ClimatePartner

The complete guide to understanding scope 1, 2, and 3 emissions

Climate action concerns us all. There is broad consensus on this both in the scientific community and across the world. Businesses in particular are seen as playing a key role in climate action. More and more companies of different sizes and from different sectors are becoming increasingly aware of this responsibility. They recognise that they must drive the decarbonisation of their portfolios and reduce emissions within their operational processes and value chains in order to be more sustainable, future-proof, and to make the transition to a net zero economy. However, climate action requires short- and long-term strategies and concrete measures.

The basis for a corporate climate action strategy is the calculation of a company's greenhouse gas (GHG) emissions and an accurate understanding of the different emission sources. This can present a challenge for companies of all sizes, but it is a crucial step in setting and achieving reduction targets to mitigate their impact on the climate.

This guide explains how to identify a company's major emission sources, correctly delineate them, and categorise them into scope 1, scope 2, and scope 3 emissions.

The international community has long recognised the necessity of reducing emissions to prevent further global warming. With the Kyoto Protocol in 1997, countries agreed for the first time in history on binding targets and measures for combatting climate change. This agreement was the basis for the Greenhouse Gas (GHG) Protocol.

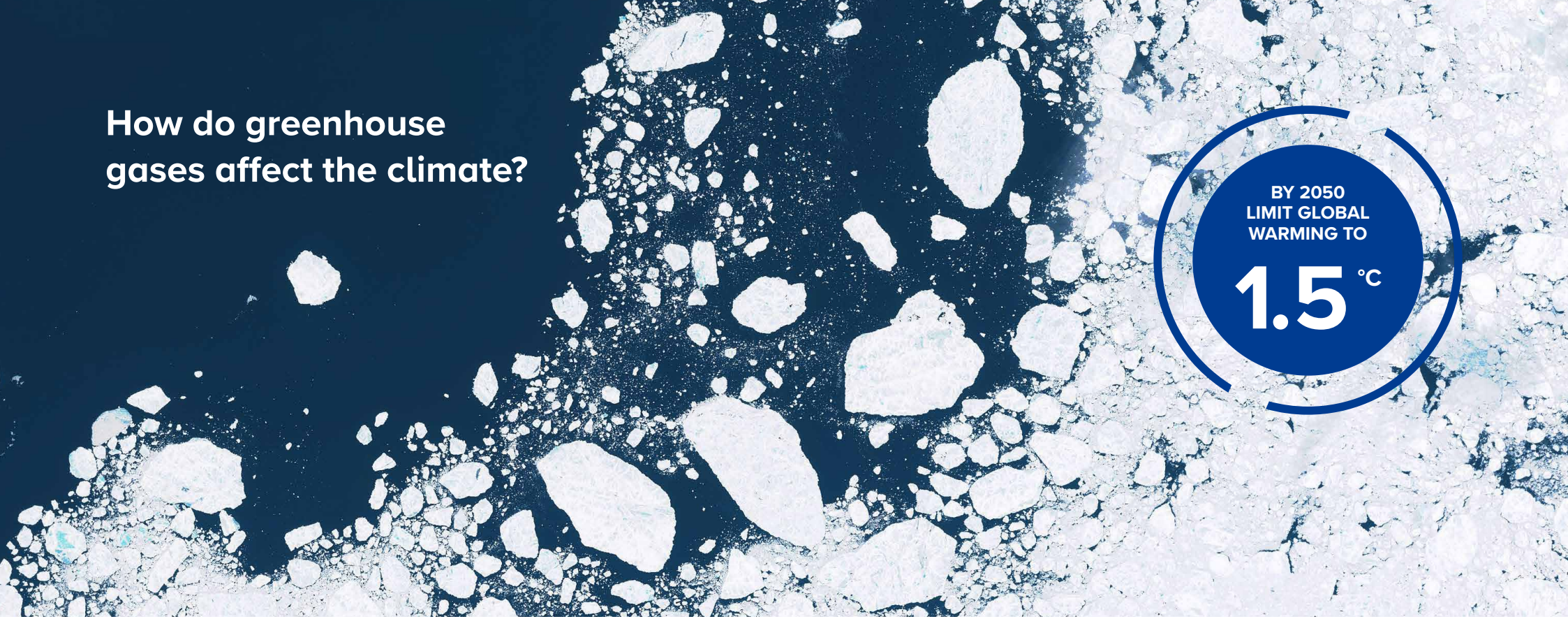
What is the GHG Protocol?

First published in 1998, the GHG Protocol provides a standard framework for measuring and managing greenhouse gas emissions from private and public sector operations.

Formed through a partnership between the World Resources Institute and the World Business Council for Sustainable Development, the GHG Protocol created accounting standards, tools, and training to help businesses to measure and manage emissions. Furthermore, it provides guidelines and requirements for companies, enabling them to prepare an emissions inventory – which also includes the calculation of their corporate carbon footprint (CCF).

A CCF describes the total amount of GHG emissions (including carbon emissions) generated by a company's activities, including direct and indirect emissions. The CCF provides companies with an overview of where exactly emissions occur within their operational processes and value chain. This data can then be used to set reduction targets. But why is it so important to reduce GHG emissions?

How do greenhouse gases affect the climate?



To understand the necessity of reducing GHG emissions, it is important to demonstrate their impact on climate change. Greenhouse gases refer to the different types of gases that trap heat in the atmosphere. By absorbing the sun's energy and slowing the rate at which the energy escapes to space, GHGs act like a blanket insulating the Earth. This effect is called the greenhouse effect.

The greenhouse effect is a natural phenomenon; without it there would be no life on Earth. This is because it stores heat in the atmosphere and prevents the planet from freezing. However, over generations, humans have disrupted the balance of the greenhouse effect.

According to the sixth IPCC report, human activities, such as burning fossil fuels and cutting down forests, have warmed the planet "at a rate that is unprecedented in at least the last 2000 years". Industrialisation has added enormous amounts of GHGs to those naturally occurring in the atmosphere, increasing global warming and driving climate change. For this reason, the Paris Agreement dictates a global responsibility to reduce GHG emissions and to limit the global temperature increase to 1.5 °C above pre-industrial levels by 2050.

There are two important factors to know about the different types of GHGs: their ability to absorb energy, known as radiative efficiency, and their lifetime, meaning how long they linger in the atmosphere. A value known as the global warming potential (GWP) is used to compare the radiative effects of the various GHGs.

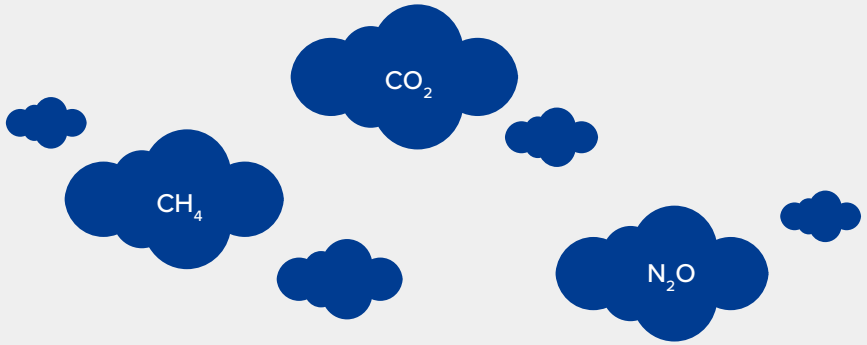
The global warming potential of GHGs

Each greenhouse gas has a different global warming impact, as some gases stay in the atmosphere for longer than others. GWP describes the radiative forcing impact (i.e. the degree of warming to the atmosphere) of different GHGs over a certain period of time. Carbon dioxide (CO_2) has a GWP of 1, so other GHGs are expressed relative to the impact of CO_2.

GWP was developed to allow comparisons of the global warming impacts of different gases. The higher the GWP, the more that a given gas warms the earth compared to CO_2 over that period.

For example, while methane (CH_4) stays in the atmosphere for approximately 12 years and nitrous oxide (N_2O) for around 109 years, CO_2 remains in the atmosphere for several thousand years. But even though CO_2 remains in the atmosphere for so much longer, measured over 100 years, CH_4 is 27.9 times more potent than CO_2 in causing global warming, while N_2O is 273 times more potent.

Depending on the activities of a business or along the value chain, many different GHGs can be emitted. They are measured in tonnes of carbon dioxide equivalents (CO_2e). By calculating their corporate carbon footprint, companies can analyse their impact on climate change. This is also an important step to derive reduction measures.



Greenhouse gas	Lifetime	Global warming potential over 100 years
Carbon dioxide (CO_2)	several thousand years	1
Methane (CH_4)	11.8 years	27.9
Nitrous oxide (N_2O)	109 years	273

GWPs of methane and nitrous oxide in reference to carbon dioxide

What are scope 1, 2, and 3 emissions?

The GHG Protocol Corporate Standard categorises GHG emissions associated with a company's CCF as scope 1, scope 2, and scope 3 emissions. However, this categorisation does not apply to the product carbon footprint (PCF), which describes the total amount of emissions generated by a product or a service over the different stages of its life cycle.

The concept of scopes comes from project management and refers to all the processes and resources needed to complete a project. According to the GHG Protocol, the main idea behind this categorisation is to "help delineate direct and indirect emission sources", while also ensuring that "two or more companies will not account for emissions in the same scope".

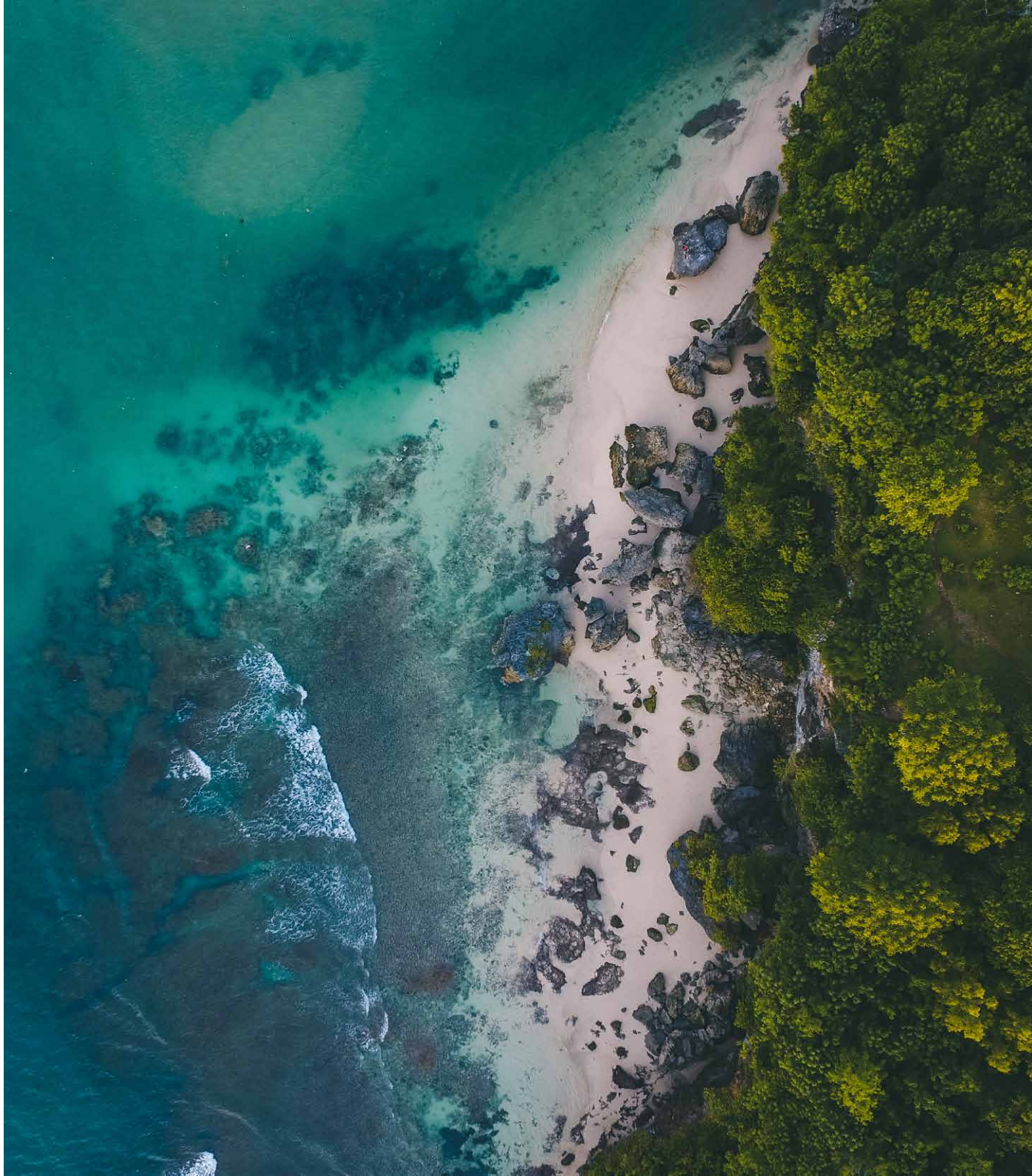
How to differentiate between scope 1, 2, and 3 emissions

Scope 1 emissions – direct emissions

Scope 1 emissions include direct emissions from a company's owned or controlled sources. This includes on-site energy, such as natural gas and fuel, refrigerants, and emissions from combustion in owned or controlled boilers and furnaces, as well as emissions from fleet vehicles (e.g. cars, vans, trucks, helicopters for hospitals).

Scope 1 emissions also encompass process emissions that are released during industrial processes and on-site manufacturing (e.g. factory fumes, chemicals).

Unlike the direct emissions that fall under scope 1, the GHG Protocol defines indirect emissions as "a consequence of the activities from the reporting company but occur at sources owned or controlled by another company." These include scope 2 and scope 3 emissions.



Scope 2 emissions – indirect emissions

According to the GHG Protocol, scope 2 emissions represent the largest source of global GHG emissions by accounting for at least a third of them. This means that assessing and measuring scope 2 emissions present a significant emissions reduction opportunity. But what do these emissions include?

Scope 2 emissions include indirect emissions from purchased or acquired energy, like electricity, steam, heat, or cooling, that is generated off-site and consumed by the reporting company. For example, electricity purchased from a utility company is generated offsite, so these are considered indirect emissions.

However, if the reporting company, such as an industrial facility, generates its own energy on-site from owned or controlled sources, the emissions associated with the energy generation are classified as direct scope 1 emissions. The same applies to companies like electricity utilities or suppliers that possess their own energy generation facilities and sell all their power into the local grid. The GHG emissions from these generation facilities are reported as scope 1 emissions.

In summary, scope 2 encompasses indirect emissions associated only with the generation of purchased or acquired energy. However, other upstream emissions associated with the production and processing of upstream fuels, or transmission and distribution of energy within a grid, are tracked in scope 3.

Scope 3 – indirect value chain emissions

Scope 3 includes all indirect emissions that occur in the value chain of a reporting company. To make a clear distinction between the scope 2 and scope 3 categories, the US Environmental Protection Agency (EPA) describes scope 3 emissions as “the result of activities from assets not owned or controlled by the reporting organization, but that the organization indirectly impacts in its value chain.”

Even though these emissions are out of the control of the reporting company, they can represent the largest portion of its GHG emissions inventory.

Overview of the scopes:

Emissions type	Scope	Definition	Examples
Direct emissions	**Scope 1**	Emissions from operations that are owned or controlled by the reporting company	Emissions from combustion in owned or controlled boilers, furnaces, vehicles, emissions from chemical production in owned or controlled process equipment
Indirect emissions	**Scope 2**	Emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting company	Use of purchased electricity, steam, heating, or cooling
	Scope 3	All indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions	Production of purchased products, transportation of purchased products, or use of sold products

Source: GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard, page 28

How to differentiate between the scope 3 emission categories

Based on the financial transactions of the reporting company, the GHG Protocol divides scope 3 emissions into upstream and downstream emissions and classifies them into 15 categories.

Upstream emissions

Upstream emissions encompass the indirect greenhouse gas emissions within a company's value chain related to purchased or acquired goods (tangible products) and services (intangible products) and generated from cradle to gate.

Upstream emissions are classified in eight categories:

1. Purchased goods & services
2. Capital goods
3. Fuel & energy related activities
4. Upstream transportation & distribution
5. Waste generated in operations
6. Business travel
7. Employee commuting
8. Upstream leased assets

Downstream emissions

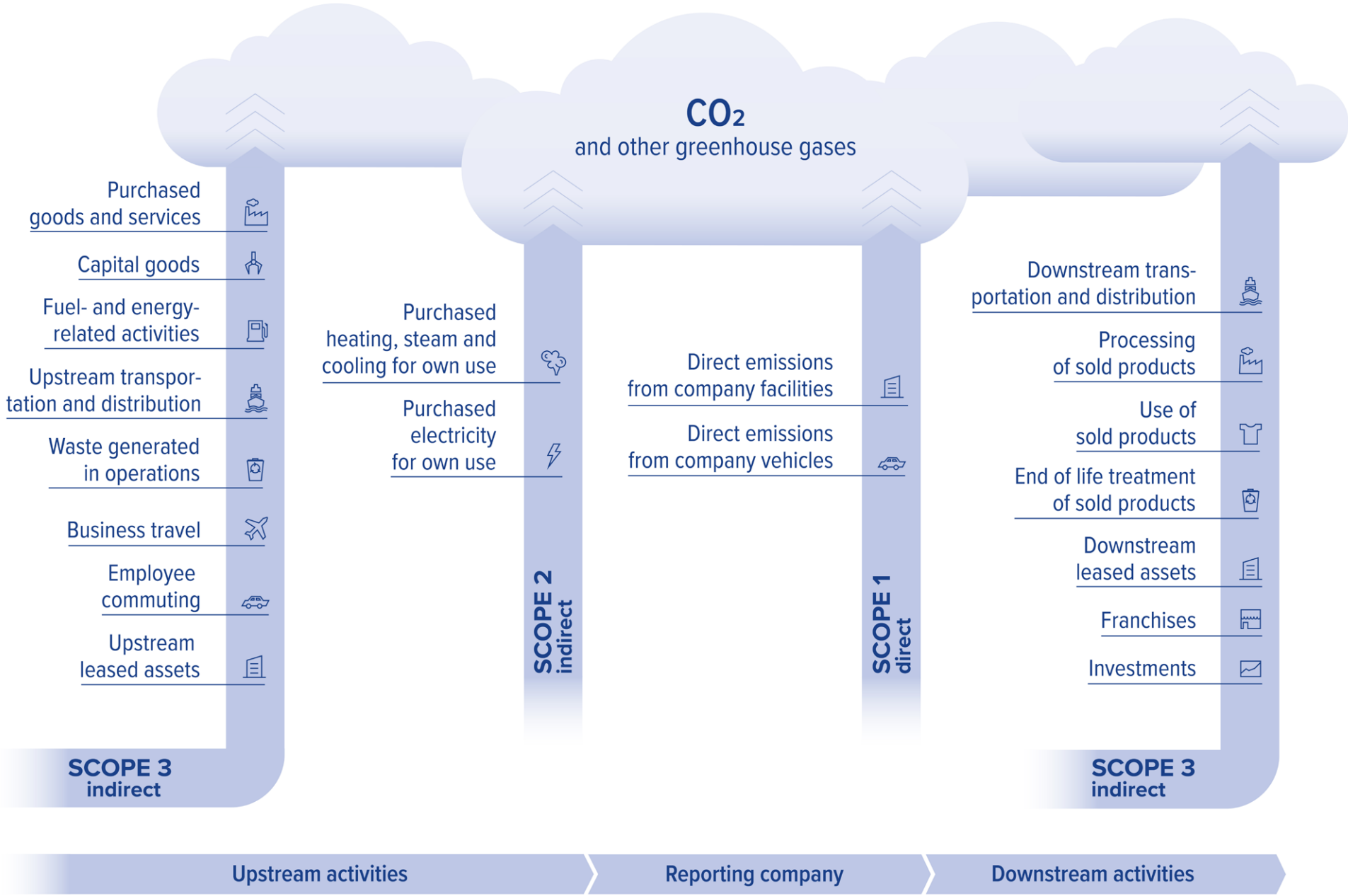
Downstream emissions include the indirect greenhouse emissions within a company's value chain related to sold goods and services and emitted after they leave the company's ownership or control.

Downstream emissions fall under seven categories:

9. Downstream transportation & distribution
10. Processing of sold products
11. Use of sold products
12. End of life treatment of sold products
13. Downstream leased assets
14. Franchises
15. Investments

Categories of scope 3 emissions based on the GHG Protocol Corporate Accounting and Reporting Standard

Not every scope 3 emission category will be relevant for every company, but knowing and understanding them is very useful to be able to set and put in place effective reduction strategies.



Scope 1, 2, and 3 emissions according to the GHG protocol

Scope 3 upstream emissions category	Description	Example
1. Purchased goods & services	This category includes all upstream cradle-to-gate emissions from the production of products and services purchased or acquired by a company.	• Extraction of raw materials • Manufacturing, production, and processing • Generation of electricity consumed by upstream activities • Disposal or treatment of waste generated by upstream activities • Transportation of materials and products between suppliers
2. Capital goods	This category includes all upstream cradle-to-gate emissions from the production of capital goods purchased or acquired by a company.	• Equipment, machinery, buildings, facilities, vehicles
3. Fuel & energy related Activities	This category includes emissions related to the production of fuels and energy purchased and consumed by a company that are not included in scope 1 or scope 2.	• Extraction, production, and transportation of fuels consumed by a company • Mining of coal, refining of gasoline, transmission and distribution of natural gas, production of biofuels
4. Upstream transportation & distribution	This category includes emissions from the transportation and distribution of products and services purchased or acquired by a company in vehicles and facilities that it does not own or operate.	• Air transport, rail transport, road transport, marine transport • Storage of purchased products in warehouses, distribution centers, and retail facilities
5. Waste generated in operations	This category includes emissions from third-party disposal and treatment of solid waste and wastewater that is generated in a company's owned or controlled operations.	• Disposal in a landfill • Recovery for recycling • Incineration • Composting • Waste-to-energy (WTE) or energy-from-waste (EfW) • Wastewater treatment
6. Business travel	This category includes emissions from the transportation of a company's employees for business-related activities in vehicles owned or operated by third parties.	• Aircraft, trains, buses, passenger cars
7. Employee commuting	This category includes emissions from the transportation of a company's employees between their homes and their worksites (in vehicles that are owned or operated by other companies).	• Automobile travel, bus travel, rail travel, air travel
8. Upstream leased assets	This category includes emissions from the operation of assets that are leased by a company and not already included in its scope 1 or scope 2 inventories.	• Leasing an office building

Scope 3 upstream emissions categories based on the Corporate Value Chain (Scope 3) Accounting and Reporting Standard of the GHG Protocol, page 36-49

Scope 3 downstream emissions category	Description	Example
9. Downstream transportation & distribution	This category includes emissions from transportation and distribution of a company's products that it sold to end consumers in vehicles and facilities not owned or controlled by this company.	• Storage of sold products in warehouses and distribution centers • Storage of sold products in retail facilities • Air transport, rail transport, road transport, marine transport
10. Processing of sold products	This category includes emissions from processing of sold intermediate products by third parties (e.g., manufacturers) subsequent to sale by a company. Intermediate products are products that require further processing, transformation, or inclusion in another product before use by the end consumer.	• Processing of agricultural or chemical products
11. Use of sold products	This category includes emissions from the use of goods and services sold by a company.	• Pots and pans require heating • Soaps and detergents require heated water
12. End of life treatment of sold products	This category includes emissions from the waste disposal and treatment of products sold by a company at the end of their life.	• Landfilling • Incineration
13. Downstream leased assets	This category includes emissions from the operation of assets that are owned by a company (acting as lessor) and leased to other companies that are not already included in scope 1 or scope 2.	–
14. Franchises	This category includes emissions from the operation of franchises not included in scope 1 or scope 2.	–
15. Investments	This category includes scope 3 emissions associated with a company's investments, that are not already included in scope 1 or scope 2. This category is applicable to investors and companies that provide financial services.	• Equity investments • Debt investments • Project finance • Managed investments and client services

Scope 3 downstream emissions categories based on the Corporate Value Chain (Scope 3) Accounting and Reporting Standard of the GHG Protocol, page 50-56

What the GHG Protocol requires companies to do

The GHG Protocol requires that companies account for and report all scope 1 and scope 2 emissions. However, accounting for scope 3 emissions is also part of an effective climate action strategy.

Identifying and accurately calculating GHG emissions, especially those that occur in the value chain and therefore out of a company's direct control, can be very challenging. It is often a complex and detailed task because of the numerous parties and processes involved.

ClimatePartner supports you with the calculation of carbon footprints, setting reduction targets, and reducing your scope 1, 2, and 3 emissions. Experienced climate action experts are available to advise you, and with the ClimatePartner Network Platform, you can collect and analyse data from your suppliers. Our solution ClimatePartner certified offers a new level in climate action, including mandatory reduction of emissions and transparent communication of your climate action engagement.

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