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Calculating emissions along supply chains — Towards the global methodological harmonisation

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ABSTRACT

In order to keep climate change on a manageable level, countries across the globe are expected to control and reduce their total greenhouse gas emissions. A major contributor to these emissions is the growing transport sector, especially professional freight transport. Several initiatives and organisations have come forward with possible methods, tools or databases for the calculation of the carbon footprint of freight transport chains. However, calculations often render results which are not comparable, sufficiently transparent or accurate since these initiatives are based on different starting points, approaches or intentions in development. Based on these existing methods and tools and with special regard to the recently published EN 16258 standard, this research provides an overview of prioritised gaps and ambiguities in current approaches together with first suggestions on how to address them in the pursuit of methodological harmonisation when calculating logistics related carbon footprint emissions along complex supply chains. The purpose of this paper is to illustrate how existing standardisation approaches for the calculation of emissions of supply chains can be further developed in a next step towards a global methodological harmonisation.

1. Introduction

According to the International Energy Agency (IEA) the transport sector at present accounts for 23% of global energy related emissions (ITF, 2010; Rodrigue, Comtois, & Slack, 2009), with global freight transport contributing to a significant extent. Global freight transport systems currently rely on up to 95% on oil and oil products such as gasoline and diesel (International Energy Agency, 2009). In order to reduce the expenses for fuel and the related negative environmental impact of the growing transport sector, the assessment, reporting, management and especially the reduction of greenhouse gas emission have become an important topic for more and more companies (Rizet et al., 2012). Several actors involved in the transport of freight along supply chains, such as shippers, terminal operators or logistic service providers have started to work towards greener supply chains and to reduce their energy consumption (Ramanathan, Bentley, & Pang, 2014). In addition, more and more end-users of products claim to be informed on the carbon footprint information by the producers and sellers of products (Bonini, Hintz, & Mendonca, 2008).

Furthermore, international organisations, e.g. the World Energy Council, have put the topic of energy efficiency on top of their agenda. The need for efficiency improvement and the subsequent reduction of emissions is recognized all over the world and on different organisational and political levels. On a global level, organisations such as the United Nations Framework Convention on Climate Change move forward international arrangements, e.g. the Kyoto Protocol, where several countries commit to emission reduction targets. On a regional level the European Union (EU) has stated that European countries are expected to reduce their annual greenhouse gas emission by at least 20% by 2020 and by 60–80% by 2050, compared to the 1990 emission level (Council of the European Union, 2007). Furthermore, even from an individual company's point of view, additional regulations such as the requirement of calculating and publishing the carbon footprints of transport services on bids in France show the increasing importance of energy efficiency and emission reduction. Other European countries may be very likely to follow with regulations similar to the one in France. As a consequence, several methods and tools have been developed on the basis of individual initiatives. However, due to their different starting points, intentions or approaches, these developments are often incomparable and incompatible in their methods and results. For identifying best practice and thus improving efficiency of supply chains, a globally harmonised calculation methodology is needed.

Initiatives to address this problem of incomparability in calculation of CO_2 emissions have been established, such as the ISO (draft) 14067 and the GHG protocol. These approaches do not focus on transport directly, though. As a consequence, their regulations about the accounting

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of transport are not specific. The European norm EN 16258 focuses on transport and logistics. However, gaps and ambiguities, which will be described later, remain. Therefore these initiatives can only be considered as the first important steps towards global methodological harmonisation. This paper presents a systematic review and detailed assessment of existing standards and calculation approaches, giving an overview on the currently most important gaps in these approaches and delivering suggestions on how these gaps can be closed in order to contribute to a further global standardisation of emission calculations.

2. Systematic review process

In order to access knowledge based on existing carbon footprint methodologies, calculation tools, and emission factors etc. – hereafter called items – a detailed two-phase analysis has been performed as the basis for this research:

In the first phase the entire spectrum of methods, tools and data was screened and initially reviewed in order to identify the most relevant items. The research was performed by a research team consisting of experts from seven European countries that investigated ongoing activities at a national as well as an international level. The approach was supported by several industry partners and also available to the public as anyone was invited to give suggestion of the items by the project website. Over 100 items have been categorized and 35 of them have been judged as important, based on in-depth empirical research with expert interviews and workshops in a methodology development. In the second phase the items have been analysed in detail by means of empirical research in combination with simulation of real-case scenarios in a programming calculated on the basis of the existing standards (Fig. 1).

2.1. Phase 1 — initial screening of methods, tools and data

The first part of the review process consisted of an initial literature survey of existing methods, tools and databases for calculation of carbon footprint of transport and logistics. Source materials used included methodology reports, guidebooks, manuals, research reports, scientific publications, brochures, etc. In addition, the actual calculation tools and databases were examined if available, and expert interviews with developers and users of the items were used to fill in information gaps. The review and assessment process was organised using a structured review template, thus following a systematic approach to collect basic information, to analyse the coverage and to evaluate implications to the development of a possible future calculation methodology. 102 items were covered, and a template considering over 75 aspects was filled in for each of them.

The reviewed items were classified into four categories (distribution of the items reviewed is shown in Fig. 2). Each item is fixed to one category in order to avoid double counting:

1. Carbon footprint methodologies cover actual standards, standard-like guidelines, guidebooks and schemes that provide the framework on how to calculate and report carbon footprint of transport and logistics along the supply chain or some part of it.
2. Carbon footprint calculation tools encompass all tools, instruments, software, algorithms and other applications, whether public, commercial or company specific, that are used to carry out and facilitate the calculations of carbon footprint of transport and logistics along the supply chain or some part of it.
3. Emission factor databases are considered as collections of greenhouse gas emission data, either public or commercial, that are needed in order to calculate carbon footprint of transport and logistics along the supply chain or some part of it. Examples of emission factors in such databases are vehicle emissions, emissions from fuel production and emissions per transport unit.
4. Other activities cover all items other than methodologies, calculation tools and databases that contribute to the topic of carbon footprint of transport and logistics along the supply chain. Examples of such activities include research projects, awareness raising initiatives and different types of communication forums and channels.

Each item was assessed according to several evaluation criteria to analyse the scope, scientific calculation approach and hands-on usability. Evaluation criteria were structured by the research team, representing different expertise such as environmental impacts of transport, the freight and logistics sectors, transport policies and life cycle assessment. Also, the views from transport and logistics operators, shippers and other industry partners were gathered. Table 1 summarizes the general results per evaluation criteria.

Parallel to the initial review process, user needs, practices and experiences with carbon footprint methodologies, tools and data were analysed. In-depth interviews with a selection of 29 experts from the transport industry were followed up by an extended user need online-survey open for all and sent to over 400 potential respondents. The objective was to identify the core users and their needs for calculation of carbon footprint along supply chains. The topics of the interviews and

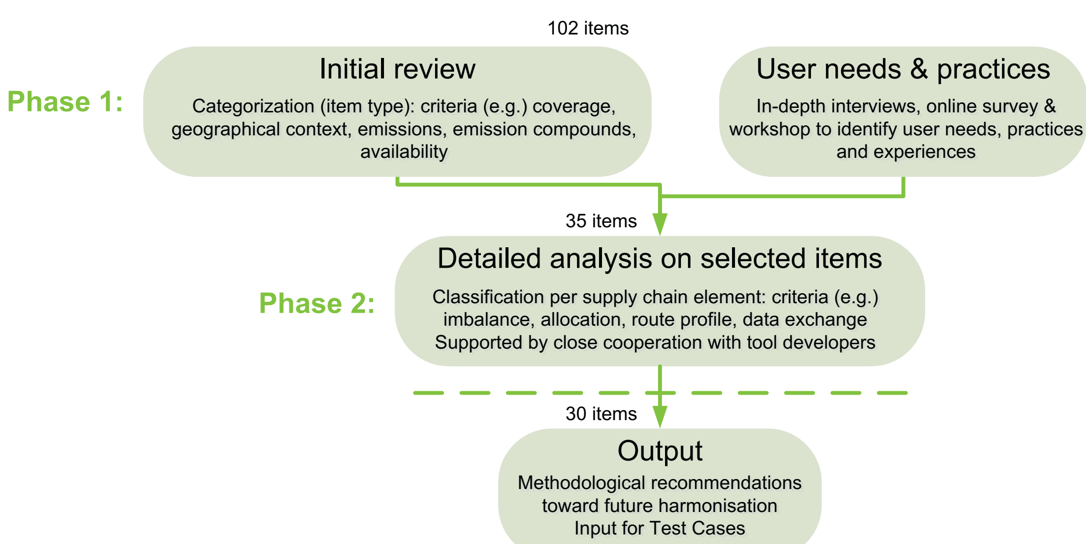

Fig. 1. Structure of systematic review process.