businesses to commit to “Net Zero” emissions by 2050 or sooner. “Net Zero” requires reducing emissions to as close to zero as possible, and then balancing any remaining emissions by removing carbon from the atmosphere.



What is CDP?



CDP is a global environmental impact non-profit working to secure a thriving economy for people and the planet. CDP runs the global disclosure system that enables companies, cities, states and regions to measure and manage their environmental impacts.

With the world's most comprehensive collection of self-reported data, the world's economy looks to CDP as the gold standard of environmental reporting. Its network of investors, purchasers and policy makers around the globe use CDP's data and insights to make better-informed decisions.

Disclosure to CDP is becoming increasingly common for companies, as pressure to address climate change grows. Disclosing to CDP also makes good business sense. Suppliers that disclosed through CDP in 2020 reported collective emissions reductions of 610 million tons and collective savings of US \$33.7 billion.

In order to disclose to CDP, you will first need to measure your GHG emissions. The rest of this training is designed to help guide you step-by-step through the process of measuring your company's GHG emissions.

To learn more about CDP, check out this video



What do we mean when we say GHG emissions?

GHG emissions are greenhouse gas emissions. Sometimes people refer to these as “carbon emissions”. In reality, carbon dioxide is one of the most commonly emitted GHGs, but there are actually many other types of GHGs. Several of the most commonly encountered of these are set out in the table on the next page.

What’s particularly important to know is that different GHGs have different levels of “Global Warming Potential” (GWP). Think of GWP as describing the relative heat-trapping ability of other GHGs in the atmosphere as compared to carbon over a certain time period. The most common approach is to use 100 years as the time frame over which to assess GWP. However, other time frames, such as 10 years can be used, particularly for some gases that have large GWP but last for a shorter time in the atmosphere. An example of this is methane. As you’ll see

in the table on the next page, the GWP of different GHGs can be extremely high, making it important to include these gases in your accounting. Even though carbon dioxide is the most common GHG for many companies, excluding the others could give an incomplete picture of your company’s impact on the atmosphere.

It’s also important to know that fossil fuels emit multiple types of GHGs when they are burned: carbon dioxide, methane and nitrous oxide. These are shown at the top of the table on the next page.

In order to add the impact of these emissions together, we convert them into a standard metric called “Carbon dioxide equivalent” or CO₂e, for short. We will explain this more in Modules 1, 2 and 3.



What do we mean when we say GHG emissions?

| Greenhouse Gas | Primary Uses / Sources | Global Warming Potential (GWP) | Average time in the atmosphere | |
|---|---|--|--|----------------------|
| Carbon dioxide (CO ₂) | Primarily emitted as a result of burning fossil fuels and land use | 1 | indefinite but can be absorbed from the atmosphere | |
| Methane (CH ₄) | Also emitted as a result of burning fossil fuels. Largely associated with activities in the industrial, agriculture and waste sectors | 28 | 12.4 years | |
| Nitrous oxide (N ₂ O) | | 265 | 121 years | |
| Hydrofluorocarbons (HFCs) | Industrial chemicals primarily used for cooling and refrigeration | Numerous individual chemicals with some GWP values over 10,000 | varies significantly | |
| Perfluorocarbons (PFCs) | Specific industrial uses (e.g., semiconductor manufacturing processes, electrical insulators) | | varies significantly | |
| Sulphur hexafluoride (SF ₆) | | | 23,500 | varies significantly |
| Nitrogen trifluoride (NF ₃) | | | 16,100 | varies significantly |



Why account for GHG emissions?

Accounting for GHG emissions is a crucial first step that your company must take to begin on a decarbonization journey. Knowing your GHG emissions can help prepare your company to effectively manage risks and opportunities as the world transitions to a Net Zero emissions economy.

Benefits of accounting for GHG emissions:

- Understanding your sources of GHG emissions and preparedness to manage any business risks associated with policy changes such as regulations or carbon taxes
- The ability to identify strategic business opportunities such as cost savings (e.g., through energy efficiency measures) and increased competitive advantage by offering products or services with lower GHG impact
- Publicly report emissions to CDP and other stakeholders, including your suppliers or customers
- Your company can join the global decarbonization movement by setting a credible emissions reduction target and tracking and reporting progress towards this target



Why account for GHG emissions?

All types of business stakeholders are beginning to hold companies responsible for addressing climate change:



Let's define a few other key terms:



What is the GHG Protocol?

It's important that companies measuring their GHG emissions do so in a standardized way. The GHG Protocol's mission is to develop internationally-accepted greenhouse gas (GHG) accounting and reporting standards for organizations and to promote their broad adoption.

The GHG Protocol Corporate Standard is the internationally-recognized go-to standard for estimating and reporting corporate GHG emissions. It was first published in 2001 by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). It provides requirements and guidance for companies and other organizations preparing a corporate-level GHG emissions inventory. The GHG Protocol is the basis for the development of these GHG emissions accounting modules.

The GHG Protocol is the most widely used global accounting standard.

Over 90% of Fortune 500 companies reporting to CDP use the GHG Protocol to account for their GHG emissions.

For more info about the GHG Protocol check out this video



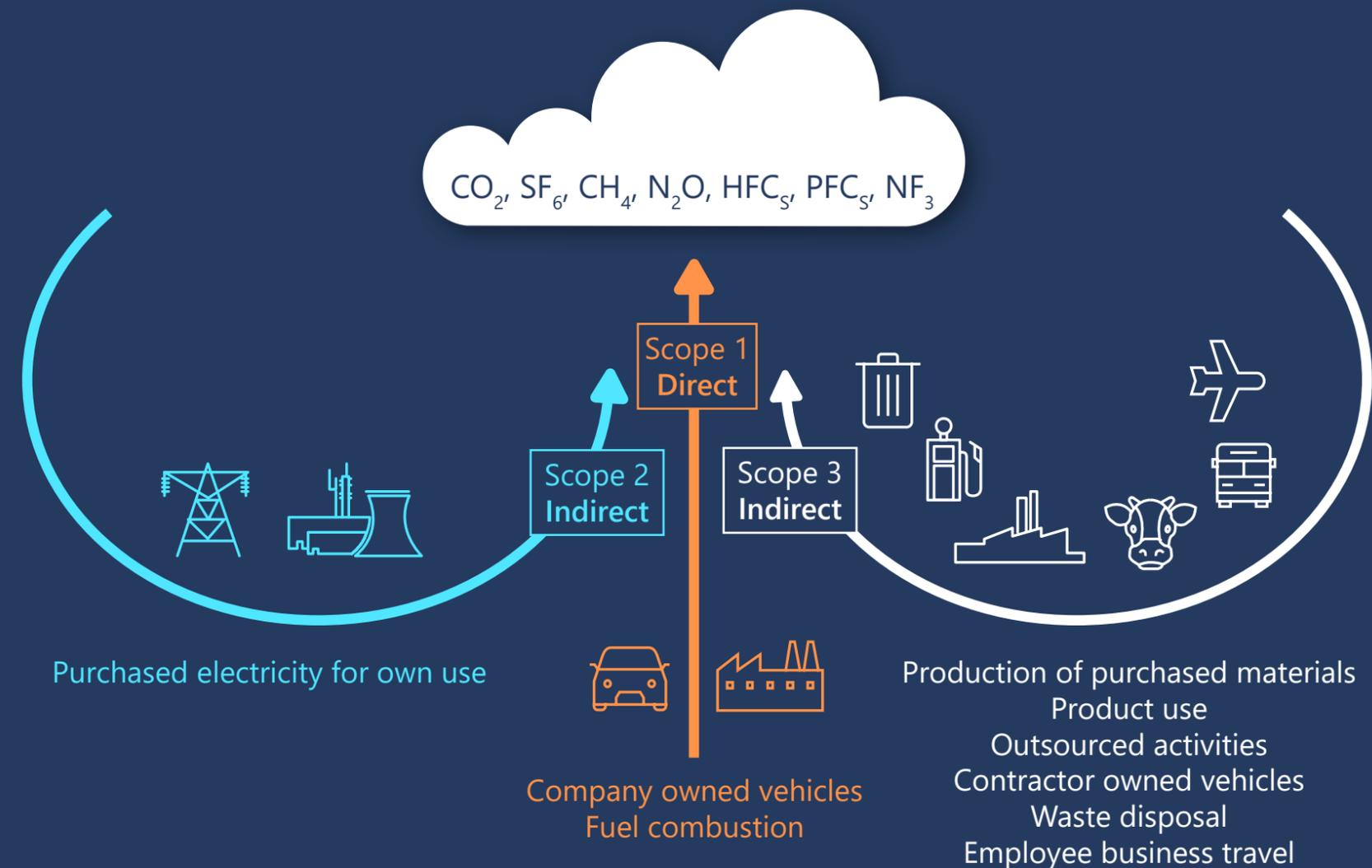
What are GHG Protocol accounting principles? Why they are helpful to know?

GHG accounting has an accepted set of principles, in the same way financial accounting does. These principles are intended to ensure that reported information represents a faithful, true and fair account of a company's GHG emissions. In other words, these principles help enhance credibility of GHG accounting. They are followed by all organizations that account emissions under the GHG Protocol.



What are the three scopes of GHG emissions?

GHGs are emitted from different sources across a company's value chain. In order to simplify the accounting process, these are divided into Scope 1, 2 and 3 emissions, which can each be tackled separately. Scope 1 emissions are direct emissions of the company, whereas Scope 2 and 3 emissions are outside the ownership or control of the company.



Check out this video that explains the Scope 1, 2 and 3 breakdown.

Image source: Reproduction from the GHG Protocol

For informational purposes only. Not legal advice or counsel.



What is the difference between direct and indirect emissions?

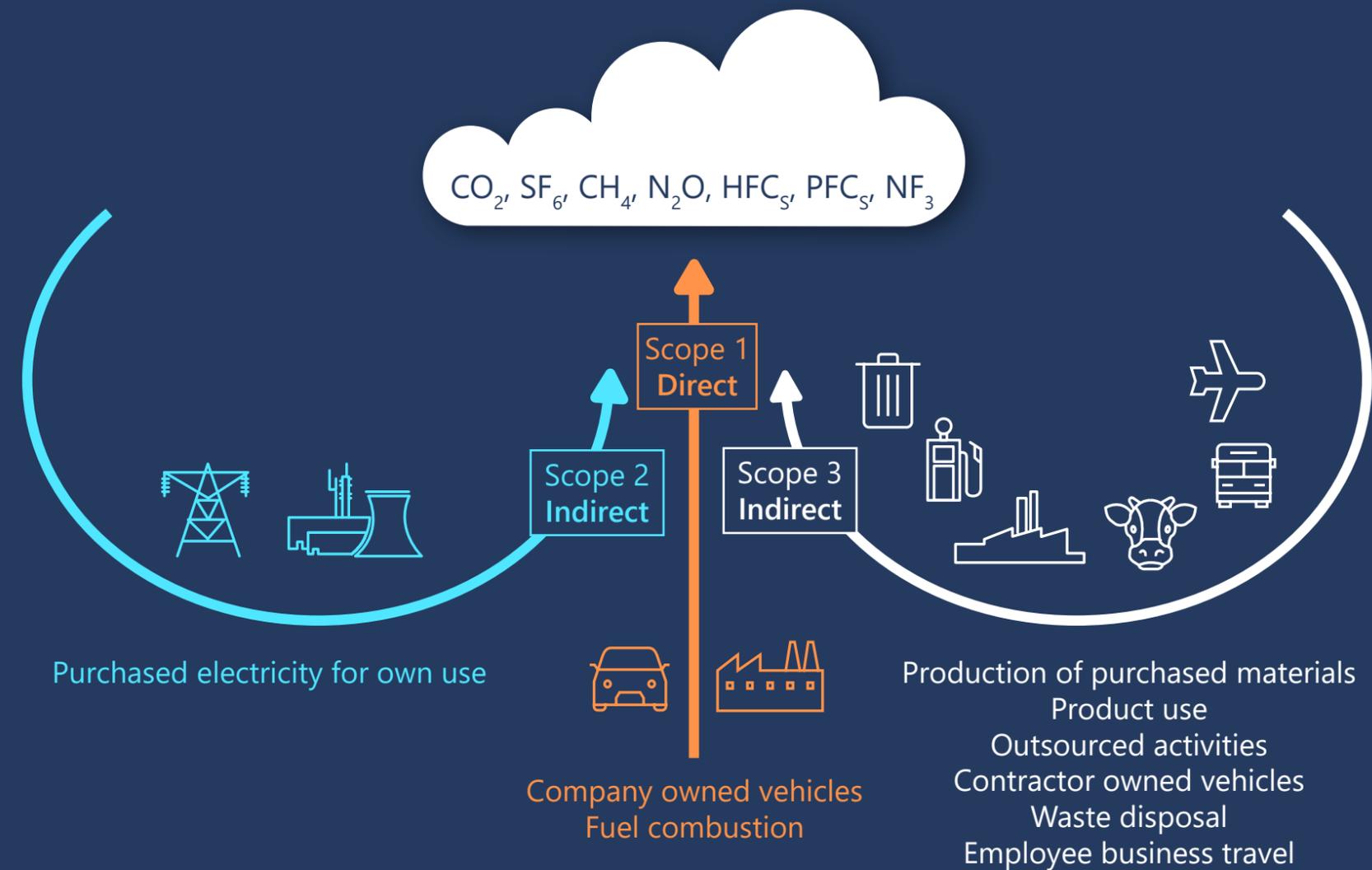


Image source: Reproduction from the GHG Protocol

For informational purposes only. Not legal advice or counsel.



What are the three scopes of GHG emissions?

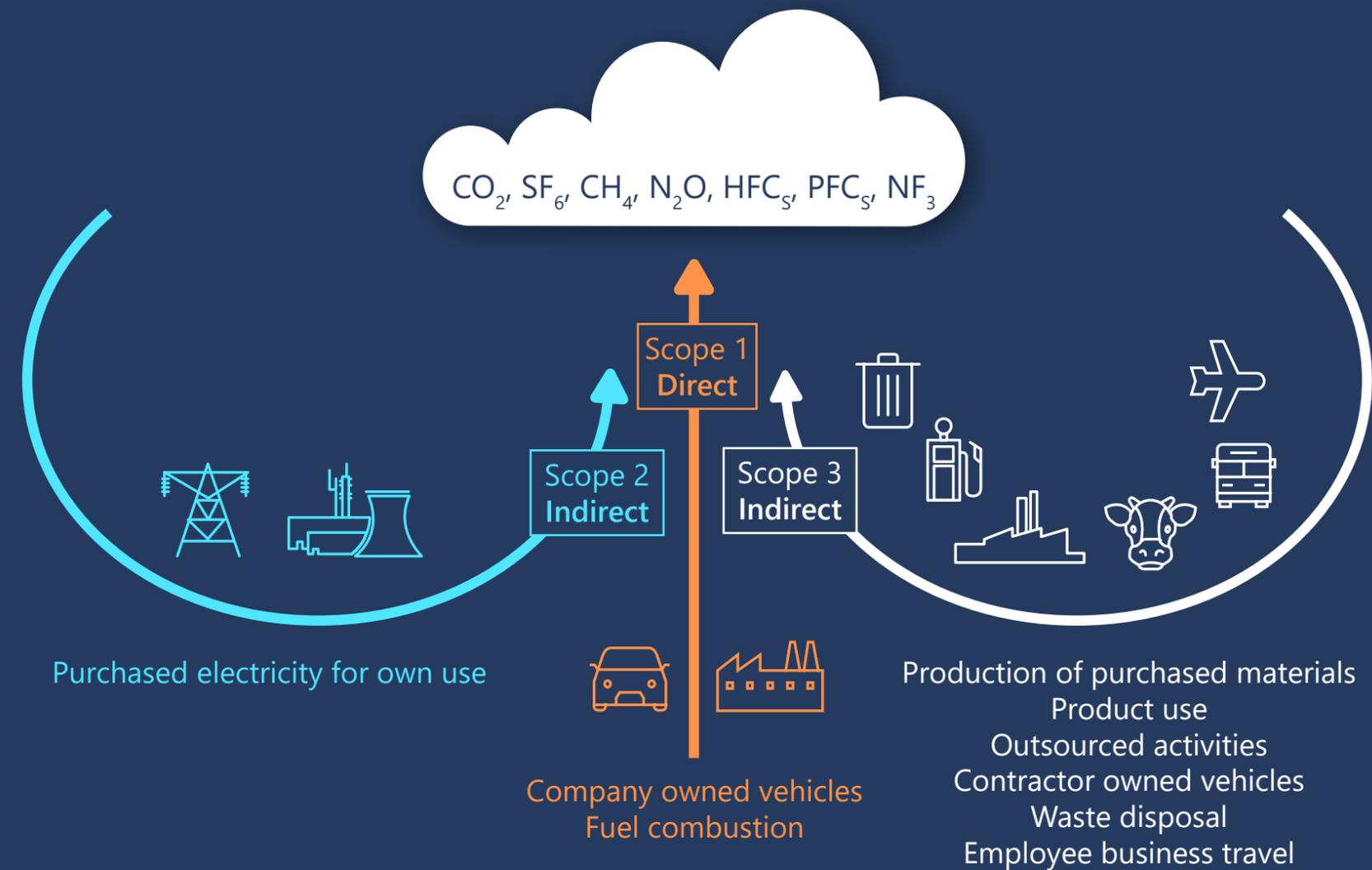


Image source: Reproduction from the GHG Protocol

For informational purposes only. Not legal advice or counsel.



Where do Scope 1 emissions come from?

Scope 1 emissions are direct emissions caused by sources that are owned or controlled by the company. Accounting for these emissions will be covered in **Module 1**.

Who does this apply to? These emissions will be large for companies in sectors such as manufacturing, energy and freight that create a lot of their own emissions on site. However, they are likely to be lower for companies in sectors like professional services, financial services and information technology.

Scope 1 Examples of activities that can create Scope 1 direct emissions



Stationary Combustion

Fuel combustion
in stationary sources

Examples include: boilers, furnaces, engines, on site energy production



Mobile Combustion

Fuel combustion
in mobile sources

Examples include: combustion of fuel in automobiles, trucks & buses owned by the company



Fugitive Emissions

Unintentional
releases of gases

Examples include: gases released from refrigeration and air conditioning equipment



Process Emissions

Physical or chemical processes
carried out on site

Examples include: steel and cement manufacturing



Where do Scope 2 emissions come from?

Scope 2 emissions are indirect emissions from the generation of electricity, steam and heating/cooling consumed by the company that is purchased by the company (i.e., not generated on site). Accounting for these emissions will be covered in **Module 2**.

Who does this apply to? Most companies will have some amount of these emissions, and they are relatively straightforward to calculate using the simplest methodology put forward by the GHG Protocol.

Scope 2 Examples of activities that can create Scope 2 indirect emissions



Purchased Electricity

Used to operate machines, lighting, electric vehicle charging, and certain types of heat and cooling



Purchased Heat

Used to control interior climates or industrial processes, or to heat water (e.g., district heating systems)



Purchased Cooling

Used to control interior climates or industrial processes



Purchased Steam

Used in industrial processes for mechanical work or heat, or as a process medium (e.g., purchased steam used for steam drying materials)



Where do Scope 3 emissions come from?

Simply put, **Scope 3** emissions are all other emissions that aren't included in Scope 1 or 2. To make the concept come to life, the GHG Protocol groups them into fifteen different categories. These categories can be divided between upstream and downstream as shown below. Accounting for Scope 3 emissions will be covered in **Module 3**.

Who does this apply to? All companies have value chains and therefore will have Scope 3 emissions. Professional services, financial services, and information technology may not have large Scope 1 emissions, but Scope 3 emissions will likely make up the majority of total emissions.

Given the difficulty of data collection, corporate Scope 3 inventories typically focus on a limited number of categories that are most relevant for a specific company's operating model. We will explain this in more detail in Module 3.



How does GHG quantification work?

Greenhouse gas emissions can be quantified using one of two main methods:

Direct Measurement

Uses physical measuring devices and equipment to gauge the actual quantity of GHGs emitted from a source. Think of a device in a smokestack that is measuring the amount of GHGs that pass through the smoke stack.

Calculation

Uses existing data on the GHG emitting activities of your company to calculate your best estimate of GHG emissions.



How does the Calculation method work?

Since the Direct Measurement method is expensive and difficult to execute, most organizations use the Calculation method.

This method involves estimating GHG emissions by multiplying activity data by emissions factors.

- **Activity data** is a measure of a level of activity that results in GHG emissions (e.g., gallons of fuel or kWh of electricity consumed, or air travel passenger miles).
- **Emissions factor:** An emissions factor is a coefficient that converts activity data into a quantity of GHGs released to the atmosphere (per unit of activity for a given emission source). An example of this: multiply a coefficient times the number of gallons of fuel burned in order to get total GHG emissions. Emissions factors can be derived in a variety of different ways. One way is through a Life Cycle Assessment (LCA). This is explained in greater detail on the following two pages.

Modules 1, 2 and 3 will provide step by step guidance on how to use this method to calculate emissions for Scope 1, 2 and 3.

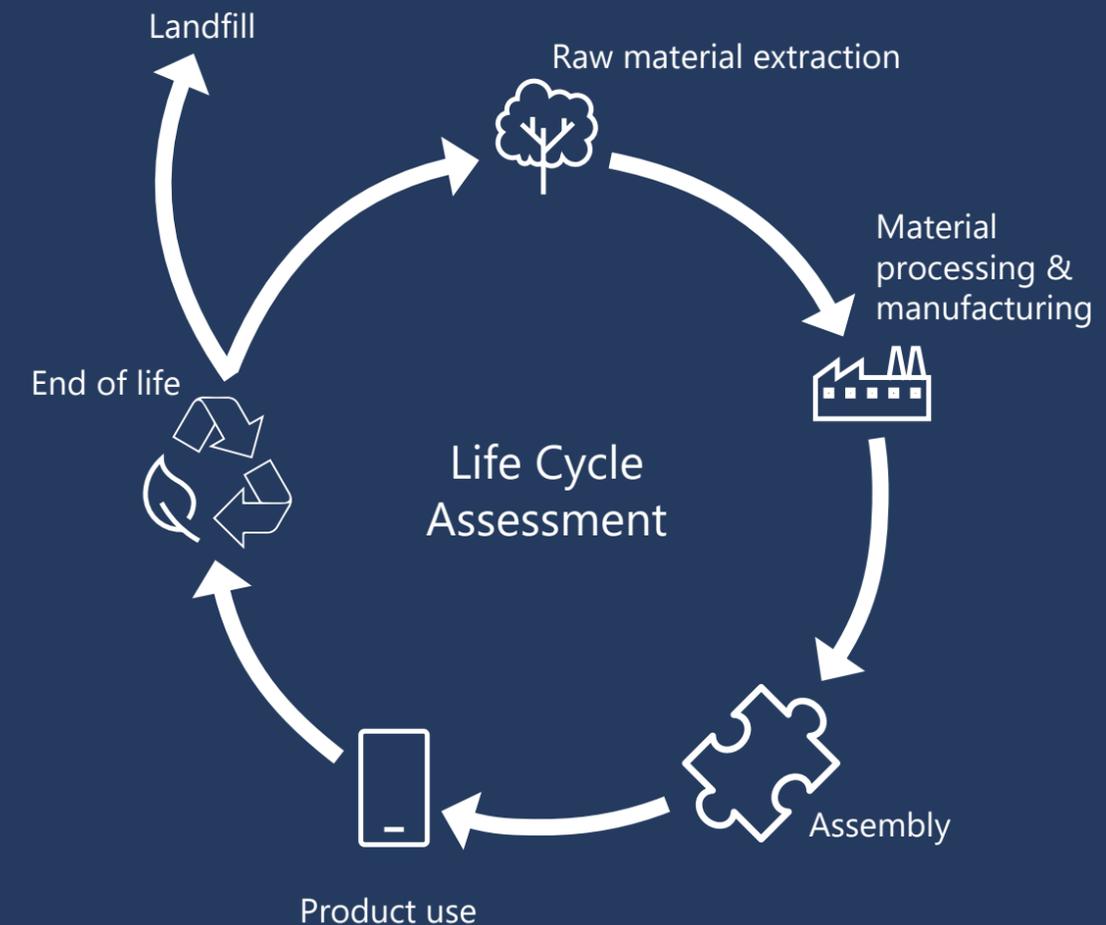


What is a Life Cycle Assessment (LCA)

A LCA is a method used to estimate the total environmental impacts from producing a good or service across its entire life span.

It is a useful tool because it helps companies avoid the “pollution displacement trap.” This happens when negative environmental impacts are transferred from one life cycle stage to another instead of being eliminated all together. Avoiding this trap is an essential part of developing new environmentally-friendly products.

An LCA is a standardized tool that can be certified by the ISO 14040 and 14044 standards. Quantifying carbon emissions is the primary use of LCA, although the standard also includes other categories such as human toxicity, land use and resource depletion.





Who should consider conducting LCAs? What are the benefits and challenges?

LCAs are more common for companies that create physical products. They are becoming increasingly common as customer sustainability expectations rise.

LCAs Allow You To:

- Identify high environmental impact “hot spots” in your company’s value chains
- Demonstrate and substantiate sustainability leadership relative to competitors
- Identify opportunities to optimize supply chain efficiency
- Support strategic decision-making to improve products
- Meet the demands of customers for sustainable products
- Improve communication with regulatory agencies and wider stakeholder groups

Challenges of LCAs

- A full LCA can be challenging to model due to the complexities of global supply chains
- The process can be time, data and cost-intensive
- It can be an iterative process, sometimes requiring refinement over time

Given the challenges associated with conducting LCAs, many companies typically chose to outsource the process to a third party that specializes in conducting LCAs.



Which steps do I need to take to prepare for accounting for my company's emissions?



You will need to complete the following two actions to prepare for accounting your company's emissions

We will cover the details of accounting for Scope 1, 2 and 3 emissions in Modules 1, 2 and 3. But before you're ready to do this, there are two first essential actions you must take to lay the foundation for the rest of your accounting exercise. These are explained below:



Action
1

Defining your Organizational Boundary

(Think of this as drawing a circle around which parts of your company to include)

Defining your Organization Boundary will help you decide which aspects of your company to include when you do your GHG inventory. This step is extremely important because it sets the foundation for your entire GHG inventory.

This is a complex concept for many companies. In fact, it's the most complex concept in this entire set of training modules. But no worries – it actually gets easier from here.



If you're struggling with this step, it may help to consult with a member of your finance or legal team to better understand your organizational structure. Share pages 31-41 with them, and they may be able to help you make this decision. It may also be helpful to let them know that reporting should be done at the parent company level.



Your Organizational Boundary for GHG accounting can differ from your financial accounting boundary



Business operations vary in their legal and organizational structures: They can include wholly-owned operations, incorporated and non-incorporated joint ventures, subsidiaries and others.



Established rules apply for the purposes of financial accounting: They depend on the structure of the organization and the relationships among the parties involved.



Each company must decide which Organizational Boundary to set for consolidating its GHG emissions: A company selects an approach and then consistently applies it to define businesses and operations that constitute the company for the purpose of GHG emissions accounting.



If the reporting company wholly owns all its operations, its Organizational Boundary will be the same whichever approach is used.



To define your Organizational Boundary, you must select across three approaches

Which approach should I pick?

Operational Control

Company will account for 100% of emissions from operations over which it has the full authority to introduce and implement its operating policies at the operation.

Most common approach (typically used by 60-90% of companies, depending on the sector).

Financial Control

Company will account for 100% of emissions from operations over which it has Financial Control (i.e., is considered as a group company or subsidiary for the purpose of financial consolidation).

Next most common approach (typically used by 20%+ of companies).

Equity Share

Company accounts for GHG emissions from operations according to its share of equity in the operation.

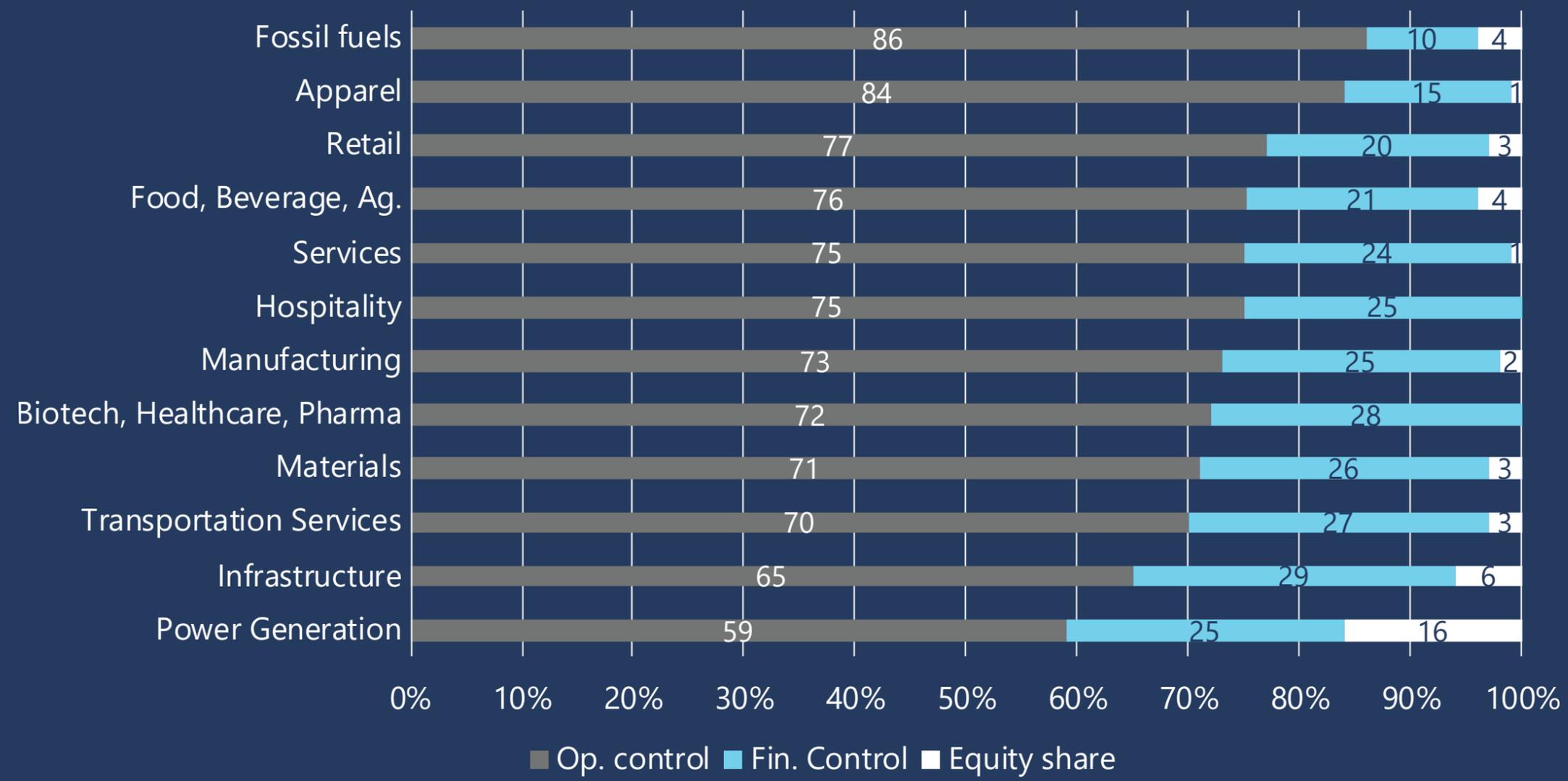
Rare approach (mostly used for companies with complex ownership structures; e.g., in infrastructure/power generation).



Action
1

The dominant choice for Organization Boundary varies across sectors

The bar chart to the right shows the typical approach by sector. Remember, every company is different. You may use an approach different to that typically used by others in your sector.



Source: CDP data 2019

For informational purposes only. Not legal advice or counsel.



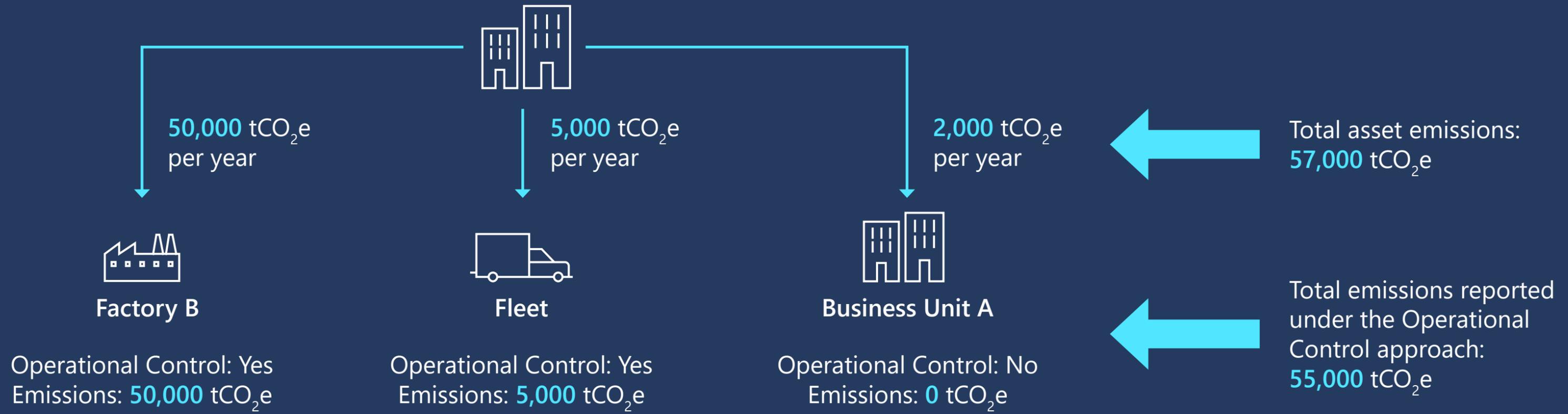
How does Operational Control work?

- This approach applies to your company if:
 - Operations and/or assets are owned and operated by your company
 - Your company controls the majority of its own operational policies
- Under the Operational Control approach, a company accounts for 100% of emissions from all the operations over which it or one of its subsidiaries has **Operational Control**. This means that the company should have the authority to introduce and implement operating policies, even if it doesn't necessarily have the authority to make all decisions concerning an operation.
- Under this approach, you do not need to account for GHG emissions from operations in which the company owns an interest but has no control over.
- This is the most commonly-used approach to setting the Organizational Boundary.



How does Operational Control work?

The example below shows how to account for GHG emissions across three different assets in your company, using the Operational Control approach:





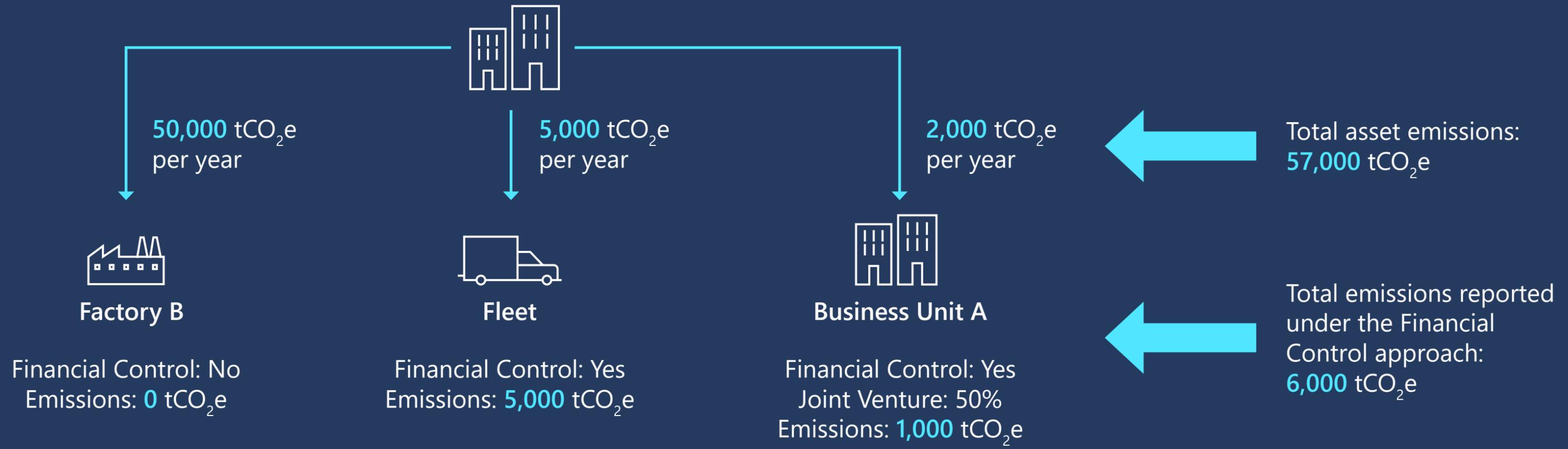
How does Financial Control work?

- This approach applies to your company if:
 - Your company has the authority to direct all asset-level financial policies to gain economic benefits
 - You can't use Operational Control because your company has joint venture operations
- Similar to the Operational Control approach, if a company uses the Financial Control approach, it must account for 100% of the GHG emissions from operations over which it has **Financial Control**. The company does not need to account for emissions from operations in which it owns an interest but has no control. A company is considered to financially control an operation if it retains the majority risks and rewards of ownership of the operation's assets.
- Under this approach, the company may have Financial Control over the operation even if it has less than a 50 percent interest in that operation.



How does Financial Control work?

The example below shows how you would account for GHG emissions across three different company assets, using the Financial Control approach:





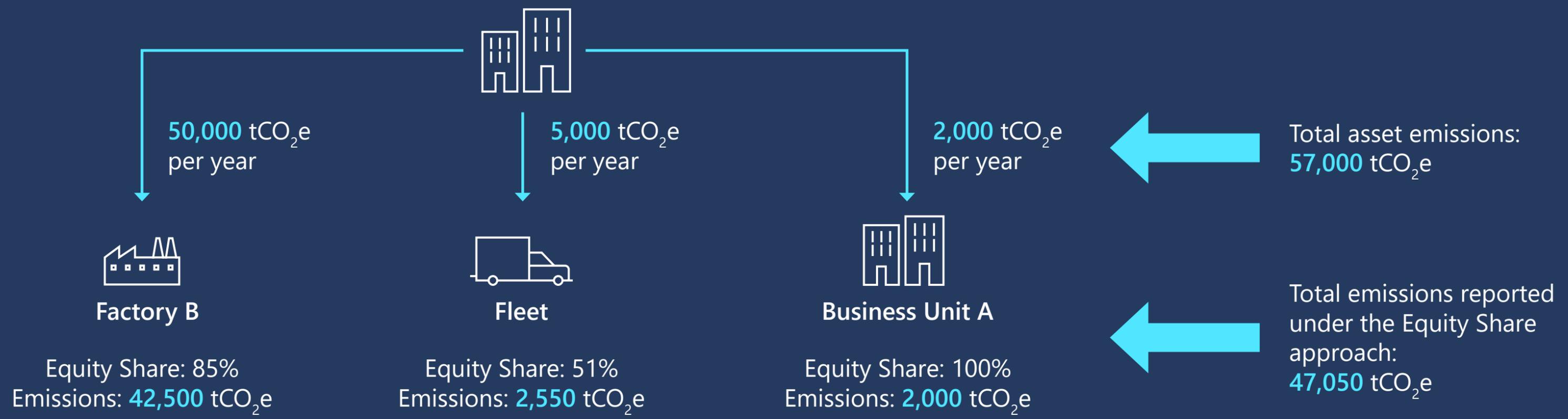
How does Equity Share work?

- This approach applies to your company if:
 - Your company has a complex ownership structure with percent ownership in other operations, assets or entities
- Under the Equity Share approach, a company accounts for GHG emissions from operations according to its share of equity in the operation. For example, if your company owns a 10% share in the organization, you report 10% of those emissions. If your company owns a 51% share in the organization, you report 51% of those emissions, and so on.
- The Equity Share reflects economic interest, which is the extent of rights a company has to the risks and rewards flowing from an operation.



How does Equity Share work?

The example below shows how you would account for GHG emissions across three different company assets, using the Equity Share approach:





The complete picture

Below is a summary of the total reported emissions for each of the three different approaches so that you can directly compare the results for each. In reality, only one approach will be the most accurate approach for your company to use.





Setting your Operational Boundary

(Think of this as identifying your sources of emissions and putting them in Scope 1, 2 and 3 buckets)

Action 2, Setting your Operational Boundary, involves identifying all material sources of emissions associated with operations, categorizing them as either direct and indirect emissions, and then further categorizing into scope 1, 2 or 3.

Action 2a

Consider all your different sources of emissions. (Think of this as putting everything on the table.)



Action 2b

Categorize emissions into Direct and Indirect.

Direct



Indirect



Action 2c

Further categorize into Scope 1, 2 and 3.

Scope 1



Scope 2



Scope 3





Action
2a

Consider all your different sources of emissions

Emission sources can be identified across company operations by considering which activities emit greenhouse gases. Here are some things to keep in mind:

- Consider which of your company operations burn fuel or would otherwise emit GHG gases
- Consider your company's other energy usage from activities related to company operations

The next page is a guide to help you identify your different sources of emissions. As you identify these, put them into a master list. You can think of this as putting all of your different sources of emissions on the table.

We suggest you create this master list in an Excel workbook so that you can add your categorizations when completing Actions 2b and 2c.



Action
2a

Consider all your different sources of emissions

| Emission Source | Specific emission-generating component | Where to find relevant data within organization |
|---|---|---|
| Buildings | Electricity for lighting and machinery/equipment | Finance/accounting department: monthly utility bills |
| | Natural gas (or other energy) for heating | |
| | Fuels used in back-up generators, forklifts | Operations managers, procurement staff, finance/accounting dept |
| | Fugitive emissions from refrigerants (refrigeration and air conditioning) | Facility managers, procurement staff |
| Company-owned fleet vehicles or employee-owned vehicles used on the job | | Odometer readings, expense reimbursement records, gallons/liters of fuel |
| Energy usage from activities ancillary to company operations | Transportation of raw materials and/or products via outside vendors | Engage with outside vendor to understand annual mass-distance (e.g., ton-mile) allocations and mode of transport (e.g., truck, rail, barge) for transportation of company purchased/sold materials |
| | Employee commuting | Options may include 1) direct survey of staff; and/or 2) estimate by compiling number of staff per facility/location and assuming an average driving distance and representative vehicle fuel economy |
| | Business travel on commercial airlines | Trip miles from travel agency or accounts payable |
| | Disposal of waste materials | Outside vendors – determine annual tonnage for each waste stream (container size and number of pickups) |



Action
2b

Categorize emissions into direct and indirect

| Emission Source | Direct | Indirect |
|---|---|--|
| Electricity used to provide lighting in buildings, to operate machinery, etc. | Is electricity generated on-site? Then it's direct. | Is electricity purchased from others (generated off-site by others)? Then it's indirect. |
| Stationary Combustion (e.g., boilers, furnaces, generators) | Does combustion happen at company-owned facilities? Then it's direct. | Does combustion happen upstream/downstream of company operations? Then it's indirect. |
| Mobile Combustion (e.g., fuel usage in cars and trucks) | Does combustion happen within company-owned vehicles? Then it's direct. | Does combustion happen within vehicles owned by others? Then it's indirect. |
| Employee Commuting | Do staff use company-provided vehicles (owned or leased)? Then it's direct. | Do staff use their own vehicles? Then it's indirect. |
| Process Emissions | Do physical/chemical processes occur on-site at company-owned facility? Then it's direct. | Do physical/chemical processes occur off-site at facility owned by others? Then it's indirect. |
| Refrigeration/Air-Conditioning | Do activities occur on-site at company-owned facility? Then it's direct. | Do activities occur off-site at facility owned by others? Then it's indirect. |
| Business Travel | Do staff use company-owned aircraft or other vehicles? Then it's direct. | Do staff use commercial aircraft or other non company-owned vehicles? Then it's indirect. |



Action
2c

Further categorize into Scopes 1, 2 and 3

Now that emissions have been categorized as Direct and Indirect, they need to be categorized further by Scope. We suggest that you now create a third column in your Excel workbook to track the Scope of each emission source.

- **Scope 1** includes all Direct Emissions
- **Scope 2** includes any Indirect Emissions associated with purchased electricity, purchased heat, purchased steam, or purchased cooling
- **Scope 3** includes all other Indirect Emissions that you didn't include in Scope 2. These emissions may occur upstream or downstream of a company's immediate operations.

Congratulations you've completed Module 0: Emissions Accounting 101

A quick recap. Now that you've completed this module you should understand:

- ✓ What the GHG Protocol means
- ✓ Why accounting for GHG emissions is good for your business
- ✓ The different types of GHG emissions
- ✓ What a base year means
- ✓ The three different Scopes of emissions
- ✓ What an LCA is
- ✓ How to set your Organizational Boundary (Remember to think of this as drawing a circle around which parts of your company to including in your emissions inventory.)
- ✓ How to set your Operational Boundary (Remember to think of this as putting all of your emissions sources on the table and categorizing then into the three scopes.)

Congratulations you've completed Module 0 Emissions Accounting 101

You now have a solid foundation to prepare you for moving forward to calculating emissions. You will cover the following topics in the next modules:

Module 1

Scope 1
Emissions
Accounting

Module 2

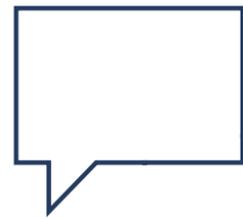
Scope 2
Emissions
Accounting

Module 3

Scope 3
Emissions
Accounting

Module 4

Emissions
Reductions
101



Looking for additional support?

Check out CDP's list of
accredited solutions providers

