CLIMATE ACTION TRAINING FOR THE FASHION INDUSTRY

Module 2: GHG Emissions

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by

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FABRIC Asia

Global Climate Action
United Nations Climate Change

Contents

1. Introduction

Welcome to the second module of the online training 'Climate Action for the Fashion Industry' training.

1.1. Key lessons

In this module, you will learn about:

- **Greenhouse gases (GHG)** - What are the different types of GHGs, and which ones are the most relevant ones for climate change?
- **Measurement approaches** - How can we measure the GHG footprint?
- **Corporate GHG accounting** - What are the different scopes that contribute to the corporate GHG footprint?
- **The fashion brands' perspective** - How do fashion brands calculate their overall GHG impact and account for the GHG impact of their suppliers?
- **The steps of GHG accounting** - What are the steps in GHG accounting, and why is it important to have an accurate baseline at the start?
- **Alternative methods** - What other methods are there to calculate the GHG footprint?

At the end of the module, you can check and apply what you have learned. We have prepared:

- A short **quiz** covering the main topics of this module.
- A real-life assignment. If you are participating in the tutor-guided course, you will discuss the assignment with your fellow learners and your tutor.
- You can also have a look at **the frequently asked questions (FAQs)** concerning this module's topic at the end of the lesson.

How much time should you plan for this module?

Going through the core content of this module will take approximately 1-2 hours.

For the assignment and web meetings of the tutor-guided course, you should plan for another 1-2 hours.

Before we start, take a minute to reflect:

What are the skills you expect to gain from taking this module?

Think about this before you continue. If you like, note down your expectations so that you can revisit them at the end of the module.

This lesson aims at helping you familiarize yourself with the different sources of GHG emissions in the fashion industry. It also introduces you to different emissions tracking tools that are available in the market. In the next module, the actual calculations and measurement strategies will be explained.

1.2. Greenhouse Gases

Greenhouse gases (GHGs) are naturally occurring. They are part of the atmosphere and play an important role in the ecosystem. Without them, life wouldn't be possible on the planet. For example, the most known GHG, carbon dioxide, is vital for photosynthesis in plants.

However, humans are responsible for climate change as human activities are responsible for the generation of additional greenhouse gases, leading to climate change that threatens the Earth. GHGs as a result of human activity are known as anthropogenic GHGs, they are the values tracked and reported.

1.3. Major Greenhouse Gases

A total of seven GHGs are covered in GHG accounting and reporting. These gases are covered by the Kyoto Protocol- carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PCFs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3).

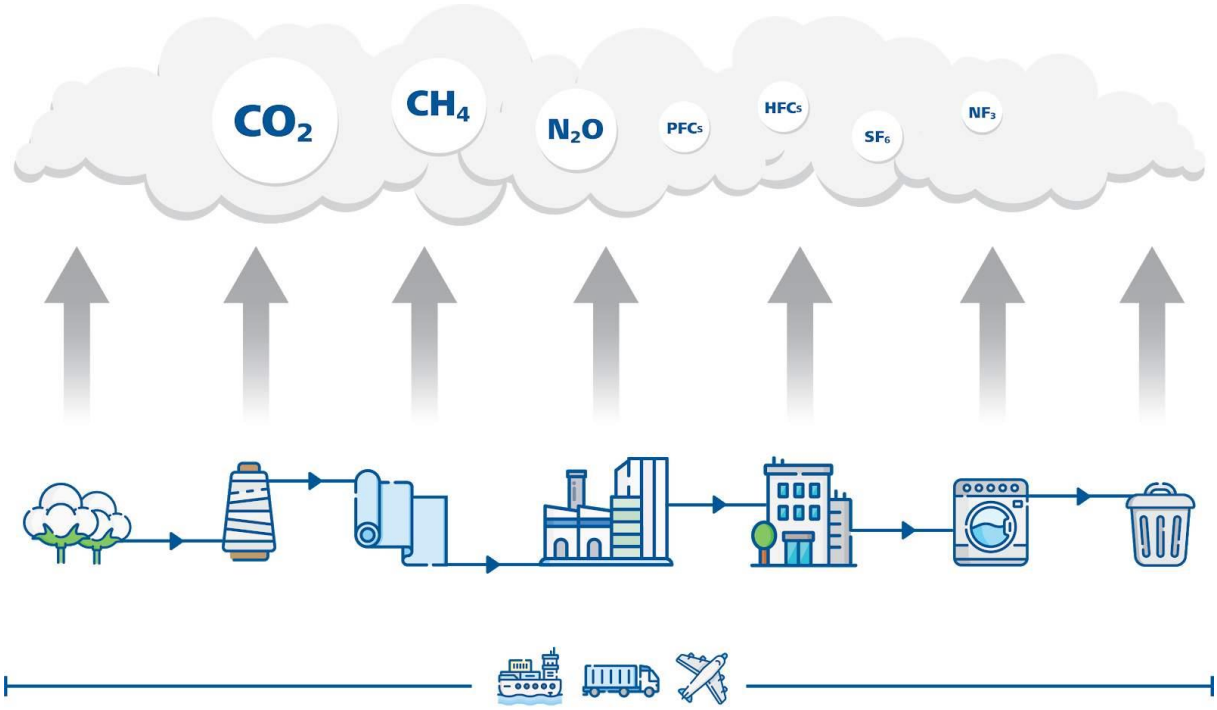

Figure 1-1 Greenhouse gases covered in GHG accounting and reporting

Note: *The size of the bubble gives a rough indication of how much the gas contributes to the emissions of the fashion industry. CO_2 is clearly the most prevalent gas, followed by CH_4 and N_2O. The remaining gases are less common.*

Carbon dioxide (CO_2)

CO_2 occurs naturally in the atmosphere (for example, from volcanoes or hot springs) and is vital for life on the planet. However, the problematic source today is anthropogenic CO_2 (originating from human activity) from the burning of fossil fuels, such as coal, oil and natural gas during manufacturing activities. For textiles, this means emissions from all manufacturing activities that use natural gas or other fuels (e.g., coal or oil).

Methane (CH_4)

Every time a cow burps or passes gas, a little puff of methane enters the atmosphere. This is called enteric emissions. Methane, the main component of natural gas, leaks into the atmosphere via the use of natural gas, production, and use of other fossil fuels, and from landfill decomposition. In the textile industry, CH_4 is released from raising cattle (enteric

emissions) which plays a role in leather production, or from the decomposition of natural fibres (textiles) that are disposed of in landfill, among other examples.

Nitrous oxide (N_2O)

Nitrous oxide occurs naturally in oceans and soils. The main man-made sources of N_2O emissions are from agricultural soil management, fossil fuel combustion and fertiliser application. In the textile industry, there are many activities that release N_2O emissions, such as growing natural fibres (e.g., cotton) that require nitrogenous fertilisers for example.

Perfluorocarbons (PFCs)

Perfluorocarbons (PFCs) are a group of substances that are used, among others, as refrigerants and as insulating agents. PFCs are also commonly used to create water-repellent fabrics. However, it has been phased out since 2015, and is not commonly used in fashion production anymore, mainly due to the environmental concerns (atmospheric and aquatic) and is detrimental to living organisms over time[1].

Hydrofluorocarbons (HFCs)

Hydrofluorocarbons (HFCs) are man-made organic compounds that are frequently used in air conditioning as refrigerants, and in fire extinguishers at your factories, warehouses or offices. According to the Montreal Protocol however, HFC will be phased down by 2050. Click here to learn more about the phasing out of refrigerants to protect the ozone layer.

Sulfur hexafluoride (SF6)

Sulfur hexafluoride is primarily produced and used as a non-conductive medium in the electrical industry, e.g., for insulators. These emissions are commonly found during manufacturing processes such as weaving, dyeing, or when finishing fashion products.

Nitrogen trifluoride (NF_3)

Nitrogen trifluoride completes the list. However, it is not very prevalent in the fashion industry. It is commonly used in the semiconductor industry, as well as in the production of liquid-crystal displays and a specific type of solar cells.

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[1] IPCC. (2021, August). *IPCC_AR6_WGI_Chapter_07_Supplementary_Material*. Retrieved from https://report.ipcc.ch/ar6/wg1/IPCC_AR6_WGI_FullReport.pdf

[2] Mathews, B. (2018, January 23). *Sun sets on PFC use in textiles*. Retrieved from Apparel Insider: https://apparelinsider.com/sun-sets-pfc-use-textiles/

1.4. Distribution of Emissions across the Supply Chain

Now that you know the different greenhouse gases, let's look at where these GHGs occur in the fashion industry supply chain. Look at the fashion value chain and think to yourself at which stages (i.e., tiers) of the manufacturing process the emissions take place.

Below, we have listed some common sources of GHGs under each tier of the fashion industry.

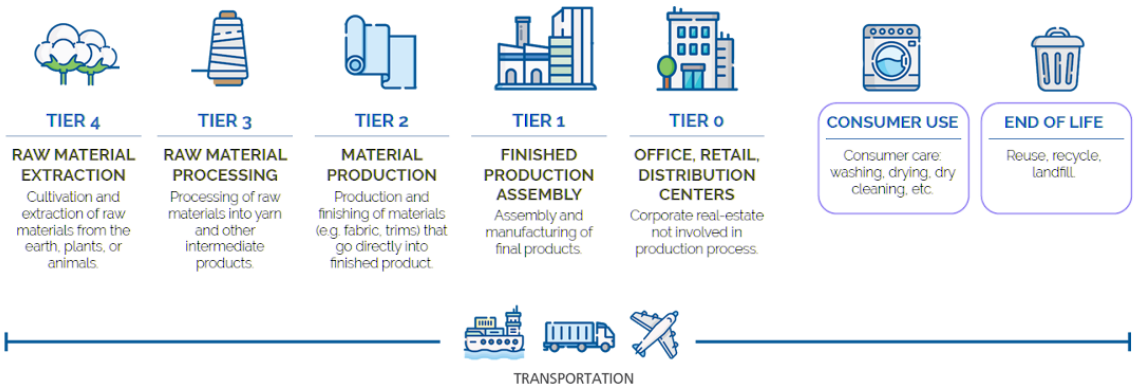


Figure 1-2 Distribution of emissions across the supply chain

1. ***Note:*** *Some brands might use different classifications of tiers in practice. However, for this course, we will be following the concept of tiers based on the UN Playbook (as illustrated).* **Tier 4**

The value chain starts with raw material extraction. GHG emissions occur

during agricultural and farming practices, such as growing plant fibres. Examples of GHG emission sources include:

- Fertilisers, pesticides and water use, machinery use.
- Enteric emissions from livestocks' metabolism for cow leather (methane).
- Natural gas and oil extraction for the production of synthetic and man-made fibres.
- Thermal energy for temperature regulation in production halls, offices, or storehouses.

2. **Tier 3**

The raw material is processed and transformed into intermediate products. For example, cotton and wool are spun into threads. Examples of GHG emission sources include:

- Energy used for machinery and equipment (i.e., both electric and non-electric boilers and steamer).
- Energy used for cooling/heating of factories or warehouses.

3. **Tier 2**
   - This step covers material production and includes knitting, weaving, finishing, dyeing, bleaching, washing, and production process of footwear outsole components. Examples of GHG emission sources include: the use of natural gas or other fuels for intensive production processes. The dyeing stage, for instance, requires use of hot water.
   - Energy used for welding and compressing shoes.
   - Thermal energy for temperature regulation in production halls, offices, or storehouses.
   - Treatment of wastewater generated from the dyeing process.

4. **Tier 1**

   In this step, final products are manufactured. Examples of GHG emission sources include:

   - Energy used for processes such as cutting, sewing, stitching, ironing activities.
   - The production of packaging materials (if recycled materials are not used).
   - Fuels used for shipping.

5. **Tier 0**

   Tier 0 is not part of the suppliers'/manufacturers' supply chain, rather it is more related to brands' own operations. This step represents distribution, and the retailing of the finished products and selling final products to customers. It also includes development, conception and brand teams. Examples of GHG emission sources include:

   - Energy used for offices or warehouses that are owned or operated directly.
   - Shipping products to their final destinations.

6. **Consumer use**

   After the product is assembled and sold, GHG emissions occur at the use phase, e.g. energy used for washing, drying and ironing garments.

7. **End of life**

   Finally, at the end of a product's life, garments can either be disposed of or recycled. GHG emissions at this stage arise from the way in which clothing or fashion products are discarded. GHG emissions arise from:

   - Garment disposal through incineration.
   - Shipping garments to landfills and decomposition of natural fibres at landfills.

Below you can see an example of how the emissions of Hugo Boss' suppliers are segregated by tier. The illustration also shows the weights of GHG emissions of different processes of the value chain.

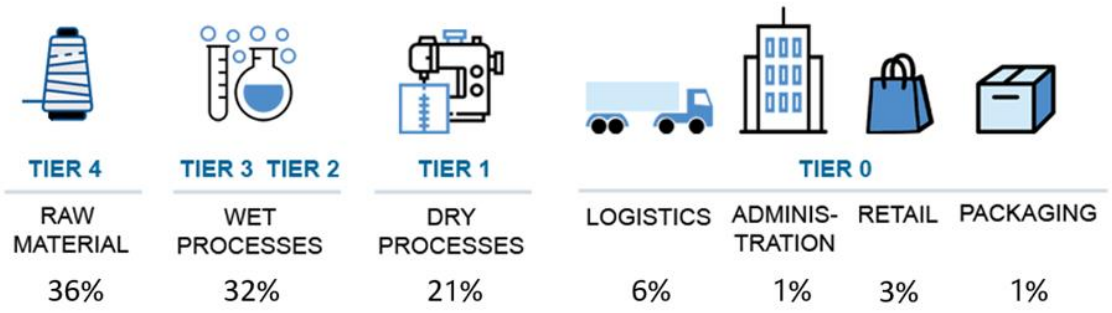


Figure 1-3 Distribution of GHG emissions across Hugo Boss's supply chain

Source: Hugo Boss (2018)

Previously, we talked about the most common GHGs, here are some exercises to help you practise.

[Exercise 1]

Do you remember which of the following is the most common GHG?

- CO_2 **(correct)**
- CH_4
- N_2O
- HFCs
- PFCs
- NF_3

The most common GHG emitted is carbon dioxide (CO_2). It accounts for the majority of emissions. That's why most companies focus on it once they start assessing their GHG emissions. This is also what we will do during this course.

[Exercise 2]

In which tiers of the value chain are CO_2 emitted?

- Tier 4: Raw material extraction **(correct)**
- Tier 3: Raw material processing **(correct)**
- Tier 2: Material production **(correct)**
- Tier 1: Finished production assembly **(correct)**
- Tier 0: Office, retail, distribution centres **(correct)**
- Consumer use **(correct)**
- End of life **(correct)**

Carbon dioxide is emitted all along the value chain! Energy is required for every step of the way. As of now, energy is mainly generated by burning fossil fuels - which results in CO_2 emissions.

[Exercise 3]

Which of the followings are the common CO_2 sources in the fashion industry?

Stationary combustion

- Fossil fuel from boilers at textile mills
- Fossil fuel from electric power plants on-site

Mobile combustion

- Fossil fuel burned by a truck
- Fossil fuel burned by a fuel from an air or sea shipment

Process emissions

- Evaporation from applying adhesives in footwear manufacturing

Fugitive emissions

- Leakage from air conditioning

All the above are the common CO_2 sources.

1.5. Measuring Greenhouse Gas Emissions

Carbon dioxide accounts for the majority of the GHG emissions. However, it is not the GHG that warms the Earth the most. The other GHGs mentioned earlier have a much higher global warming potential. Methane, for example, will contribute 28 times more to global warming than CO_2 within 100 years. Sulfur hexafluoride contributes 25,200 times as much! Each gas has a different GWP given the difference in their ability to absorb energy over a given period of time and how long they stay in the atmosphere. The bottom line is that some GHGs are more harmful than others.

In order to compare how much each GHG contributes to climate change, the emissions of all GHGs are 'converted' to CO_2 emissions using the GWP coefficient. The equivalent amount of other GHGs in terms of CO_2 emissions is called carbon dioxide equivalent (CO_2e).

GWP will be updated overtime as scientific estimates of the energy absorption or the atmospheric concentrations of GHGs change. The calculation methodology and the updated values are reported by the Intergovernmental Panel on Climate Change (IPCC) and the most updated coefficients used for GHG accounting and reporting is the 100-year GWP. We'll explore how to measure GHG emissions in the next chapter.

GHG	Global warming potential (GWP) for 100-year time horizon
Carbon dioxide (CO_2)	1
Methane (CH_4)	28
Nitrous oxide (N_2O)	265
Sulfur hexafluoride (SF_6)	23,500
Perfluorocarbon (PFCs)	9,200
Hydrofluorocarbon (HFCs)	12,400
Nitrogen trifluoride (NF_3)	16,100

Table 1 Global warming potential for 100-year time horizon

Source: AR5 WGI Report

For example:

Nitrous oxide will contribute to global warming 265 times more than CO_2.

So if two tonnes of nitrous oxide are emitted, that equals 2 x 265 = 530 tons of CO_2e.

Try it yourself!

[Exercise 4]

What is the carbon dioxide equivalent of 3 tonnes of methane?

- 51
- 78
- 84 **(correct)**
- 95

Three tonnes of methane equal to 84 tonnes of carbon dioxide (3 tonnes x 28 = 84 tons of CO_2e).

2. Measurement Approaches

To measure GHG emissions, we often use the term 'GHG footprint' or 'carbon footprint'. You heard about these terms in the first module.

Do you remember what it means?

Try writing it down or explaining it in your own words.

So, what's the difference?

- A **carbon footprint refers to the total amount of carbon emissions (only CO_2 emissions)** caused by an individual, an organisation, a service, or a product.

- The term **GHG footprint accounts for all other GHG emissions (i.e. CO_2, CH_4, N_2O etc)**.

However, both terms are used interchangeably.

In practice, GHG and carbon footprints are expressed in CO2-equivalents (CO2e). This means that if you want to accurately describe the full impact of your GHG footprint, you need to convert all GHGs that are not CO2...into CO2! Or CO2 equivalent (CO2e), to be precise. Just like we did a moment ago.

2.1. Measuring GHG Footprint of Business Activities

There are different ways to measure, or account for, a GHG footprint (also known as GHG accounting) depending on what needs to be measured. The scope of a GHG footprint determines what's measured and what's not. More information on GHG accounting concepts is in Module 3.

Some of the most common ways to measure or account for a GHG footprint are outlined by the GHG Protocol, ISO 14064 and PAS 2050. These are global standards that show you how to best measure and manage GHG emissions from your business operations.

Consider the GHG Protocol, ISO 14064 and PAS2050 as methodologies to help you to understand where you have the most GHG emissions. Once you understand where the majority of your emissions are, you can start working on ways to reduce them (more about that later).

Why are we using the GHG Protocol for this?

The GHG Protocol is a commonly used international standard. Both public and private sector organisations use it to measure their GHG emissions because it has very robust methodologies. This makes it very credible.

If you are curious to learn more about the other tools and methodologies to measure your GHG footprint, have a look at the documents and links below.

What is GHG Protocol

GHG Protocol

The Greenhouse Gas Protocol (GHG Protocol) is a private transnational set of standards for greenhouse gas emissions accounting and reporting for companies, and increasingly for the public sector.

Click here to access the GHG Protocol website: ghgprotocol.org

A GHG footprint can be calculated with different scopes in mind – based on what's included in the calculation and what's not. You can theoretically calculate the carbon emissions of a country, a flight, or even a person!

But if you're a business, you will want to understand the GHG footprint of your company or your product. Therefore, it's very common for businesses to calculate their GHG footprint on a corporate or product level.

Learn about GHG Protocol with this Video: https://youtu.be/_urMCfkPdus
Video: WRI/WBCSD Greenhouse Gas Protocol (GHGP) | WorldResourcesInst [3:20 min]
You can click on the CC icon in the video for subtitles. But how does that work in practice?

2.2. Corporate Carbon Footprint

The corporate carbon footprint refers to emissions arising from a corporation's operations. Corporate-level emissions can be divided into two types: direct and indirect GHG emissions. The emissions occurring on a corporate level are also categorised as Scope 1, 2 and 3 emissions. We will come back to these scopes later in this module.

Direct GHG emissions come from the sources that are owned or controlled by the corporation. Indirect GHG emissions are emissions that are a consequence of the operations of the reporting company but occur at sources owned or controlled by another company.

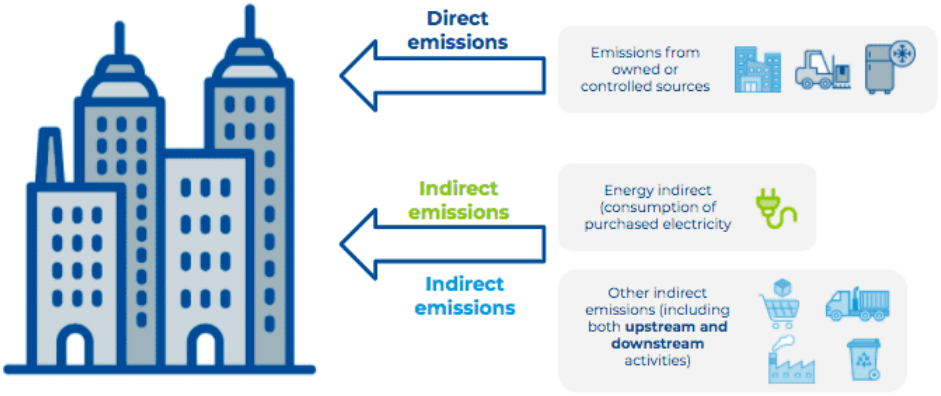


Figure 2-1 Corporate carbon footprint

2.3. Product Carbon Footprint

The product carbon footprint refers to the emissions associated with the life cycle of a product (e.g. all the emissions associated with the production, use and after disposal of shoes or shirts).

Figure 2-2 Product Carbon Footprint

Note: GHG emissions associated with a product over its entire life cycle

Here are the commonly used guidance and standards for both product and corporate GHG footprint calculations.

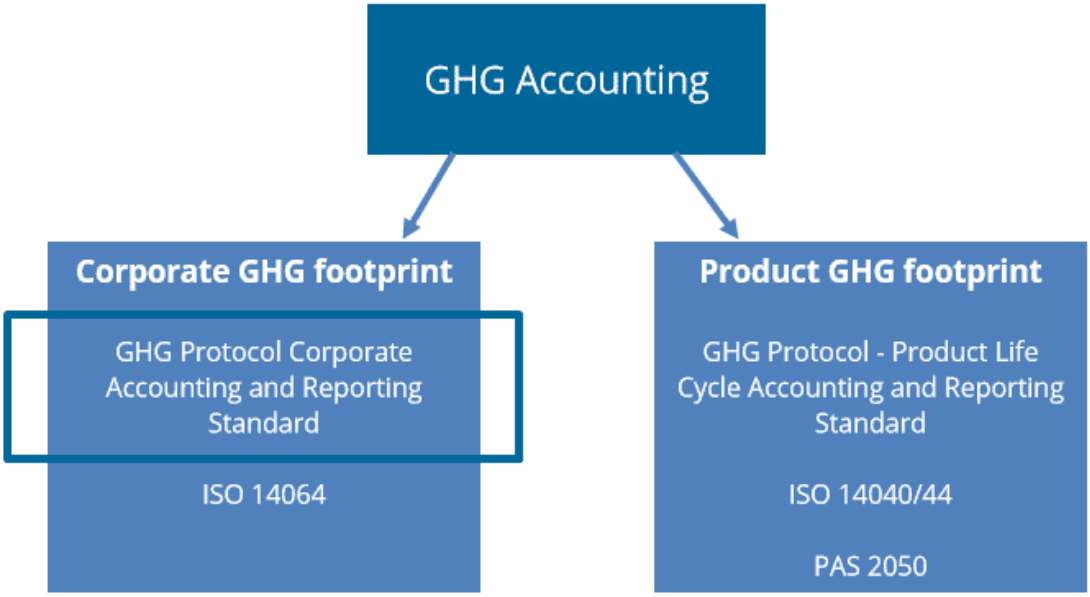


Figure 2-3 Commonly used guidance and standards for GHG Accounting

In this Climate Action Training course, we will focus on the corporate GHG footprint, which is relevant for suppliers and will follow the approach suggested in the GHG Protocol.

Find out more about the other approaches in 8. Resources**.**

3. Corporate GHG accounting

When setting corporate GHG footprint boundary, all direct and indirect emissions of a company should be included.

3.1. Considerations for Setting Corporate GHG Footprint Boundaries

- Emissions the **company produces itself**, such as emissions resulting directly from the production process, or emissions from company-owned vehicles.
- Emissions that are produced by **energy suppliers** to the company, e.g., for electricity or heating and cooling.
- Emissions that result from **supplier activities (upstream)**, like the production of raw material or pre-products, or transportation to get these to the company.
- Emissions that accrue from **customer activities (downstream)**, e.g., the transport of the goods sold by the company, use of the product, or disposal of the product.

3.2. Scopes 1, 2 and 3

To capture all direct and indirect emissions of a company, you need to understand which emissions are included and which emissions are not included. This is done by using three different **emission scopes**.

These three scopes allow companies to differentiate between the emissions they emit directly into the air, which they have the most control over, and the emissions they contribute to indirectly. Please note that the examples provided below are not exhaustive.

1. **Scope 1: Direct emissions**

   Scope 1 emissions are the most direct. They include emissions from all energy produced on-site such as fuel combustion, company vehicles and fugitive emissions. If a company is in the business of fashion, Scope 1 includes emissions from fuels for operated warehouses, boilers, or emissions from the company's owned vehicles.

2. **Scope 2: Energy-related indirect emissions**

   Scope 2 emissions are one step beyond a company's immediate control; they come from the purchase of electricity or the heat a company buys to keep its facilities running. Almost all businesses generate Scope 2 emissions due to the purchase of energy.

3. **Scope 3: Indirect emissions**

   Indirect emissions include both upstream activities (emissions related to products purchased by a company), and downstream activities (those related to the products they sell). The Greenhouse Gas protocol breaks down scope 3 emissions into 15 distinct categories.

Here's an overview of the three emission scopes, as well as the respective relevant categories. Various scope 3 emission sources will be discussed later.

Source: Greenhouse Gas Protocol - Technical Guidance for Calculating Scope 3 Emissions

3.3. Example of How Scopes Work

Imagine there's a sewing company called North Sewing Ltd that is located in Vietnam and produces clothes for PINA, a fashion brand selling clothes all over the world.

To produce clothes, North Sewing Ltd. needs material like cotton fabrics, which it purchases from a supplier called Chino Cotton Textile Co.

If you were PINA, where would your Scope 1, Scope 2 and Scope 3 emissions be? How about if you were North Sewing Ltd? Or Chino Cotton Textile?

Let's explore this question together.

We'll start with North Sewing Ltd, the sewing company.

[Exercise 5]

What are the Scope 1, 2 and 3 emissions sources from North Sewing Ltd?

Scope 1 Diesel for company's fleet

Fuel oil for generators

Leakage of refrigerants for air-conditioning

Scope 2

Grid electricity for lighting

Purchased electricity to operate cutting and sewing machineries

Purchased steam for pressing

Scope 3

Emissions from Chino Cotton Textile related to North Sewing Ltd

Upstream emissions from Tier 0, and Tier 1 related processes

Emissions from business trips taken to meet and negotiate with PINA

Emissions caused by shipping the final products from Vietnam to Thailand

Downstream emissions from the use of their fabric and emissions from product end of

life

Chino Cotton Textile weaves and dyes cotton fabric, which is supplied to North Sewing Ltd.

[Exercise 6]

Which of Chino Cotton Textile's emissions fall under Scope 1, 2 or 3?

Scope 1

- Emissions from the use of a propane-fired cooker for the self-operated cafeteria
- Emissions from the use of coal to heat facilities during winter
- Emissions from the use of diesel for forklift
- Emissions from the use of fuel oil with generator
- Emissions from the use of natural gas in stenter machines
- Emissions from onsite wastewater treatment processes

Scope 2

- Emissions from grid electricity weaving and dyeing machines
- Emissions from purchased steam used for boilers

Scope 3

- Fuel emissions of the truck that takes the dyed fabrics to North Sewing Ltd.
- Emissions from North Sewing Ltd.
- Farm-level emissions from growing raw materials (cotton) that the company uses.
- Downstream emissions from the use of their fabric and emissions from product end of life

Let's play this game one more time, and this time let's take the perspective of PINA, the global fashion brand.

[Exercise 7]

What are the relevant Scope 1, 2 and 3 emissions for PINA?

Scope 1

Emissions from business trips undertaken in company-owned vehicles

Emissions from heating used in company-owned stores

Scope 2

Emissions from grid electricity for their warehouses, offices, stores etc.

Scope 3

Purchased goods and services emissions from North Sewing Ltd.

Emissions from Chino Cotton Textile's activities

Emissions from fertiliser used in the farms where the cotton is grown

Emissions from shipping activities to deliver yarn to their end customer

Downstream emissions from the use of their fabric and emissions from product end of life

Emissions from waste generated at their stores and corporate offices

Of course, these examples do not cover all possible emissions sources. Reality is much more complex.

Takeaway Points about Scopes

The emission sources and scopes differ based on where a company sits in the fashion value chain

For example, the Scope 1 and 2 emissions of suppliers are Scope 3 emissions from 'Purchased Goods and Services' of a brand.

Emissions from suppliers and customers contribute to a company's footprint

Emissions from all scopes go into the footprint of a company. If companies want to reduce their carbon/GHG footprint, emissions need to decrease across all three scopes.

Fashion brands need to reduce Scope 3 emissions to significantly decrease their corporate GHG footprint

For fashion brands and retailers, the majority of emissions are Scope 3 emissions (mainly due to 'Purchased Goods and Services'). Unlike Scope 1 and 2 emissions, understanding Scope 3 emissions is complex. This is because it involves many levels of suppliers that brands and retailers

may not have direct control over. This is why, if brands and retailers want to successfully reduce their Scope 3 emissions, they need their suppliers' help. A supplier also needs the help of their own suppliers further down the chain. Similarly, a supplier needs the help of their customer to choose low-carbon manufacturing, and the consumers need help to choose fashion items made with lower GHG emissions.

3.4. Relevance of Scope 3 Emissions

According to the GHG Protocol, Scope 1 and 2 emissions are mandatory to calculate and report, while Scope 3 emissions are considered voluntary. However, recently there has been an increasing focus on supply chain sustainability, which requires brands and retailers to measure emissions from their suppliers. The GHG Protocol divides Scope 3 into different 15 emission categories that must be taken into account, if relevant.

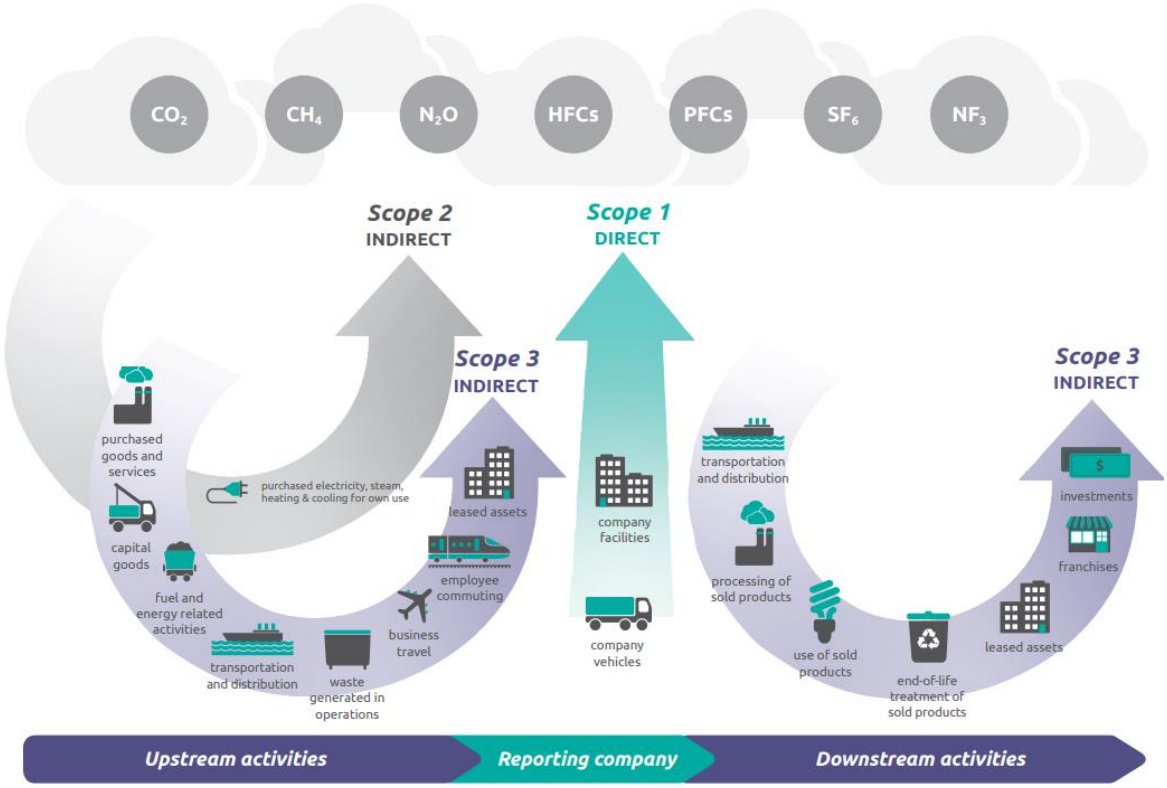
Cat.	Description	Illustrative Examples of Fashion Industry				
		Brands	**Tier 1**	**Tier 2**	**Tier 3**	**Tier 4**
1	Purchased goods and services	*This includes all the emissions "embedded" in finished products, from raw materials through processing to final assembly (i.e., tiers 1 to 4)*				
		• Final products such as clothes and accessories	• Fabric bought from Tier-2 facilities • Metal accessories needed for the apparel product	• Yarn • Dye • Wastewater treatment service by third party	• Raw materials e.g., cotton or wool	• Pesticides • Food for animal rearing for wool/leather
2	Capital goods (Including machinery, tools, and equipment)	*Extraction, production, and transportation of capital goods (goods that are used in producing other goods, rather than being bought by consumers)*				
		• Production and transportation of computer	• Production and transportation of sewing machine	• Production and transportation of newly purchased boiler	• Production and transportation of yarn spinning machine	• Production and transportation of tractor
3	Fuel and energy-related activities (not included in scope 1 or 2)	*Extraction, production, and transportation of fuels and energy purchased or acquired by the reporting company in the reporting year, which have not been included in scope 1 or scope 2. Also includes self-generated electricity being sold to a third party*				
				• Self-generated electricity from onsite solar PV or CHP systems sold to third-party	• Refining of gasoline used in third party vehicles for garment distribution purchased by a manufacturer	
4	Upstream	*Transportation and distribution of products purchased by the reporting company*				

	transportation and distribution	• Third-party transportation services for final products	• Third-party transportation services for purchased fabric. Note that some tools like the Higg Material Sustainability Index (MSI) includes generic inputs for such transportation	• Third-party transportation services for yarn and dyes	• Third-party transportation services for cotton or wool	
5	Waste generated in operations	*Disposal and treatment of waste from the reporting company's operation*				
		• Incineration or landfilling of unsold product	• Incineration or landfilling of samples	• Incineration or landfilling of fabric	• Incineration or landfilling of scrap yarn	• Incineration or landfilling of agricultural wastes
6	Business travel	*Transportation of employees for business-related activities (in vehicles not owned or operated by the reporting company)*				
		• Air travel for business-related meetings				
7	Employee commuting	*Transportation of employees from home to work (in vehicles not owned or operated by the reporting company)*				
		• Employee's automobile • Public transportation				
8	Upstream leased assets	*Operation of assets leased by the reporting company (lessee)*				
		• Leased retail space that was not included in a company's scope 1 and 2 inventory. This may occur if a company draws its inventory boundary via the financial control approach				

9	Downstream transportation and distribution	*Transportation and distribution of products sold by the reporting company in the reporting year between the reporting company's operations and the end consumer (if not paid for by the reporting company), including retail and storage (in vehicles and facilities not owned or controlled by the reporting company)*				
10	Processing of sold products	*Emissions of processing intermediate products by downstream companies*				
			• Further product packaging	• Further processing of sewing and product printing by another company	• Further processing of knitting and/or weaving by another company	
11	Use of sold products	*End use of goods and services sold by the company*				
		• Customer care for products (e.g., washing and drying)				
12	End-of-life treatment of sold products	*Waste disposal and treatment of discarded products*				
		• Incineration or landfilling of sold clothing	• Incineration or landfilling of sold products e.g. clothing, footwear, accessories	• Incineration or landfilling of fabric	• Incineration or landfilling of yarn	• Incineration or landfilling of cotton and other raw materials
13	Downstream leased assets	*Emissions of assets owned by the company but leased to another entity*				

14	Franchises	*Emissions of franchises*				
		• Scope 1 and 2 emissions from franchisees, whom the franchisor grant licenses to sell or distribute garments in return for payments				
15	Investments	*Emissions from investment (applicable to investors and companies that provide financial services)*				
				• A reporting company's Scope 3 emissions from investments are the Scope 1 and 2 emissions of investees (e.g., jeans producer etc.)		

Table 2 A list of Scope 3 emissions examples



Brand's Scope 3 emissions: suppliers' Scope 1 & 2 emissions

Priority for suppliers: scopes of emissions that can be controlled by suppliers (Scope 1 and 2 emissions).

Purchased goods and services category: largest emissions for brands.

The Fashion Brands' Perspective

Before we look at an example, let's refresh our memories of the previous chapter.

[Exercise 8]

Which emissions are the most significant for a fashion brand?

- Scope 1 emissions
- Scope 2 emissions
- Scope 3 emissions **(correct)**

[Exercise 9]

Can you guess how much Scope 3 emissions contribute to a fashion brand's supply chain?

- 10 %
- 50%
- 80% **(correct)**
- 100%

Scope 3 emissions often make up to 80% of a brand's total emissions, sometimes even more.

[Exercise 10]

Which emissions are important to report as a textile supplier?

- Scope 1, 2 and 3 emissions
- Scope 1 and 2 emissions **(correct)**
- Scope 1 and 3 emissions
- Scope 2 and 3 emissions

Suppliers should prioritise their Scope 1 and 2 emissions, as brands are increasingly expecting suppliers to measure and report these emissions.

3.5. Illustration of Distribution of Emissions across Scopes

Let's test what we've learned by using an example of the fashion value chain. The breakdown of Decathalon's total emissions in 2018 is provided in the chart below.

Decathalon's scope 1 and 2 emissions account for the smallest part of their total emissions as highlighted in grey (Construction & Operation of Decathalon Sites and Teammates & Consumer Travel). Majority of their emissions occur outside their owned facilities. Within their scope 3 emissions; 69% comes from supply chain, covering categories of transportation of products, raw material extraction and production.

While 12% comes from consumer use and disposal phases. The emissions that go into creating, selling, and using a product are more significant.

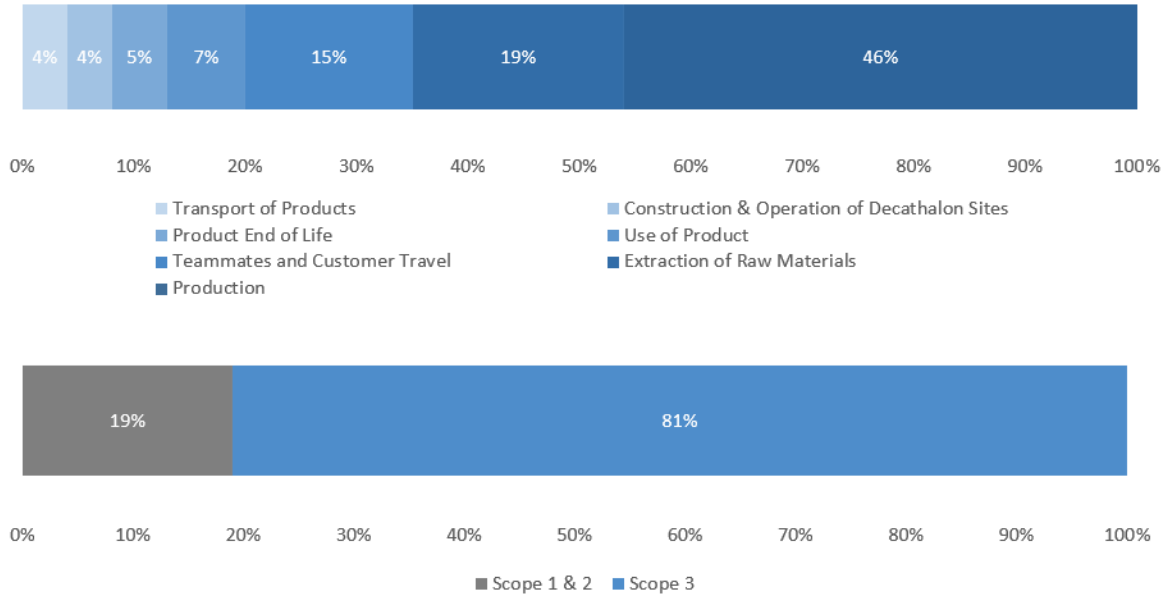


Figure 3-1 Decathlon's carbon emissions across categories and scopes

Source: Decathalon Annual Sustainable Development Report (2018)

Today, climate action is a high value attribute to consumers and the market. Brands want to be competitive, therefore, they need to take steps to reduce their emissions.

As emission reduction measures are important to the brands, by default they will become important to suppliers (you). To continue your business with the customers (brands), it is essential that you follow the brand's steps in reducing your own emissions. But how can you reduce your emissions? We will tackle this question in the following module.

3.6. The First Step of GHG Accounting

"Without goals, and plans to reach them, you are like a ship that has set sail with no destination." Fitzhugh Dodson, psychologist and author

As you've learned, the exercise of GHG accounting can be quite complicated and it can take a lot of time. So why are we even doing this exercise?

The goal of GHG accounting is to understand what your impact on the planet is. Once you know your impact, it will be easier to reduce it! But your organisation grows and develops all the time. So do your emissions. This is why your organisation's GHG emissions should be regularly measured and monitored. Ideally, you should measure and report your company's full value chain emissions every year.

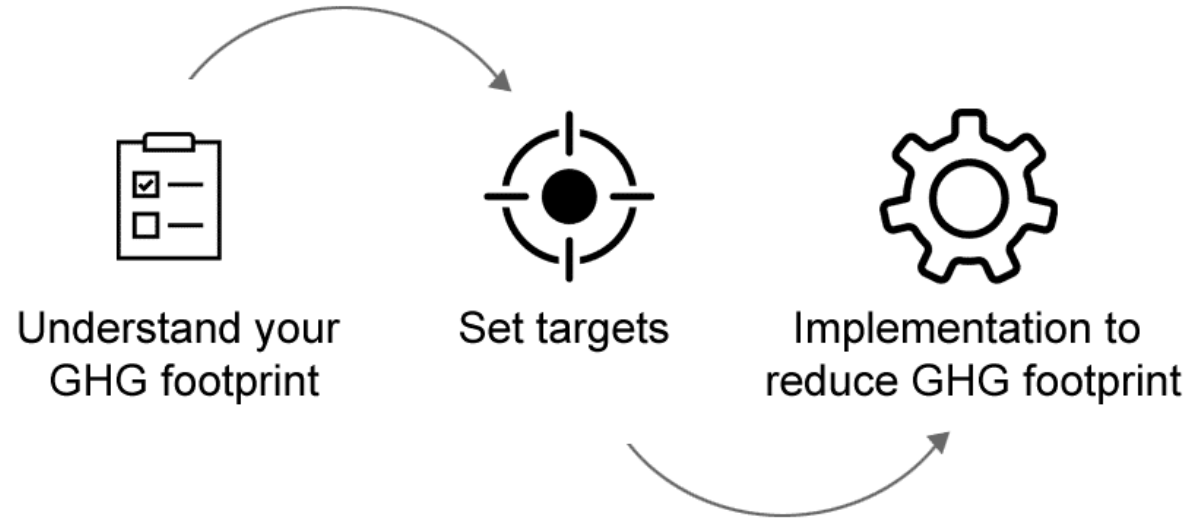


Figure 3-2 Pathway for decarbonization

a. Understand your GHG Footprint

It all starts with the question: "Where are our emissions today?"

Your first step in GHG accounting is to measure your current emissions, also known as your baseline emissions. Baseline emissions refer to the total GHG emissions that are produced from your operations – before you have taken any activities to reduce them. The step-by-step process to calculate your baseline emissions as per GHG Protocol is as follows:

- Identify your organizational boundary for reporting.
- Identify the scope of activities that will be accounted.
- Select the calculation approach (product or corporate level).
- Collect data based on scope of activities and select emission factors.

Once you measure your emissions, you should report them publicly, either to your customers or your relevant stakeholders (i.e. fashion brands, financiers etc). You will learn more about all the GHG accounting processes in Module 3.

b. Target Setting

Once you understand what your emissions are and where they are, the next questions to answer are:

1. Where do most of your emissions come from?
2. What sources could be reduced?
3. Do you have a specific target of how much you want to reduce your emissions?
4. How do you want to reduce it?
5. How should you monitor your emission reductions activities?

This may sound like a lot to answer but don't worry, we will tackle all these questions in Module 4. If your company (as a group) is very advanced in managing your carbon footprint, you can start looking at setting a more ambitious target, such as a reduction target that is approved by the Science Based Targets Initiative (SBTi).

Science Based Targets initiative (SBTi) – Apparel and Footwear

SBTi seeks to help businesses develop carbon reduction targets, this is more relevant to manufacturers with multiple facilities under their wing. It is designed on the science backed Paris Agreement target of limiting the global temperature rise at 1.5°C. Businesses can set verified targets that they plan to reach by 2030 and regularly report their progress.

Science Based Targets – Apparel and Footwear

c. Implementation to Reduce your GHG Footprint

Once you have set your targets and you know what you want to achieve, the next question is *how* – how to achieve your targets? What actions can you take to reduce your emissions?

There are many ways to reduce emissions. In this course, we will explore two very effective solutions:

- Energy efficiency in Module 5.1
- Renewable energy and biomass in Module 5.2

All of this sounds like a lot of work, we know. But it is worth it! Understanding and reducing your emissions has many business benefits.

3.7. How you can benefit from GHG Accounting

Please think about this question before you look at our ideas.

There are many benefits to GHG accounting. You can support your customers and understand your business better, with accurate and credible information. And there's more:

- You can identify **GHG-related risks** including the hotspots in your value chain. This allows you to **prioritise emission reduction efforts** to reduce business costs while meeting your climate targets.
- **You can become more efficient with your resource and energy use, and you can save money.**
- You will be **prepared to report** your GHG emissions at any time, to meet the needs of your stakeholders (e.g., investors, customers and even governments).
- You can continue to monitor your climate strategy and make adjustments to **improve your climate performance.**
- You can earn eco labels that can help you stand out. Reporting your GHG emissions can also help you **get GHG certification to apply for eco labels**. This improves your credibility, which makes you a more attractive partner for brands and more interesting to investors.
- You can **identify areas in which to innovate** by exploring more efficient technologies.
- You can **engage your stakeholders** - employees, customers, suppliers, communities, and investors.

So, what is the first step? Understand your footprint and establish a solid baseline.

3.8. The Importance of Accurate Baseline Emissions

You can't reduce what you can't measure. Your baseline emissions will help you set your emission reduction targets.

- A baseline provides you with an overview of where the most critical emissions are located, and where the 'hotspots' are. This helps you to prioritise your emission reduction programme activities.
- A baseline helps provide a starting point from which you can track your improvements.

The next module of this course (Module 3) will take you through the step-by-step process on GHG accounting, a fundamental process to estimate your GHG emissions. Bringing the GHG accounting knowledge from Module 3, we will discuss more on setting your baseline and emission reductions target in Module 4.

4. Alternative Methods

So far, we have focused on measuring the corporate GHG footprint according to the GHG Protocol. However, as mentioned, there are other methods. Here you'll find some documents and websites that introduce you to these methods.

You can take a look at these materials – however, it is not mandatory for this course. We will continue working according to the GHG Protocol corporate standard. However, if any of these approaches to GHG accounting are more aligned to your business, do consider using them instead or in addition to the GHG Protocol's corporate standards. Please refer to 8. Resources for other GHG/Corporate Carbon Footprint Accounting Tool.

5. Quiz

We've reached the end of Module 2: GHG emissions. Did you do the self-evaluation at the start of the module? If so: were your expectations met? Compare your personal take-aways with the notes you might have made when starting the module.

Before we proceed with the practical assignment, please check your knowledge in a short quiz.

[Quiz 1]

Which of these are GHGs?

- Carbon dioxide **(correct)**
- Methane **(correct)**
- Oxygen
- Butane
- Chloride

The most common greenhouse gas is carbon dioxide. Another important one is methane. Both of them contribute to the greenhouse effect and therefore to global warming. The other gases do not contribute to the greenhouse effect and are therefore not greenhouse gases.

[Quiz 2]

How can you compare the contribution of different GHGs to climate change?

- By calculating the carbon dioxide equivalent (CO_2e) **(correct)**
- By multiplying each GHG's contribution with its global warming potential (GWP) **(correct)**
- As GHG are so different in amount and impact, their contribution cannot be compared
- Through a complicated calculation that requires specific calculation tools

To make the impact of different GHGs comparable, you simply multiply the emission of a GHG with its global warming potential (GWP) to get the amount of CO_2 which would lead to the same impact. This is called the carbon dioxide equivalent (CO_2e).

[Quiz 3]

"Carbon footprint and GHG footprint are identical." Is this statement true or false?

- True
- False **(correct)**

Strictly speaking, they are not identical. A carbon footprint only measures CO_2 emissions whereas a GHG footprint considers further GHGs. In practice however, these terms are often used interchangeably, namely if emissions from non-CO_2 gases are converted into carbon dioxide equivalents.

[Quiz 4]

How does a corporate measure their GHG footprint?

- There are different ways to calculate a GHG footprint, for example based on a product's life cycle or based on corporate emissions **(correct)**
- There's only one correct way to calculate a GHG footprint: Following the GHG Protocol
- There's no way to calculate a GHG footprint. It's just too complicated to do this

There are indeed several ways to calculate a GHG footprint. Two different approaches are calculating the corporate footprint or calculating a product's footprint. Both approaches can be applied according to the GHG Protocol guidelines, but there are further standards that you can use.

[Quiz 5]

What are Scope 1, 2 and 3 GHG emissions?

Scope 1 emissions are the emissions that occur directly within the company's boundary (also known as direct emissions), whereas Scope 2 and 3 emissions are categorised as indirect emissions

Scope 2 emissions are the indirect emissions generated from purchased energy (e.g, electricity, heat, steam)

Scope 3 emissions are the indirect emissions that are produced by the downstream and upstream activities of the reporting company. This includes emissions from suppliers activities and even customers' use phase

[Quiz 6]

Which scope represents the biggest emissions for a fashion brand?

- Scope 1
- Scope 2
- Scope 3 **(correct)**

For a fashion brand, the highest emissions will be found in Scope 3, with the majority of its emissions coming from Tier 1 to 4 suppliers' production activities.

[Quiz 7]

What is the first step for a corporate when measuring their GHG footprint?

- Set a baseline to find out how high their current GHG emissions are. **(correct)**
- Define emission reduction targets and publish the targets publicly
- Create a monitoring plan to assess emission reductions achievements

All of these steps are important; however you would start with setting a solid baseline. Find out how the volume of emissions your company generates prior to any emission reduction activities. Once you've done this, you can start developing an emission reduction targets plan, and develop a roadmap on how to achieve this. But these are only the next steps.

6. Assignment

You've heard a lot about GHG accounting and Scopes 1, 2 & 3 in this module. Here's your assignment for this week:

Take the first step to categorise your factory's GHG emissions under Scope 1, Scope 2, and Scope 3 emissions!

1. **Try to identify Scope 1 and 2 emissions of your factory:**

   You can start by thinking about all the processes that consume electricity or fuels within your factories. Make a list of the 10 most energy-intensive processes within the factories and then try to allocate them to the right category.

- Fuels: natural gas (for boilers), LPG, diesel (for generators), coal, wood etc.; petrol (for company owned vehicles) ➔ Scope 1 emissions (direct emissions) natural gas (for boilers), LPG, diesel (for generators), coal, wood etc.; petrol (for company owned vehicles) ➔ Scope 1 emissions (direct emissions)
- Refrigerants: Air conditioning ➔ Scope 1 emissions (direct emissions)
- Purchased energy: electricity from grid provider, steam from provider etc. ➔ Scope 2 emissions (indirect emissions)

2. **Create a table to list your findings:**

#	Activity	Equipment	Emission source	Scope	Emission source description
1	Steam production	Boiler	Fuel	1	Natural gas boiler
2	Lighting	Light bulbs	Electricity	2	Electricity from the local grid
3	Ironing & pressing	Industrial iron	Electricity	2	Electric iron machine
4	Steam production	Boiler	Renewables	1	Solar boiler

Table 3 Illustration of emission source idenitifaction

*Note: The content on the table above is just an example.

As mentioned in the beginning, please allocate 1-2 hours to complete the assignment during your training week.

7. Frequently Asked Questions

What are the most recognised methodologies or standards for calculating GHG emissions?

Answer: The most recognised methodologies are GHG Protocol, ISO and PAS 2050. These three global standards are commonly used by companies to measure and manage their GHG emissions. Depending on the type of accounting a company would like to undertake, different methodologies are used.

For **product-level** GHG accounting, the common methodologies are: GHG Protocol Product Standard, ISO 14067, 14040 and 14044, and PAS 2050.

For **corporate-level** GHG accounting, the common methodologies are: GHG Protocol: Corporate Accounting and Reporting Standard, GHG Protocol: Corporate Value Chain (Scope 3) Accounting and Reporting Standard, and ISO 14064. ISO 14064 refers back to GHG Protocol, they are essentially the same.

I am a supplier – which GHG accounting method should I begin with: product or corporate-level accounting?

Answer: You should start with corporate-level accounting. This is because brands will likely ask you to report your Scope 1 and 2 emissions, therefore focusing on corporate-level accounting will be your priority. However, when you become more advanced, you should conduct product-level accounting as it will give you a better understanding of the emissions from your own value chain.

What is Global Warming Potential (GWP)?

Answer: GWP is a common unit of measurement expressed in CO_2 equivalent (CO_2e). This unit allows you to compare global warming potential of different greenhouse gases. For example, scientists estimate that 1 kg of methane (CH_4) has 25 times more global warming impact than 1 kg of carbon dioxide (CO_2) over 100 years.

How do I calculate GHG emissions from direct and indirect energy use?

Answer: You will learn more about the concept and practical exercises of GHG emissions calculation in Module 3, however in practice, you need to collect relevant activity data related to your direct (Scope 1) and indirect energy use (Scope 2) and finding relevant emission factors for your activities.

The calculation can be done using GHG Protocol tools, as recommended by GHG Protocol.

How do I calculate GHG emissions from purchased goods and services?

Answer: Measuring Scope 3 emissions in general can be very challenging due to the lack of direct control of the activities included in this category, including the emissions from purchased goods and services. In practice, you will need to look into your bill of materials, invoices and talk to your suppliers to make some estimations. More detailed explanation on how to calculate Scope 3 emissions from purchased goods and services can be found here. You'll also learn more about the concept and practical exercises of GHG emissions calculation in Module 3.

What is the difference between corporate and product GHG footprint?

Answer: The product GHG footprint refers to the emissions associated with the life cycle of a product (e.g. all the steps that a shoe or a shirt goes through, from the day it is produced to the day it is discarded). The corporate GHG footprint refers to all emissions arising from a corporation's operations (Scope 1, 2 and 3).

What is the best way to reduce Scope 3 GHG emissions?

Answer: Scope 3 GHG emissions include 15 different categories and are quite complex. Therefore, there is no one size fits all answer to this question. The reduction of Scope 3 GHG emissions varies on a case-by-case basis, but in most cases it includes active supplier engagement. Brands, for example, are engaging their suppliers to identify energy efficiency measures and renewable energy options that can be adopted. This will be addressed further in the next modules.

What would be the measurement procedure for fugitive emissions?

Answer: There are different ways of calculating fugitive emissions with varying levels of accuracy and data collection required. The US Environmental Protection Agency (EPA) has published a guidance to calculating fugitive emissions here. We will learn more in detail how to calculate fugitive emissions in Module 3.

8. Resources

Greenhouse Gas Protocol (ghgprotocol.org), Product Life Cycle Accounting and Reporting Standard [PDF, 148 pages]

British Standards Institution (BSI), Product Carbon Footprinting for Beginners [PDF, 46 pages]

Business for Social Responsibility (BSR), Life Cycle Carbon Mapping [PDF, 23 pages]

US Environmental Protection Agency (EPA), Greenhouse Gas Inventory Guidance [PDF, 20 pages]

ISO Corporate level GHG reporting (ISO), ISO 14064 on the ISO website

ISO Lifecycle assessment principles and framework (ISO), ISO 14040 on the ISO website

ISO Lifecycle assessment requirements and guidelines (ISO), ISO 14044 on the ISO website

GHG/Carbon footprint accounting for corporate carbon footprints

To calculate the corporate GHG emissions, you could also adopt the ISO approach.

ISO 14064

The standard specifies principles and requirements at the organisation level for the quantification and reporting of greenhouse gas (GHG) emissions and removals.

ISO 14064 on the ISO website

GHG/Carbon footprint accounting for product carbon footprints

As you learned earlier, in addition to assessing the corporate carbon footprint, you can also define a product's carbon footprint. The GHG Protocol provides some guidelines for this method.

Product Life Cycle Accounting and Reporting Standard (by GHG Protocol)

The Product Life Cycle Accounting and Reporting Standard can be used to understand the full life cycle emissions of a product and focus efforts on the greatest GHG reduction opportunities.

"Product Standard" on the GHG Protocol website

And, again, there are ISO standards available for this type of accounting.

ISO 14040/44

There are two ISO standards that refer to the accounting of product carbon footprints.

ISO 14040 describes the principles and framework for life cycle assessment (LCA):

ISO 14040 on the ISO website

ISO 14044 specifies requirements and provides guidelines for life cycle assessment (LCA):

ISO 14044 on the ISO website

Another standard referring to this approach is PAS 2050.

PAS 2050

PAS 2050 is the specification for the assessment of the life cycle greenhouse gas emissions of goods and services:

PAS 2050 on the BSI website

Finally, here are some additional documents that can be helpful to start with GHG accounting, based on a product's life cycle in general:

Product Carbon Footprinting for Beginners

The aim of this guide, published by BSI, is to provide non-technical guidance on product carbon footprinting to enable specific sectors or organisations with limited experience (especially small and medium sized enterprises or SMEs) to take the first steps in calculating the carbon footprints of their products.

Download "Product Carbon Footprinting for Beginners" [PDF, 46 pages]

Life Cycle Carbon Mapping

This document was compiled by BSR and H&M. It includes current publicly available information about the life cycle carbon emissions of the apparel industry.

Download "Life Cycle Carbon Mapping" [PDF, 23 pages]