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EDITORIAL

Carbon footprinting—opportunities and threats

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1 Background

There are surprisingly many people out there that obviously think that carbon footprinting is a new thing. They obviously are not aware of the fact that it has been around for decades—just being called differently, i.e. the result of the life cycle impact category indicator global warming potential (GWP). However, carbon footprinting (CFP) is really fashionable these days. Like with all fashion, not all that glitters is gold.

Taking carbon footprinting as the one and only yardstick, one has to face life-threatening trade-offs. If carbon footprint is the way to go, we need to shut down each waste-water treatment plant in the world, because it leads to an increased carbon footprint. You should also tear out the catalytic converter and diesel particulate filters from cars, because they lead to a higher CFP. Nuclear power would be obviously a most preferable energy generation option, because it has a lower carbon footprint than even most renewable energy sources—at least based on information provided by pertinent EPDs (Vattenfall 2005; 2007a, b). Recycling paper should be stopped, because compared to virgin paper with a carbon footprint close to 'zero', it comes with a higher burden—unless renewable energy is used for the processes necessary (Carbon Trust 2006).

But, on the other hand, we have the market demand. Whether it is real or just perceived or just desired seems not so important. There is enough momentum for numerous international, national and sectoral initiatives underway to deal with CFP:

- ISO started developing an international standard ISO 14067 on Carbon Footprint of Products (Part 1: Quantification, Part 2: Communication) and there is already a proposal for a standard on Carbon Footprint of Organisations.
- The World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI) develop two standards under their Greenhouse Gas Protocol Product/Supply Chain Initiative: A Product Life Cycle Accounting and Reporting Standard and a Corporate Accounting and Reporting Standard: Guidelines for Value Chain (Scope 3) Accounting and Reporting.
- The UNEP/SETAC Life Cycle Initiative launched a project group on carbon footprinting.
- The British Standards Institution published a Publicly Available Specification (PAS) to specify requirements for assessing the life cycle greenhouse gas emissions (GHG) of goods and services. The development of this PAS was co-sponsored by the Carbon Trust and the Department for Environment, Food and Rural Affairs (PAS 2050 2008).
- The Japanese Ministry of Economy, Trade and Industry (METI) launched a carbon footprint trial project and a Technical Specification "General principles for the assessment and labelling of Carbon Footprint of Products" will be issued shortly.
- and many more like, e.g., the Korean Product Based Reduction Scheme, the European Commission Project on "carbon footprint measurement toolkit" for the European Union Ecolabel, the potential carbon products footprint software developed by Bilan Carbone

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(ADEME, France), the methodology project of the German Ministry of Environment or the carbon footprint methodology of the New Zealand Ministry of Agriculture and Forestry.

All these initiatives try to serve an increasing market demand for 'climate relevant' information along supply chains and towards consumers. From an application and communication side, there are numerous questions and issues to deal with. However, whether a certain number of CO_2 equivalents on the packaging of a food product make sense or not, whether the term 'footprint' has any meaning or not or why it is a footprint and not a fingerprint—all these questions are outside the scope of this journal. But the potential communication to consumers raises many issues with regard to quantification as well.

2 Scientific relevance and challenges

Digging a bit deeper into contents, there are several interesting aspects of carbon footprinting—some of them even very scientific in nature. Some core questions and challenges that were raised in the recent meeting of the ISO Working Group dealing with the standardisation of the quantification included the following issues:

- Scope of emissions
  Shall all GHGs specified by IPCC 2007 or only the six GHG gases of Kyoto Protocol be considered?
- Life cycle stages
  While a general understanding is that CFP should relate to the life cycle using process-based data, the inclusion of the use phase might be controversial between business-to-business and business-to-consumer perspectives. If included, how can use phase profiles be defined in a meaningful way?
- System boundaries
  How to specify cut-off criteria? Materiality threshold or GHG threshold? How to deal with employees transport? Time boundaries can be challenging as well, especially for agricultural products.
- Offsetting
  Shall offsetting be included in the calculation or not? Is the use of renewable energy a type of offsetting or not?
- Data
  Even though there was broad agreement to use process-based data linked to technical processes, not data linked to money flows, there are still fundamental issues: Which data sources? Share of primary activity data and secondary data? Are any operational data quality requirements possible?
- Allocation
  Is there any progress or further specification possible compared to the existing ISO 14040 procedures? For system expansion, how can the identification of an avoided product system be qualified?
- End-of-life
  How to define end-of-life scenarios? Recycled content approach on the product level or average recycled content on the material level?
- Carbon storage
  How to deal with carbon storage, carbon capture, carbon sequestration?
- Land use change
  Shall emissions arising from direct land use change be included or not? Shall changes in soil carbon (source or sink) be included or not?
- Capital goods
  How to deal with capital goods?
- Renewable electricity and electricity mix
  Shall the grid-average carbon intensity be used and, if so, what is the grid? Shall renewable energy be treated as part of the grid or shall there be specific benefits if it is used in a specific supply chain?

Looking at this non-exclusive list of methodological issues reveals a very valuable aspect of the carbon footprint discussions and standardisation activities: the sobering recognition of very down-to-earth, basic scientific challenges for our community which have been getting a bit out of sight over the years. While most scientific attention was recently focussed on pushing impact assessment further, by e.g. finding ways to calculate how many years of life I may lose—depending on someone's assumptions on my quality of life—based on a certain amount of emissions at ONE virtual point of time and ONE virtual place, we now face the challenge that calculating a meaningful inventory result is not really solved—even for the probably easiest class of substances like greenhouse gases.

The scientific LCA community has been somehow escaping those fundamental challenges of how to define a system, how to treat allocation, how to deal with data, how to deal with recycling, etc. Nowadays, we may pretend to know how many life-years humankind is losing because of malaria resulting from a certain amount of GHG emissions, but there are still scientifically unresolved issues, how much GHG emissions we can actually attribute to a certain product. It is a bit like flying to Mars before having invented the wheel (at least one that is more or less circular in shape).

By saying this, I do not want to devalue by any means the excellent efforts underway to improve impact assessment. However, I do want to raise the awareness that there are still just as many challenges as far as the inventory and

interpretation phases of LCA are concerned. Everybody using LCA for actual real life decision making and not just 'LCA projects', is well aware of that and this should be more clearly reflected in the allocation of LCA research efforts. In that sense, carbon footprinting may have—despite a limited scope—the added value to bring back a bit more attention to open issues in those phases of LCA that have been somewhat unattended and underrated by the scientific mainstream in recent years.

3 How to deal with the issue in Int J Life Cycle Assess? "Love it, leave it or change it"?

From the perspective of the one and only scientific journal entirely devoted to LCA there are fairly obvious pros and cons to deal with the issue. The opportunity given concerns increased market relevance, and the threat lies in the monophthalmia of this 'castrated type' of LCA called CFP. Some LCA purists might not want to see CFP in this journal because it is per se in conflict with the principle of comprehensiveness which requires the consideration of all attributes or aspects of natural environment, human health and resources and, by doing so, allows the identification and assessment of potential trade-offs (Finkbeiner et al. 2006). On the other hand, CFP offers the potential to get life cycle approaches into organisations and decision making contexts which pure LCA did not reach yet. It may offer the opportunity to increase the audience and relevance of our community and its journal.

In a previous editorial of this journal, the LCA Steering Committee of the Society of Environmental Toxicology and Chemistry Europe acknowledged the importance of simplified and practical methods if a large number of products are to be assessed in a short time frame. But also concerns were raised that oversimplified methods may misguide stakeholders on the environmental implications of products and services and thereby lead to counterproductive results for the environment (SETAC 2008).

All these pros and cons have been discussed at last year's editorial board meeting in Heidelberg. Reading this editorial and the announcement of a new section of the journal on carbon footprinting tells you that the decision was that we have to address it.

Being rather critical towards the issue myself, one reason to accept the role as section editor is that I want to contribute to a balanced share of papers that address rather positive and rather critical aspects of CFP. Referring to the limited scope, but possibly broader outreach of carbon footprinting, I definitely want to make sure that this section does not end as the 'tabloid section' of the journal.

Anyway, I assume that most readers of this journal agree that we cannot allow all the other environmental interventions to be brushed under the carpet. However, among the blind the one-eyed is king. In that sense, the challenge of the LCA community is threefold:

- Willingness to accept that CFP can be a meaningful tool for mitigating global warming.
- Achievement of contributions to solve those methodological problems indicated above. If we prove that we are the ones that can help there, our concerns are taken seriously rather than being perceived as the moaning of a group of academics not facing realities.
- Success as eye-opener that climate change is not the only problem we have and that CFP is not in all cases the right proxy to support sustainable production and consumption.

Love it, leave it or change it? In my view, CFP is too bad to love it, but too good to leave it. Therefore, let's change it.

4 Call for papers in this new section on carbon footprinting

With the opening of this new section on carbon footprinting, we invite Research Articles, Short Original Communications, Review Articles, Commentaries and Discussion Articles on all aspects relating to this topic. Relevant topics include:

- Introduction and discussion of standards and guidelines for carbon footprinting.
- Application and case studies of carbon footprinting including examples that show the trade-offs with other environmental aspects.
- Contributions to the methodological challenges for carbon footprinting.
- Relation between LCA and carbon footprinting.

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