Carbon footprint, GHG reports and other strategic uses of comprehensive screening methods

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Why new methods

The last few years have seen the development of several standardized protocols for accounting of CO_2 and other greenhouse gas (GHG) emissions. While these standards offer valuable guidance to business, they carry significant weaknesses when used to identify cost-effective mitigation measures. A recent report estimates that the narrow scope of current protocols leads to results on average potentially overlooking up to 75% of total emissions when including supply-chain activities[1]. These may be included in GHG accounts by use of screening methods that require little additional effort.

Limited protocol scope

The most popular guideline document for GHG accounting is the protocol issued by World Resources Institute and the World Business Council for Sustainable Development[2]. The GHG protocol focuses mainly on emissions originating from processes within company ownership, termed *direct* emissions by the protocol. Additionally, the protocol requires estimation of emission from processes supplying energy to company activities, such as electricity and heat. Emissions occurring from activities not within company control are termed *indirect* emissions. These may be separated as *energy-indirect*, which include emissions caused by energy and transport services, and *other indirect emissions*. The other indirect emissions are those that occur from production of materials and other services that feed into the supply chain.

A problematic issue with the protocol is its strict focus on direct emissions, and the indirect emissions from energy and transport services. Current developments in GHG policy discussions move towards use of more comprehensive carbon (or climate) footprint studies[3, 4]. Carbon footprint studies include the normal protocol emissions, but put equal emphasis on emissions previously termed *other indirect*.

Possible approaches

There are two main approaches for making comprehensive GHG footprint studies: bottom-up using process data in life-cycle assessment (LCA), and top-down using national economical statistics and company spending accounts in environmental input-output analysis (IOA)[4]. The latter has been proposed as a screening approach for GHG accounting [1], and generally is much less time-consuming. Investigating the importance of supply-chain emissions for typical US industries through IOA, Matthews and colleagues found that only 14% of emissions were related to internal activities, and on average up to 75% of total emissions were overlooked by the scope that is outlined in protocol approaches and used in most company reports[1]. In a screening study for clothing's retailer, the largest contribution to GHG emissions per kg clothing was found to be the production of fabrics[5]. Clearly this means that large potentials for mitigation are overlooked, ending in less cost-efficient mitigation measures.

Life-cycle assessment aims at quantifying total aggregated emissions for the production, use and disposal of products and services. Life-cycle assessment is well established within the private sectors, e.g., in environmental product declarations (EPD). It relies on use of formalized procedures and combines process information (emissions, material use etc) with database information (emissions from materials production, generic emissions data for transport, energy etc). An alternative approach is offered by input-output analysis, which uses national statistics for to represent the exchange of services between sectors of the economy. In combination with emission statistics and linear mathematical modeling, input-output analysis estimates total emissions induced by making monetary purchases in the economy. A significant difference between LCA and IOA is that while LCA relies on physical flows, IOA is based on monetary flows. However, recent developments combine the two methods in an approach termed hybrid-LCA[5].

Supplement, not competition

Documents have been established in the UK with relevance for most industries, requiring that emissions induced by procurement be included in carbon footprint studies[6]. Proposed methods include a combination of top-down and bottom-up approaches, called hybrid-LCA. In practice this means that financial and physical accounts are combined to make GHG emission estimates. The use of monetary information stored in financial reports makes it easier to include supply-emissions, while letting more familiar processes remain in physical units (e.g., energy, fuels, etc) ensures precision and allows results still to be comparable to those reported purely by use of the GHG protocol approach.

Supplementing the familiar GHG protocol reports with the more comprehensive indications offered by IOA and hybrid-LCA adds significant value. It offers the possibility to identify important, previously overlooked, contributions to total emissions, thereby opening for more cost-efficient mitigation measures. Results may be used to expand the reporting scope while still using the GHG protocol as a basis. It is therefore not a contrast to the current protocol scheme, rather it is a necessary supplement to an otherwise limited assessment scope.

Strategic reasons

There are sound economic reasons why companies may want to investigate the environmental profile of their supply chains. Emissions left out of current management structures may be included in future international policy tools, e.g., by covering countries currently outside the Kyoto protocol regime. Knowledge of supply chain CO2-emissions thereby offer valuable insights to financial risks posed by policy changes.

Moreover, the recent shifts in commodity markets (i.e., biofuel production) and consumption patterns (increase in international oil and coal use) have showed the sensitivity of energy and energy-intensive commodities to changes in the oil price. A company that is familiar with the supply chain sensitivity to energy is better placed to predict developments in procurement costs and potential market possibilities arising from changes in energy prices. One example of such applications have shown that if India and China were to participate in Kyoto-like limitations in national emissions, electricity prices in these regions are likely to increase by 50 % [7]. A company would be well advised to be aware of their sensitivity to such future scenarios.

Energy and CO_2 are the two most prominent examples where we see financial repercussions from global resource competition. Other relevant issues include land-use and future material constraints in metals, organic materials (cotton, wood, chemical constituents). A pressing issue with potential large health consequences is the global competition for water sources, where in some regions we already see that industry is putting pressure on the public availability of water. These are some examples were companies see the benefit from aligning their own supply chain activities with the expected developments in resource availability and procurement costs. The first step of such a process is to map the flow of resources in and out of their own supply chain.

The aspects that we discuss here are all well covered by methods in LCA and IOA. We have the models available today, and are eager to put them to use in various strategic applications.

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[1] Matthews HS, Hendrickson CT, Weber CL, 2008: The importance of carbon footprint estimation boundaries. *Environmental Science and Technology* **42**(16): 5839-5842

[2] World Resources Institute and the World Business Council for Sustainable Development: T*he Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard.* www.ghgprotocol.org
A similar approach is outlined in the ISO standard for GHG accounting:
ISO 14064-1:2006: *Greenhouse Gases – Part 1: Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals*.

[3] Wiedmann T, Minx J, 2007: *A definition of carbon footprint*. ISA Research Report 07-01. Integrated Sustainability Analysis, Durham UK. www.isa-research.co.uk

[4] Minx J, Wiedmann T, Barrett J, Suh S, 2007: *Methods review to support the PAS process for the calculation of the greenhouse gas emissions embodied in good and services*, Report to the UK Department for Environment, Food and Rural Affairs by Stockholm Environment Institute at the University of York and Department for Biobased Products at the University of Minnesota, DEFRA, London, UK.

[5] GHG accounts for Norwegian retailer Stormberg:
http://www.stormberg.no/PageFiles/12393/Klimarapport%20endelig%20140408.pdf

[6] PAS 2050: Assessing the life cycle greenhouse gas emissions of goods and services. See web: http://www.bsi-global.com/en/Standards-and-Publications/How-we-can-help-you/Professional-Standards-Service/PAS-2050/

[7] Trucost Research Note, Manufacturers: Profits at risk from carbon costs. July 2008. http://www.trucost.com/