CARBON ACCOUNTING IN FREIGHT TRANSPORTATION AFTER THE PUBLICATION OF EN 16258

A proposal for proactive collection and exchange of the required data

Nikolas Nikias, MSc, Monotherm-Nikias Brothers SA
nikiasnik@hotmail.com

Christian Busse, Ph.D., ETH Zurich, Chair of Logistics Management

Prof. Stephan M. Wagner, Ph.D., ETH Zurich, Chair of Logistics Management

Juup Willemse, Dow Chemical

Greenhouse gas (GHG) emissions as a major cause of global warming are increasingly scrutinized by legal authorities and the general public. The transportation sector is responsible for a large share of these emissions and will have to mitigate them substantially, in the near future. The European norm EN 16258 offers a methodology for calculating GHG emissions, yet it does not consider the logistics-specific context of intense outsourcing, which jeopardizes data availability for logistics service providers (LSPs) and shippers. The article analyzes how LSPs can proactively prepare their freight transportation operations by collecting and exchanging suitable data to facilitate emission calculation. LSPs who proactively develop GHG emission calculation services have an important value added service to offer their customers.

To mitigate climate change, the European Union has committed itself to reducing future greenhouse gas (GHG) emissions which are one of the most important causes of global warming. It aims to reduce overall GHG emissions by 20 % by the year 2020 compared to the 1990 levels (European Commission, 2014) and by 80 to 95 % below 1990 levels by the year 2050 (European Commission, 2011). Since transportation causes a large share of GHG emissions, the transportation sector must also contribute substantially to future emission reduction. The sector-specific target is to reduce transport related emissions by at least 60 % by 2050, compared to the 1990 baseline (European Commission, 2011). By 2030, a decrease of around 20 % should be achieved in comparison with 2008 (European Commission, 2011). Logistics service providers (LSPs, specifically carriers and forwarders) must hence become attentive to GHG measurement and management. Early moving firms have the opportunity to position themselves as pioneers in this area. Others must at least prepare for upcoming legislation related to GHG measurement and management. One of the means how LSPs can differentiate themselves is by collecting and exchanging the right kind of data to facilitate GHG computation; this topic is addressed in this article.

In accordance with the proverb "what does not get measured does not get done," GHG mitigation necessitates consistent calculation of GHG from freight operations. Before December 2012, there was no standardized methodology for the calculation of GHG emissions from logistics services (Schmied & Knörr, 2012; Panteia BV, 2014). Consequently, different countries and institutions provided their own guidelines of how the emissions should be calculated and what should be included within the system boundaries. While some standards (such as ISO 14064, ISO/TS 14067 and the GHG Protocol) specified the general calculation process to be followed, they lacked the required level of detailed guidance or calculation rules (Panteia BV, 2014). Even companies had developed their own procedures for measuring their transport related emissions. This rendered the tracking and calculation of emissions even for the simplest supply chains very difficult.

Therefore, the European Committee for Standardization (CEN/TC 320) published the European norm EN 16258 "Methodology for calculation and declaration of energy consumption and GHG emissions of transport services"

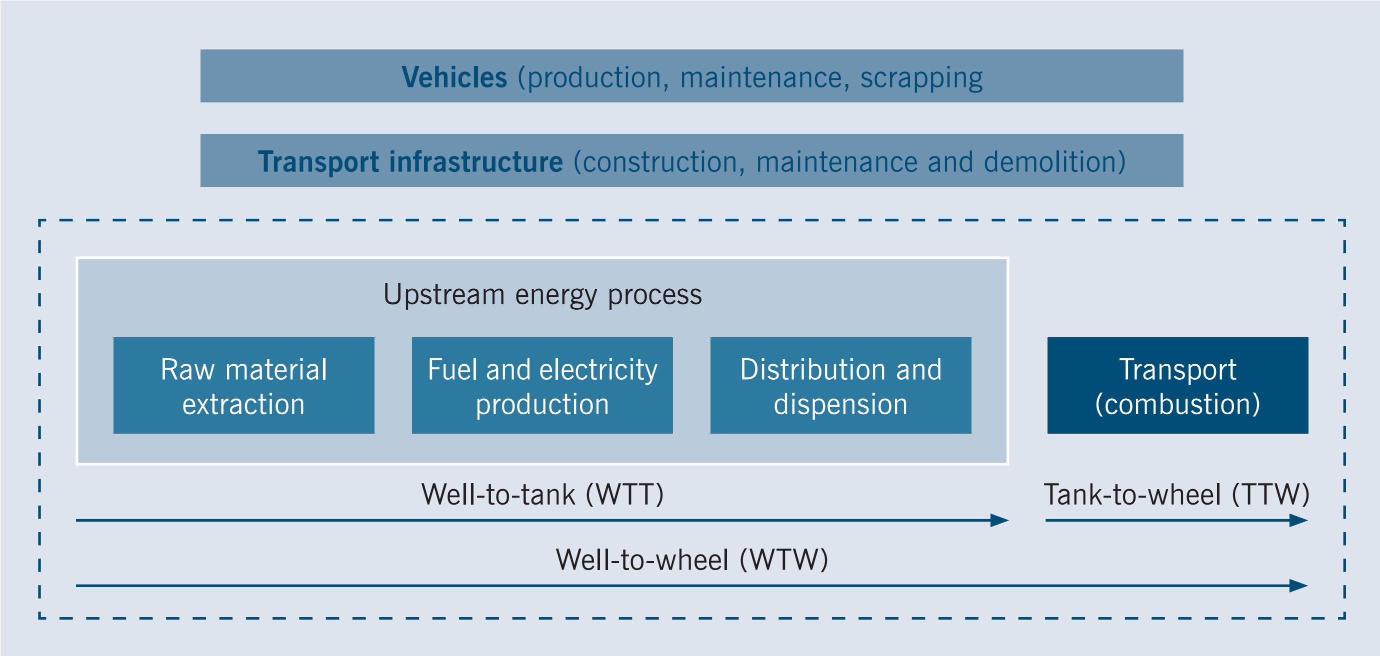

Figure 1: Life cycle phases of transport services within the scope of EN 16258 (adapted from VTT Technical Research Centre of Finland, 2011, p. 3)

at the end of 2012. Publishing this methodology served to standardize the measurement and reporting procedure. Specifically, EN 16258 seeks to demonstrate how GHG emissions and energy use for passenger and goods transport can be determined in a standardized manner (Schmied & Knörr, 2012). The norm specifies definitions, system boundaries, measurement rules, calculation methods, and data sources. The life cycle phases of transport services included within the scope of EN 16258 are illustrated in Figure 1, denoted by the dashed line (VTT Technical Research Centre of Finland, 2011). Accordingly, not only fuel combustion processes within the transportation vehicle (so-called tank-to-wheel processes, TTW processes) are considered, but also upstream energy processes (so-called well-to-tank processes, WTT processes). The WTT emissions cover all the phases from the extraction and production of the energy carrier till the distribution to the final customers. Energy consumption related to the production of the necessary transport infrastructure and to the construction of the vehicles are out of scope, however, for the sake of simplicity.

The main advantage of EN 16258 is that it facilitates the calculation of the emissions from freight operations in a standardized manner. The emissions are calculated based on the fuel consumption for each leg of the transport service according to the following Formula [1]:

Emissions generated =
Fuel consumption ×
Emissions per liter of fuel [1]

Emissions per liter of fuel are listed in EN 16258, for each common type of fuel. The norm highlights both WTT and TTW emission factors per liter of fuel consumed. Consequently, according to EN 16258, emissions are calculated bottom-up for each leg, depending on the actual fuel consumption. The norm does however not yet specify any best practices for tackling information deficits arising from outsourcing. Our related suggestions in the following are based on interviews with 12 corporate experts who participate in the Green Freight Europe industry initiative (www.greenfreighteurope.eu).

The information required by Formula 1 is available, when an "own-fleet operation" is performed. However, the emissions reported by one company should cover, according to EN 16258, both the own-fleet and the sub-contracted freight operations. In reality, fuel consumption for sub-contracted operations is typically not known. For these cases, EN 16258 does not provide detailed guidance for how the emissions should be calculated. Consequently, this is the most significant of a number of "practical gaps" of EN 16258 (Panteia BV, 2014). In order to clarify this gap, Figure 2 illustrates a fictitious example of collaboration of multiple LSPs within the provision of a transport service (Panteia BV, 2014).

Figure 2 depicts a typical case in which a shipper (Firm 1) outsources a logistical service to an LSP (Firm 2) which first of all acts as a forwarder. The operational transport service from source A to destination D is divided into three legs (A → B, B → C, and C → D). For each of these legs, another firm acts as carrier. For example, Firm no. 3 operates leg A → B as an own-fleet operation. It will hence have all of the following information available:
– Fuel consumption
– Distance travelled
– Weight transported
– Type of vehicle used
– Empty km travelled
– Load factor

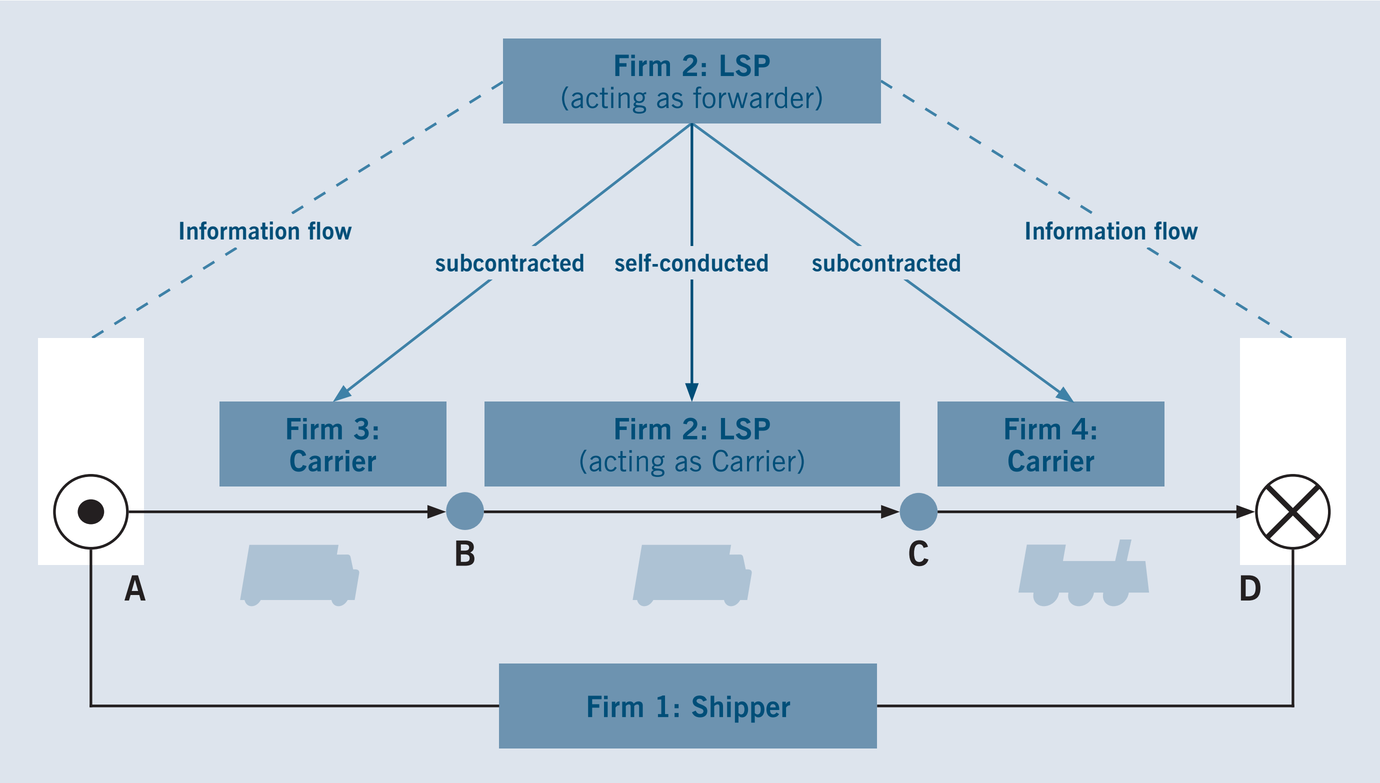

Figure 2:
Example of a collaboration of multiple LSPs in the provision of a transport service (adapted from Panteia BV, 2014, p. 15)

Knowing the fuel consumed for this leg, Firm no. 3 is able to calculate the generated emissions with the help of Formula [1]. Similarly, Firm no. 2 and Firm no. 4 are also able to calculate their emissions for legs B → C and C → D, respectively. However, as Firm no. 2 acts as a carrier for only one of the legs, it can only calculate the total emissions from the source to the destination according to Formula 1 if it receives the required fuel consumption data for the legs A → B and C → D from Firm no. 3 and Firm no. 4, respectively.

Typically, a forwarder has no fuel consumption information available regarding the outsourced legs. Moreover, in the majority of the cases, the forwarder has also no information about the type of vehicle used and the distance travelled, data that would allow them to calculate the total emissions by adopting certain assumptions. The problem becomes even worse when the shipper (i.e., Firm no. 1 in our example) tries to calculate the emissions for the entire transport service from A → D. While the shipper may need this information for the GHG reporting, it will usually have very limited, if any, knowledge about the legs of the service, the fuel consumption for each of the legs, the distances travelled and in general all the operational characteristics of the transport service. Especially in cases of multimodal shipments, the calculation of the emissions is almost impossible for a shipper. Even if the shipper knows "generally" that more than one mode of transport is used for the shipment, the firm usually has no clue about the specific circumstances related to pre-carriage and post-carriage. Therefore, even assumption-driven calculations are obstructed by lack of suitable data.

Congruent with the above described example, lacking information and data exchange between the partners of a transport service (the carriers, the forwarder and the shipper) are currently the typical case, rather than the exception. Carriers tend to have access to primary data (such as fuel consumption and distances travelled), but no processes are in place that this primary data is available to the shipper (or the forwarder acting on its behalf) who is most in need of the emission data for the overall GHG emission calculation. Therefore, it is currently really difficult for the companies sub-contracting freight operations to calculate their emissions by following the procedure specified in EN 16258 (based on fuel consumption). Moreover, it is also very challenging for these companies to make valid assumptions regarding the distances travelled and the types of vehicles used, information that would allow them to calculate their emissions approximately.

EN 16258 suggests that the calculation of the emissions from the fuel consumption results in the most accurate outputs. For these reasons, companies sub-contracting their freight operations should first of all try to gather the required data to calculate their footprint proactively. If the data cannot be obtained, assumptions may be employed to facilitate estimations. The following list depicts the available alternatives, beginning with the most preferred ones:

1) Fuel consumption per leg of transport service or emissions produced per leg of transport service.
2) Mode of transport, type of vehicle, weight transported and distances travelled per leg.
3) Firm-specific averages for the subcontractors, i.e. emissions per tonnekilometers shipped.

By collecting this data, the companies sub-contracting their freight operations will be able to calculate their emissions. The first type of data gives the most precise outcomes by using Formula [1]. The data pertaining to the second option are all combined for the calculation of the emissions. The calculations are not based on the fuel consumption and the outputs are not absolutely accurate. For this option, EN 16258 determines several sources of values that could be used. In these sources, the emissions generated per tonnekilometer shipped are specified, for specific types of vehicles. Therefore, knowing the vehicle used for one leg of the transport service and the weight and distances, the calculation is feasible with the following Formula [2]:

$$\textit{Emissions generated} = \textit{Tonnekilometers shipped} \times \textit{Emissions per tonnekilometer} \quad [2]$$

If the data for option 2 is unavailable, either due to lack of data or unwillingness to share the data, firm-specific averages could be used. Consider the following example. Company A is only performing own-fleet operations. The fuel consumption for each leg is known. Therefore, the emissions could be calculated by following the Formula [1]. Let us assume that company A shipped 5 tonnekilometers, and that the total amount of the emissions generated is 10 kg CO_2e (read "carbon dioxide equivalents", a measure for the global warming potential associated with all emitted GHG). This means that a firm-specific average of 2 kg CO_2e/tonnekilometer can be calculated. This information can be used by company B that is sub-contracting freight operations to A. Assuming that B shipped 3 tonkm with A, the emissions generated by B are estimated to be 6 kg CO_2e. Firm B is hence calculating the emissions based on an average figure of A for all the operations performed for all their customers, meaning that the figure is not specific to the operations that A performed only for B. This process is not the ideal scenario in terms of data accuracy, but offers a feasible solution in presence of sub-contracting freight operations.

The consistent calculation of the emissions from freight operations is of the highest priority for all companies. The procedure described here is a necessary first step in the direction of the reduction of the emissions generated. Companies should become proactive and be prepared for any possible legislation connected with this issue, since the targets set by the European Commission are really ambitious and require copious effort to be realized. We expect that in the future firms will increasingly be held responsible for their freight operations independent of whether these are performed in-house or are sub-contracted to another company. Moreover, we conjecture that shippers' stakeholders will increasingly regard efforts to outsource GHG responsibility as inacceptable. This means vice versa that GHG emission calculation services reflect an important value added service for proactive LSPs.

References

– European Commission. (2011). *Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system* White Paper – COM(2011) 144 final. Brussels, Belgium. Retrieved March 22, 2015, from ec.europa.eu/transport/themes/strategies/doc/2011_white_paper/white_paper_com(2011)_144_en.pdf
– European Commission. (2014). *Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth* COM(2014) 130 final/2. Brussels. Retrieved March 22, 2015, from ec.europa.eu/europe2020/pdf/europe2020stocktaking_en.pdf
– Panteia BV. (2014). *Gap analysis* COFRET Deliverables, D 3.2: COFRET. Retrieved March 22, 2015, from www.cofret-project.eu/downloads/pdf/COFRET_Deliverable_3.2_Final.pdf
– Schmied, M., & Knörr, W. (2012). *Calculating GHG emissions for freight forwarding and logistics services in accordance with EN 16258* (Friedl, Christa ed.): European Association for Forwarding, Transport, Logistics and Customs Services (CLECAT), DSLV. Retrieved March 22, 2015, from www.dslv.org/dslv/web.nsf/gfx/1090CAF3225E6AF241257BB70077B20E/$file/DSLV-Leitfaden%20engl.%20Berechnung%20von%20THG-Emissionen%20Stand%2003-2013.pdf
– VTT Technical Research Centre of Finland. (2011). *Existing methods and tools for calculation of carbon footprint of transport and logistics* COFRET Deliverables, D 2.1: COFRET. Retrieved March 22, 2015, from www.cofret-project.eu/downloads/pdf/COFRET_Deliverable_2.1_final.pdf
– Green Freight Europe website: www.greenfreighteurope.eu