



THOUGHTS ON A “CARBON FOOTPRINT”

Carbon Footprints are very topical at the moment. A Carbon Footprint is a Life Cycle Assessment (LCA) with the analysis limited to emissions that have an effect on climate change and is a method of illustrating humanity’s impact on the earth. It is a simple, yet graphic measure of the resources consumed and the wastes produced by a given system under prevailing technology. A Carbon Footprint can include direct and indirect emissions eg the Kyoto reporting of Greenhouse Gases (GHG) is based on direct emissions only. In many cases indirect emissions contribute much more than the direct emissions. A Lifecycle approach is essential for measuring the true GHG emissions of human activities.

A Life Cycle Assessment is an internationally standardized method (ISO 14040, ISO 14044) for the evaluation of the total environmental burdens 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, recycling, energy recovery and ultimate disposal. The Carbon Footprint is merely a sub-set of the data covered by a more complete LCA.

Are there standards or guidelines to perform Carbon Footprint calculations?

There are many conversion factors generated using non-standard Carbon Footprint methodologies and boundaries. It is the variability amongst those footprint analyses that drives the need for a standard for industry and other practitioners.

Over the past ten years, a wide consensus on climate change evaluations in a life cycle context has been built up within the scientific community and this has been successfully applied in many sectors. The Carbon Footprint is growing in demand and is being used for decision making to attempt to manage sustainable consumption and production. ISO standards support specific needs on climate change topics. ISO 14040-14044 provide robust and proven requirements for performing transparent and accepted Life Cycle Assessment calculations.

Critically, ISO-Type I Eco-labels and Type III Environmental Product Declarations (EPDs) are the best, although not always the preferred, reference framework for third-party verified claims on the environmental performance of products. EPDs are ISO standards that can be used with confidence by all parties.

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 whilst often running in opposition to climate change. If organisations are developing Carbon Footprint data it makes sense to evaluate the relevant non-greenhouse gas emissions (e.g. NO_x, particles, SO₂) along the product supply chain or even throughout the full life cycle. The in-house cost and effort is slightly higher but the same background data sources will be used. Achieving sustainable consumption and production requires the consideration and evaluation of all relevant environmental impacts at the same time, such as eg acid rain, summer smog, and land use. This can only be ensured by using the more complete EPDs or a full Life Cycle Assessment.

In considering a product’s effect the following factors could be included. How long does a product last, ie material A lasts 40 years but material B lasts 20 years? Is there any waste? How much production waste is produced? What happens to that waste? Are there



maintenance issues? Is re-work required, or does the product require regular maintenance throughout its lifespan?

Finally, and most importantly, a company MUST assess materials on an application basis as a per kg measurement is not a fair comparison.

In the table of recently published data (below), there are a number of points to reference. The Ice Cream data does not add up to 100%. Where is the retail data for the Crisps? Why is the packaging energy so different when the primary packaging for Ice Cream weighs more than that for Crisps (although there will be a compensating saving on secondary and transport packaging)? It seems we are examining apples and pears. An EPD will answer these questions and will provide an objective, peer reviewed comparison of both systems as apples and apples.

Examples of Published Carbon Footprints

	Ice Cream	Potato Crisps
Raw Materials	33%	44%
Manufacture	2%	30%
Packaging	6%	15%
Distribution	4%	9%
Retail	46%	
Home Use	6%	
Disposal of Empty Packs		2%

Given the above, why would a company carry out any kind of environmental audit? Is there any value? In 2004 The Climate Group carried out a study of 5 major international companies undertaking active greenhouse gas reduction policies and found they had attained a total of €6bn in cost savings. The flipside, for those who do not see the need, was illustrated by Metroeconomica in 2006: "There is a small but positive correlation between environmental and financial performance, and markets punish bad environmental performance."

In understanding that the measure Carbon Footprint is not the most appropriate measure to use, what contribution does packaging make to our Carbon Footprint? We have taken reported data at a high level.

Carbon Footprint of different activities and sectors - energy, industry, transport, agriculture/food	
Energy/Energy Supply	26%
Transport	3%
Residential & Commercial Buildings	8%
Industry	20%
Agriculture	14%
Forestry	17%
Waste & Waste Water	3%
Other	9%



Then we looked at Carbon Footprints for industry

Carbon Footprint – direct CO₂ emissions for industry	
Other	29%
Iron & Steel	26%
Chemicals & Petrochemicals	20%
Non Ferrous Metals	2%
Non Metallic Minerals	23%

Plastics consume ~4% of Petrochemicals (which account for ~20% of industry emissions) and packaging uses ~ 37% of plastics so we can calculate a worst case scenario of a Packaging Carbon Footprint of only 0.06% of the whole industry emissions. This sounds fine but is a totally meaningless figure and does not reflect any real effect on the environment.

It seems we are trying to reificate - that is, we are translating a complex set of phenomenon into a single entity such as a number. 0.06% is the wrong answer and on a par with the Douglas Adams¹ 42!

In continuing in the mood of reification we looked at biofuel Carbon Footprints.

Carbon Footprint – Lifecycle comparison of different fuels	
Source	CO₂ equivalents (gm/mJ)
Petrol	84
Bioethanol	
Wheat	78
Sugarbeet	50
Sugar Cane	20
Biomass Waste	8
Maize	126
Biodiesel	
Rape	78
Soy	58

It seems as though petrochemical derived feedstock has a lower Carbon Footprint than that for maize derived feedstocks. Are the traditional plastics better for the environment than Bioplastics based on maize? Only an independent EPD can answer the question with certainty. An independent study that Petcore would like to see initiated sooner rather than later

In conclusion we believe that as populations and their expectations grow Environmental Protection Policy is becoming “bigger” relative to the economy and consequently seen to become more of a problem. The Carbon Footprint, a partial measure, is the blunt tool that is used to justify very broad ranging agendas to change behaviour. Unfortunately these agendas often seem to be about existing political priorities – ie not the outcomes of ‘science’. Perhaps the use of EPDs will drive political ideas in the right direction.

We have to rely on learning – reducing uncertainty over time – and flexibility. (Reverend Bayes (1702-1761)).

¹ The Hitchhiker’s Guide to the Galaxy