

Facts about carbon calculations

– what you should know about carbon footprint and LCA calculations

Climate change is caused by human activity, especially the burning of fossil fuels, emitting carbon dioxide (CO₂) and other greenhouse gases (GHGs) into the atmosphere. When mitigating climate change it is vital to know the burden each material is placing on the environment. Carbon footprint calculations and life cycle assessments (LCA) are widely used to demonstrate the carbon emissions and environmental impacts of a product. When evaluating the results it is important to know which parts of a product's total value chain are included in the calculation and which data can be compared.

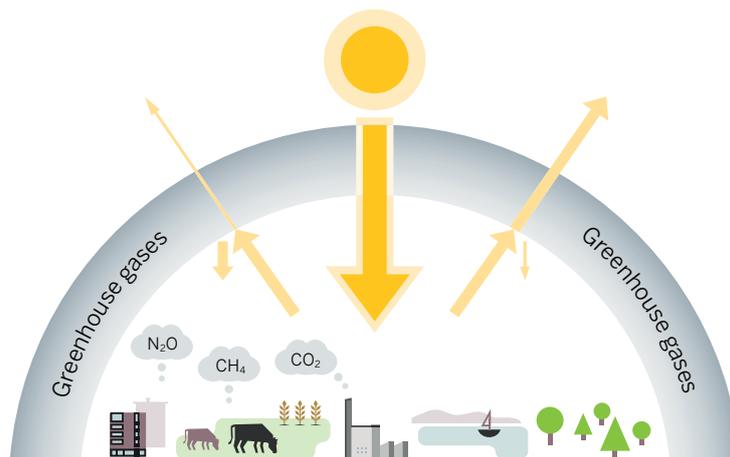
The ability of trees to absorb CO₂ makes forests an important carbon sink. Good forest management practices, including regeneration, play a key role in ensuring that forests grow more than they are harvested and therefore remain a carbon sink.

WHAT ARE GREENHOUSE GASES?

Greenhouse gases, or GHGs for short, are gaseous compounds that absorb infrared radiation, trap heat in the atmosphere and contribute to the greenhouse effect – in other words, the warming of the surface and lower

atmosphere of the planet caused by the conversion of solar radiation into heat. The main gases responsible for the greenhouse effect include carbon dioxide, methane, nitrous oxides and water vapour – which all occur naturally – and fluorinated gases, which are synthetic.

GREENHOUSE GASES FROM FOSSIL FUELS CAUSE GLOBAL WARMING



Solar radiation heats the Earth's surface and lower atmosphere, but some of this radiation is reflected back to space. Some of this heat is trapped by the greenhouse gases (CO₂, CH₄ and N₂O, for example) in the atmosphere,

warming the Earth and enabling life on the Earth.

The main cause of the increase in greenhouse gases in the atmosphere is the use of fossil fuels. This leads to extra heat being trapped, causing temperatures to rise.

WHAT IS A CARBON FOOTPRINT?

The amount of greenhouse gases emitted by something (such as a service or a product) during a given period is known as its carbon footprint. The carbon footprint takes into account all the life cycle stages of the finished product or service. These include all raw material and energy sourcing, upstream transportation and manufacturing as well as specified downstream activities such as product transportation, use and end-of-life treatment. It is good to bear in mind that calculation scopes can vary and the results are not necessarily comparable.

Carbon footprint, or global warming potential as it's sometimes termed, is one of the environmental impacts measured in a life cycle assessment.

WHAT IS A LIFE CYCLE ASSESSMENT?

A life cycle assessment (LCA), also known as a life cycle analysis, is a methodology for assessing the environmental impacts associated with all stages of the life cycle of a product, process or service. For instance, in the case of a product, environmental impacts are assessed from raw material extraction (cradle) and processing, through the product's manufacture (gate), distribution and use, to the recycling or final disposal of the materials it is made from (grave).

An LCA study involves a thorough inventory of the energy and materials that are required across the value chain of a product, process or service and calculation of their corresponding impacts on the environment as well as on human and ecosystem health. The categories that are evaluated include global warming potential, eutrophication potential, acidification potential, human toxicity and ecotoxicity. An LCA thus assesses cumulative potential impacts. The aim is to document and improve the overall environmental profile of the product, process or service. As with carbon footprint calculations, the scope of LCAs varies and the results are not always comparable.

Widely recognised procedures for conducting LCAs are included in the International Organisation for Standardisation (ISO) 14000 series of environmental management standards, in particular ISO 14040 and ISO 14044. ISO 14040 provides the principles and framework of the standard, while ISO 14044 provides an outline of the requirements and guidelines.

WHAT ARE SCIENCE-BASED TARGETS?

Science-based targets provide a clearly defined pathway for companies to reduce their GHG emissions, helping to prevent the worst impacts of climate change and enabling sustainable business growth.

Targets are considered science-based if they are in line with what the latest climate science deems necessary to meet the goals of the Paris Agreement: limiting global warming to well below 2°C above pre-industrial levels and pursuing efforts to limit warming to 1.5°C.

WHAT DO SCOPES 1, 2 AND 3 REFER TO?

- Scope 1 includes direct greenhouse gas emissions from a company's own operations
- Scope 2 includes indirect greenhouse gas emissions from the generation of purchased energy
- Scope 3 includes indirect greenhouse gas emissions from the value chain
- CO₂ emissions arising from biogenic sources (i.e., biomass combustion) are reported independently from the scopes.

When setting science-based targets for a company's emission-reduction efforts, the reduction targets should be set for all three scopes – i.e., scopes 1, 2 and 3 – if scope 3 emissions are 40% or more of the company's total emissions.

WHAT IS RENEWABLE AND NON-RENEWABLE ENERGY?

Fossil-free energy		Fossil-based energy	
Renewable energy		Non-renewable energy	
Bio-based energy (biomass)	Renewable energy from other sources (solar, wind, hydro)	Nuclear power	Fossil fuels (e.g., oil, coal, natural gas, peat)

"It is important to know the scope of the assessment and what results can be compared."

What should we keep in mind when comparing the results of carbon footprint or LCA calculations for packaging?

- The scope and methodology
- The material
- The type of energy used to manufacture the material
- The weight of the material