

# CARBON FOOTPRINT - what it is and how to measure it

## Executive Summary

Climate change is of high global concern, driving growing demand for Carbon footprint information. This leaflet is designed to help your organisation getting started to address this topic. It provides an efficient and effective approach, building on international standards and data harmonisation activities. Further information and data sources as well as links to service providers are included.

We also recommend to maximise your benefits of Carbon footprint work, “getting the most out of it” and avoid shifting burdens to other types of environmental impacts. With limited extra effort you can provide your customers and other stakeholders with broader life cycle information related to your goods and services and “get ready”, anticipating upcoming demands in the context of “Sustainable Consumption and Production”, being a core commitment of the European Commission and in many other countries. For internal purposes you can already benefit from identifying hot-spots, better steer your continuous improvement process, better understand supply-chain implications, and better manage potential risks. This can all be achieved using existing, well-established approaches.

## What is a Carbon footprint?

**Carbon footprint (CF)** – also named Carbon profile - **is the overall amount of carbon dioxide (CO<sub>2</sub>) and other greenhouse gas (GHG) emissions (e.g. methane, laughing gas, etc.) associated with a product<sup>1</sup>** along its supply-chain, use and end-of-life recovery and disposal. These emissions are caused, among others, by electricity production in power plants, heating with fossil fuels, transport operations, and other industrial and agricultural processes.

The Carbon footprint is quantified using indicators such as the Global Warming Potential (GWP). The Intergovernmental Panel on Climate Change (IPCC)<sup>2</sup> defines the GWP as an indicator that reflects the potential relative climate change effect per kg of a greenhouse gas over a fixed time period, such as e.g. 100 years (GWP<sub>100</sub>).

The GWPs for different emissions (see Table 1) can then be added up to give one single indicator that expresses the overall climate change impact of the product over its life cycle.

## How can I measure the carbon footprint of my product?

Perform a (limited) Life Cycle Assessment! The Carbon footprint is a sub-set of the data covered by a more complete Life Cycle Assessment (LCA). LCA is an internationally

standardized method (ISO 14040, ISO 14044)<sup>3</sup> for the evaluation of the environmental impacts and resources consumed along the life cycle of products; from the extraction of raw materials, the manufacture of goods, their use by final consumers or for the provision of a service, to recycling, energy recovery, and disposal of remaining waste.

One of the key impact categories considered in an LCA is Climate change, generally using the already named IPCC characterization factors. Hence, **a Carbon footprint is a Life Cycle Assessment with the analysis limited to emissions that have an effect on Climate change.**

**Table 1: Global Warming Potentials (GWP<sub>100</sub>) of main greenhouse gases (IPCC, 2007)**

Species	Chemical formula	GWP <sub>100</sub>
Carbon dioxide	CO <sub>2</sub>	1
Methane	CH <sub>4</sub>	25
Nitrous oxide	N <sub>2</sub> O	298
HFCs	-	124 - 14800
Sulphur hexafluoride	SF <sub>6</sub>	22800
PFCs	-	7390 - 12200

Suitable background data sources for the Carbon footprint are therefore the life cycle inventory data sets of existing LCA databases. These data sets cover average LCA data of the goods and services that you may purchase, as well as of many of the underlying

<sup>1</sup> ISO 14040 defines the term “product” as both “goods” (e.g. consumer goods, intermediate goods) and “services” (even complex services like events, conferences and exhibitions).

<sup>2</sup> [www.ipcc.ch](http://www.ipcc.ch)

<sup>3</sup> ISO 14040:2006 Environmental Management – Life Cycle Assessment – Principles and Framework. ISO 14044:2006 Environmental Management – Life Cycle Assessment – Requirements and Guidelines.

materials, energy sources, transport and other services. Producer-specific LCA data sets are documented in Environmental Product Declarations, compliant with ISO 14025 (and thereby also ISO 14040 and 14044).

### **Why the evaluation must be broadened to avoid misleading results and wrong decisions?**

Although building upon a life cycle approach, Carbon footprints address only impacts on Climate change. When exclusively Carbon footprint data are used to support procurement decisions or to improve goods and services, other important environmental impacts are neglected. These run often opposite to climate change, resulting in a "shifting of burdens". **Achieving sustainable consumption and production requires the consideration and evaluation of all relevant environmental impacts** simultaneously, such as e.g. acid rain, summer smog, eutrophication, cancer effects, and land use. This can only be ensured by the more complete Life Cycle Assessment.

If organizations are now collecting Carbon footprint data, then it makes sense to evaluate also relevant non-greenhouse gas emissions (e.g. NO<sub>x</sub>, particles, SO<sub>2</sub>). The in-house effort is only slightly higher and same background data sources will be used.

### **Are there standards or guidelines to perform carbon footprint calculations?**

The international standards **ISO 14040 and 14044 provide robust and practice-proven requirements for performing transparent and accepted Carbon footprint calculations**. Over the past 15 years, a wide consensus on product Climate change evaluations in this life cycle context has been built up in the scientific community and has successfully been applied by many leading companies in all sectors.

ISO standards also support specific communication needs on climate change topics. The ISO type I Eco-labels and type III Environmental Product Declarations (EPD) are the best reference framework for third party verified claims on carbon performance of products. We note here the importance of critical third-party reviews to help ensure problems do not arise later.

In a policy context, life cycle based information is being used for knowledge-based decision making in the context of Sustainable Consumption and Production, globally. Given a growing number of Carbon footprint programs and many LCA applications, but the lack of

global agreements, the **International Reference Life Cycle Data System (ILCD)** is under development. In cooperation among participating national governmental LCA projects and in global consultation, the ILCD Handbook provides guidance on recommended LCA practice. It is in line with the named international standards and is aiming at better reproducibility and quality-assurance.

The objective of the related **ILCD Data Network** is to facilitate the availability of high quality and consistent life cycle based data, studies, and claims. This network is scheduled to start by mid of 2009. It is open for all data providers to join and give access to their data, for free or for fee, as long as the data is in-line with the named ISO standards and the ILCD Handbook. The ILCD System is currently hosted at <http://lca.jrc.ec.europa.eu>.

### **Where do I get professional help, data and further information?**

There are many available resources of data, software tools, and consulting services on Life cycle assessment and Carbon footprints, either for a fee or free of charge. The independent LCA Resources Directory characterises such resources on a global basis: <http://lca.jrc.ec.europa.eu/lcainfohub/directory.vm>

The European Commission is developing via its JRC-IES further recommended guidance documents with European scope, reference life cycle data for commonly used materials, energy sources, and services, as well as recommended impact factors for not only Climate change but also other impacts along the life cycle. Visit the European Platform on LCA website.

---

#### **Contact:**

European Platform on Life Cycle Assessment  
European Commission – Joint Research Centre  
Institute for Environment and Sustainability  
TP 460; Via E. Fermi 2749; I-21027 Ispra (VA), Italy

Fax: +39 0332 78-5601

Email [lca@jrc.it](mailto:lca@jrc.it)

<http://lca.jrc.ec.europa.eu/>

You can also pose your questions on the LCT forum:

<http://lca.jrc.ec.europa.eu/EPLCA/mailing.htm>

#### *Disclaimer:*

*Views expressed are those of the individual and do not necessarily represent official views of the European Commission.*

*Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of this publication.*

© 2009, European Commission