Facts about carbon footprint

– what you should know about carbon footprint and life cycle assessments

Climate change is caused by human activity, especially the burning of fossil fuels, emitting carbon dioxide (CO_2) 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 footprints and life cycle assessments (LCA) are widely used to demonstrate climate and other environmental impacts associated with a product or service. When interpreting the results it is important to know which parts of a product's total value chain have been included in the assessment, based on which methodology and under which assumptions.

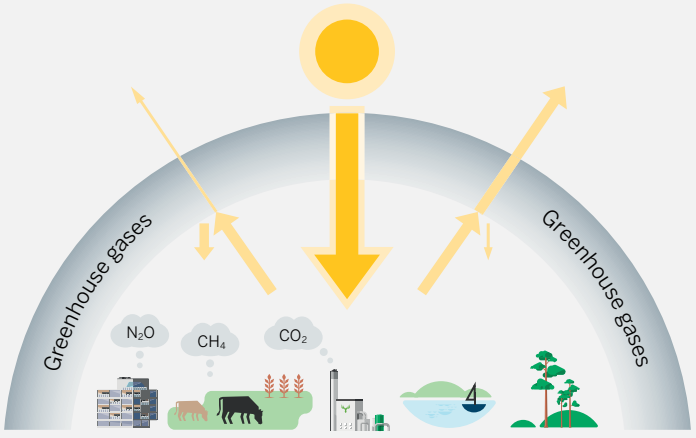
WHAT ARE GREENHOUSE GASES?

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. 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 (CO_2, CH_4 and N_2O, 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. The ability of trees to absorb CO_2 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.

GREENHOUSE GASES FROM FOSSIL FUELS CAUSE GLOBAL WARMING

When wood is used sustainably to create various products the amount of carbon in the atmosphere does not increase as there is always new tree growth to compensate for the release of biogenic carbon at the end-of-life of bio-based product.



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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 starts with a goal and scope definition. This phase is important step that sets the scene for everything that follows. In goal and scope phase description on the objectives of the study (why), production unit(s) that will be assessed (what) and methodologies applied (how) are disclosed.

The next steps involve 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. Impact categories such as are often included global warming potential, eutrophication potential, acidification potential, human toxicity and ecotoxicity.

The term 'potential' highlights that in an LCA results are not reported as emissions but as potential impacts to environment due to those emissions based on their relative contribution. The aim is to document and often compare the overall environmental profile of the product, process or service. Special care is required when making comparative claims based on an LCA. In addition to thorough description of the study a third-party critical review is required.

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 IS A CARBON FOOTPRINT?

Carbon footprint, climate change or global warming potential, is one of the environmental impacts measured in a life cycle assessment. Carbon footprint can be calculated for a product or for a company as a whole. Total carbon footprint can be broken down into three distinct sub-categories and then represented as a total of these three. The sub-categories are fossil, biogenic and LULUC (Land Use and Land-Use Change). Depending on the applied methodology biogenic impacts can either include or exclude biogenic carbon dioxide.

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.

WHAT DO SCOPES 1, 2 AND 3 REFER TO?

Breakdown of greenhouse gas emissions into three scopes is a widely adopted concept introduced by GHG Protocol. Reporting a carbon footprint by each scope is especially aimed for corporate/company level reporting.

- 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 (both upstream and downstream)
- CO_2 emissions arising from biogenic sources (i.e., biomass combustion) are reported independently from the scopes.

WHAT IS RENEWABLE AND NON-RENEWABLE ENERGY?

The type of energy used play a determining part in a carbon footprint. Renewable energy is either non-fuel based such as hydro or wind or fuel based such as sustainable biomass. Non-renewable, but fossil free energy is something that does not replenish but also does not contribute to the accumulation of carbon in the atmosphere.

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

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
- Whether carbon footprint is reduced within products own value chain or by separate purchase of offsets that happen outside of products own value chain.