Global Compact Network Germany

DISCUSSION PAPER

SCOPE 3.4 / 3.9

Practical guidelines for data collection and calculation of greenhouse gas emissions from up- and downstream transportation and distribution

1. INTRODUCTION

As part of their climate management strategy, a growing number of companies are also accounting for greenhouse gas (GHG) emissions originating from outside their organisational boundaries within the value chain. To actively reduce these emissions, companies must initially collect data, calculate emissions, and identify emission hotspots. The Greenhouse Gas (GHG) Protocol of the World Resources Institute identifies 15 categories of so-called scope 3 emissions from upstream and downstream activities.[1] For many companies, GHG emissions from upstream and downstream transportation and distribution, which fall within scope categories 3.4 and 3.9, constitute a major source of corporate emissions.

For companies, direct emissions (scope 1) only arise from transportation in vehicles owned or operated (leased) by the company itself. Scope 3.4, on the other hand, covers all emissions arising from the transportation and distribution between a company`s direct suppliers and its own operations or between different company sites by external service providers. This includes fuel combustion emissions from road, air, marine and rail transport, leakage of refrigerants or energy-related emissions from the (interim) storage of purchased products in warehouses or distribution centres. It also covers multi-modal logistics supply chains, including transhipment activities. Other transport elements that occur within the value chain upstream of the direct suppliers (from a company perspective), fall under scope 3.1 (purchased goods and services).

Scope 3.9 covers emissions from the transportation and distribution of sold goods from company facilities to their customers in vehicles and vessels neither owned nor controlled by the company. In addition to transport alone, this includes emissions associated with interim storage. It is worth highlighting that downstream transportation from a company can only be categorised as scope 3.9 if the

The **Peer Learning Group Climate** was launched in 2015 by the Global Compact Network Germany (DGCN). It currently consists of 12 companies from chemical/pharmaceutical, energy, retail, service, transportation and technology industries. In webinars and face-to-face meetings, experts from large German companies exchange experiences relating to corporate climate management and collaborate on developing concrete solutions. sustainable AG supports the working group by providing expert knowledge. Past topics have included 2°C climate strategies, GHG reduction target setting and science-based targets, climate risk management, data management, and scope 3 materiality and data collection.

PRACTICAL GUIDELINES

1) Defining clear goals for data collection and calculation: The selection of an appropriate method for data collection and calculation for a particular company depends on an initial materiality assessment of scope 3 logistics emissions (scope 3.4 and 3.9) and on their relevance in relation to emissions management.

2) Selecting calculation methods: Depending on the company's objectives for data collection and data availability, a company can opt for a) a precise calculation involving primary data request from transport service providers / carriers, b) a less precise individual calculation or c) a rough approximation of logistics emissions based on financial data.

3) Pragmatic approaches to calculation: If scope 3 transport emissions are only marginal to the overall corporate carbon footprint or if there is only limited data availability on the part of the carriers, a company can resort to alternative calculation methods. These could consist of an individual calculation using standardised consumption factors or using a tool such as EcoTransIT. While an approximation based on financial data is the least precise method, it requires the least effort.

4) Requesting data from carriers: Requesting complete emission data or specific consumption factors from carriers or transport service providers in accordance with the existing standards (DIN EN 16258) or methodological framework (GLEC Framework v.1) can add weight to scope 3 transport emission accounting and provide a good basis for GHG management.

1 Greenhouse Gas Protocol (2013): Technical Guidance for Calculating Scope 3 Emissions. www.bit.ly/ghgp-guidance.
World Resources Institute und WBCSD (2011): Corporate Value Chain (Scope 3) Accounting and Reporting Standard. www.bit.ly/ghgp-guidance-value-chain.

company is not paying for the transport costs. For example, if an outsourced transport service provider collects goods from a company site and transports them to a retail outlet, with the transport costs paid for by the company, then the resulting emissions would fall under scope 3.4.

Since 2017, the Peer Learning Group Climate Management of the Global Compact Network Germany (DGCN) has held discussions on selected challenges of data collection and calculation of scope 3 emissions from transportation and distribution, applying the methodological basis of the GHG Protocol, and have developed a range of solutions. This paper reports the core findings, making them available to a broader audience and opening them up for discussion. The goal of this paper is to support companies by facilitating their path into the calculation of scope 3 logistics emissions in consideration of individual corporate goals and targets with respect to GHG accounting. The paper further aims to provide specific calculation options based on established standardised methods and frameworks for companies that consider logistics emissions to be highly relevant. GHG emissions arising from transportation and distribution, and not emissions arising from interim storage, will be focused on.[2]

2 Guidelines for the calculation of these emissions can be found, for instance, in the GHG Protocol Technical Guidance for Calculating Scope 3 Emissions. http://www.bit.ly/ghgp-guidance

2. SELECTED CHALLENGES AND QUESTIONS

2.1. The complexity and lack of transparency of multi-modal logistics supply chains

In most cases, the process of supplying goods from a direct supplier to one's own company (the so-called "shipper" who requests the logistics service) involves more than one carrier. The direct contractor is usually a transport service provider. Along the transport chain however, a wide range of actors and modes of transport tend to be involved (e.g. road, rail, sea, inland waterways, air). These are linked by transhipment or handling activities. Merely identifying the various legs of a shipment already presents a challenge. To complicate matters, each mode of transport involves various types and different sizes of vehicles, engines and fuel types. Moreover, types of freight (dry or liquid bulk, containers, pallets, volume-limited general cargo, mass-limited general cargo) must be differentiated. All of these factors significantly impact the intensity of logistics emissions. For example, while the emission intensity ratio of sea freight to air freight is approximately 1:100, the size category of a mode of transport can make a relative difference of up to 1:4.

When faced with a complex multi-modal logistics supply chain, the precise transport scenario for a particular purchase can seem particularly unclear to a shipper. Across the entire logistics supply chain, it remains uncertain who is ultimately responsible for providing activity and emission data. For the shipper, this combination of factors can make data collection and calculation of GHG emissions along the logistics supply chain seem unmanageable.

2.2. Selecting a suitable calculation method

Any consideration of scope 3.4/3.9 emissions must begin with an understanding of the calculation methods available. This can often appear daunting given the numerous calculation methods, methodological frameworks and emission factors from secondary sources that are available for different modes of transport.

Adding to the difficulty is the fact that many companies, prior to collecting their first set of transport emission data, are uncertain about the relevance of scope 3 emissions in proportion to their total emissions. This makes it challenging to determine the level of accuracy required in data collection and calculation.

2.3. Data availability and provision by the transport service provider

On the one hand, how accurately a shipper can calculate his scope 3.4/3.9 emissions depends largely on data availability from the transport service provider. Any missing data about a consignment, such as its weight, distance, or vehicle type (size category), negatively influences the accuracy of the calculation of emissions.

On the other hand, the transport service provider is challenged with inconsistent and non-uniform data requests from various shippers, which increases the effort needed to provide the data. Those difficulties demonstrate the need for clarifying responsibilities for the provision of data along the logistics chain and for standardizing data requests and calculation methods.

3. PROCEDURES FOR THE COLLECTION AND CALCULATION OF SCOPE 3 LOGISTICS EMISSIONS

3.1. Setting objectives for data collection and selecting a suitable calculation method

Setting clear objectives for data collection must precede any analysis of scope 3 logistics emissions. The amount of effort and level of accuracy scope 3 logistics emissions data are collected and analysed with are determined by the relative relevance of logistics emissions and the company's specific requirements. If the company's main objective is merely to include scope 3 emissions in its annual sustainability report and not to actively manage them, then a lower level of accuracy is needed. However, in the case that outsourced logistics emissions constitute a significant proportion of a company's GHG emissions, the company's goal should be an active management of these emissions. This requires direct interactions with the logistics chain and more resources. Shippers who consider the management of scope 3 logistics emissions to be relevant will need to clearly identify what exactly needs to be managed. The amount and accuracy of data required is determined accordingly. Key factors for the management of scope 3 emissions usually include:

- the choice of mode of transport
- the choice of vehicle for that mode of transport (vehicle size/efficiency)
- contract type (dedicated or consolidated/groupage)
- knowledge of the route taken, including intermediate handling locations
- the selection of a transport service provider based on the best average fuel consumption or lowest level of CO_2 emissions per tonne-kilometer

Selecting an appropriate calculation method depends not only on the objectives for the collection and calculation of scope 3 logistics emissions, but also on the availability of data. How accurately the emissions can be calculated depends on how many of the following data are known:

- total transport activity (quantified in tonne-kilometers) or alternatively shipment weights and transported distances or typical transportation radius
- carriers used
- details about the carrier, such as vehicle size, age and emission category
- type of goods transported: liquid, solid, mixed, voluminous or high density
- transport as an exclusive full load or as partial load shipment together with freight from other shippers

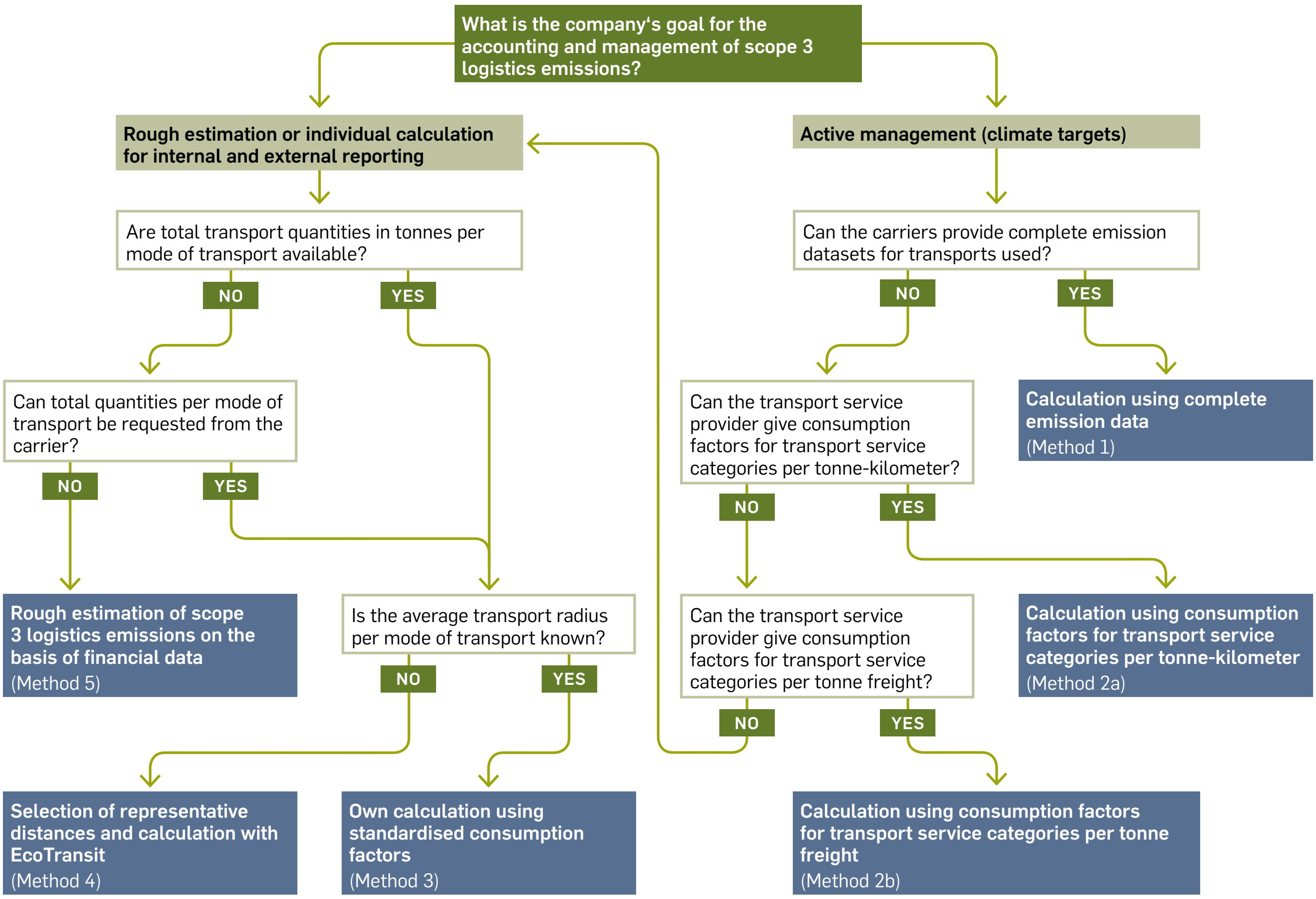

Figure 1: Decision tree for selecting an appropriate calculation method for scope 3 logistics emissions

Figure 1 shows a decision tree that helps shippers identify an appropriate calculation method based on their objectives and data availability. The figure indicates the relevant sections of this paper in which each calculation method is described.

It is worth noting that reporting companies also have the option of combining different methods. For example, a shipper could request emission data or consumption factors from their most important carriers, but use different calculation methods for the rest of their consignments. Primary data can also be requested from particularly representative carriers and then be extrapolated to the remaining shipments using the same mode of transport.

3.2. Methods for the collection and calculation of scope 3.4 and scope 3.9 emissions

Currently, efforts are being put towards the further development and the standardisation of methods for GHG accounting along global multi-modal logistics supply chains. These build on the basic methodologies and established guidelines for the accounting of transport emissions (such as the GHG Protocol, DIN EN 16258 and transport-mode specific frameworks). The goal of those efforts is to establish a better basis for choosing activities to reduce GHG emissions. A key player in this development is the global non-profit initiative Global Logistics Emissions Council (GLEC), whose GLEC Framework contributes to advancing logistics emission accounting.[3] In Germany, the basic principles of the GLEC Framework have already been incorporated into the DIN SPEC 91224:2017-03, which provides specifications for the trans-boundary accounting of transport-related emissions and focuses on the acquisition and transmission of relevant data. Furthermore, the GLEC Framework principles are also to be consolidated into a new ISO standard.[4]

METHODOLOGICAL BASIS ACCORDING TO GHG ACCOUNTING STANDARDS

Well-to-wheel-emissions accounting

The accounting of transport-related emissions should be based on the principle of well-to-wheel. This means including both direct emissions from fuel combustion (tank-to-wheel) as well as upchain emissions from fuel production and fuel transport (well-to-tank).

In the following sections, five different methods for calculating scope 3 logistics emissions will be presented. The advances in the accounting of GHG logistics emissions described above apply to all calculation methods except method 5, which only involves a rough estimation of transport emissions based on financial data.

Methods 1, 2 and 3 involve the request of data from transport service providers and carriers. Generally, two types of data that shippers can, or indeed should, request from their carriers or transport service providers can be distinguished:

- complete emission data for the transport services used
- average fuel consumption for specific transport service categories

Method 1: Requesting emission data from carriers and transport service providers

The first method involves requesting complete emission datasets for the shipments from transport service providers and carriers. This means that the emission calculations are performed by the service providers. To reliably assess the quality of this data, emissions should have been calculated according to an existing standard (DIN EN 16258) or methodological framework (GLEC Framework v.1) using consumption factors (see Method 2). Moreover, emissions should be given as specified metrics (e.g. total GHG emissions in tonnes CO_2e; emission intensity as kg CO_2e per tonne km, per tonne freight or similar) or within an overview of all calculated emissions for transport activities. Any GHG inventory should respect the criteria for data collection and emissions calculation specified in the chosen standards.

For a request of aggregated GHG inventory key performance indicators (KPI), it is recommended to use an indicator-based request table (see Table 1). Such a table should contain all indicators relevant for emission management: total emissions for all shipments processed for the shipper,

Table 1: Request table for scope 3 logistics data

Data			Contextual information
Total CO_2e (t)	**Total tonnes freight**	**Total tkm**	**Sources for:** a) Determining the distance b) Vehicle use and average load (capacity) c) Fuel consumption d) Conversion factors
Share of emissions by mode of transport	**Share of freight by mode of transport**	**tkm pro Verkehrsträger**	**Example of references:** a) Map&Guide, EcoTransIT, Searates, etc. b) 40t truck/60% capacity; category of ship EU-Asia trade lane; aircraft B777 or long-haul >6,000 km, or similar. c) HBEFA Version 3.2, DSLV Guidelines, EcoTransIT, calculated consumption factors from actual consumption d) EN 16258 Annex A, DSLV Guidelines, DEFRA, …

3 http://www.bit.ly/glecframework

4 http://www.bit.ly/DinSpec (only available in German)

total tonnage transported and total tonne-kilometers, as well as a breakdown of all data by mode of transport. To ensure transparency of the underlying calculations, contextual information should also be required in the form of references, e.g. how the distance was determined, sources of vehicle use, average load, fuel consumption and emission factors.

Method 2a: Requesting consumption factors for transport service categories per tonne-kilometer

A second option for calculating logistics emissions with a high level of accuracy is to request average fuel consumption rates ("consumption factors"; in kg or l per tonne km) from the transport service providers / carriers. This generally involves requesting consumption factors per tonne-kilometer for specific transport service categories (Method 2a). Alternatively, consumption factors can be requested per tonne freight (see Method 2b). Understanding how consumption factors are derived is important for their proper use in calculating emissions. The consumption factor is defined as:

$$\text{Consumption factor} = \frac{\sum \text{fuel used (kg or l)}}{\sum \text{useful work done (tkm)}}$$

Formula to derive a consumption factor

As per the GLEC Framework, a vehicle operator calculates a consumption factor by first summing up all fuel consumed, usually over a period of one year, by similar transport services, according to mode and fuel type (e.g. diesel, gas, biofuel). This sum is then divided by the sum of all shipment weights on direct distances (useful work in tonne-kilometers) for each of these transport modes.

The role of the transport service category

Consumption factors are determined by transport service providers / carriers for each category of similar transport services. The term transport service category refers to homogeneous transport structures, generally with a comparable level of fuel consumption per (tonne-)kilometer. For trucks, this may refer to e.g. refrigerated cargo, distribution transport and long-haul transport. For sea transport, it could refer to the so-called trade lanes, i.e. trade routes used generally by ships of comparable size. For aircraft, it could refer to the type of aircraft used for different distance classes. Descriptions of the conventional delimitations of different transportation clusters by mode of transport can be found in the GLEC Framework.

Templates for requesting consumption factors from carriers

The DIN SPEC 91224:2017-03, based on the GLEC Framework, has created request tables for shippers with different degrees of data access and granularity (see Tables 2 and 3 for requests on the reporting level transport service category). This offers a basis, as well as explanations, for standardised data request from transport service providers/carriers.[5]

Table 2 provides an example of a data request template differentiated by transport service category and containing associated consumption factors, as ideally completed by the transport service providers /carrier. In principle, the carrier would prepare such an overview for accounting for a full year (date from - to). For the carriers, the tonne-kilometer value submitted could be based on (booked) direct shipment distances associated with the consumption factor, or only those distances travelled for the customer requesting the information (in case of dedicated transports/ full truck load).

The shipper can also request consumption factors based on start and end points (see Table 3). The carrier should provide this information to the purchaser in a table that includes details about the transportation cluster (see Table 2).

Table 2:
Example of a completed data request template on the reporting level category transport using consumption factors

Transportation cluster				Consignments (all or only those for customer X)			Journey and result data (for all tkm or only those for customer X)		
Transport equipment	**Temperature control**	**Transport type**	**Contract type**	**Quantity**	**Date from**	**Date to**	**Consumption factor**	**Unit**	**Absolute transport effort in tkm**
Standardised equipment	Ambient temperature	Direct transport	Less than load shipment (LTL/ LCL)	30	01/09/2016	30/09/2016	0.02004	l/tkm	287,440
Special equipment	Ambient temperature	Direct transport	Less than load shipment (LTL/ LCL)	30	01/09/2016	30/09/2016	0.02000	l/tkm	135,000
...	...	...	...	...	...	...	...	...	...

5 http://www.bit.ly/DinSpec (only available in German)

Table 3: Example of a completed data request template on the reporting level category start and end points using consumption factors

Shipment (customer specific)			Sender			Recipient			Journey and result data (customer specific)		
Quantity	**Date from**	**Date to**	**Country**	**Postcode**	**Town/city**	**Country**	**Postcode**	**Town/city**	**Consumption factor**	**Unit**	**Absolute transport effort in tkm**
10	01/09/2016	30/09/2016	DE	15236	Frankfurt Oder	DE	63741	Aschaffenburg	0.0203	l/tkm	124,200
10	01/09/2016	30/09/2016	DE	14979	Großbeeren	DK	1200	Copenhagen	0.0203	l/tkm	113,400
10	01/09/2016	30/09/2016	DE	20457	Hamburg	DE	39126	Magdeburg	0.0196	l/tkm	49,840
30	01/09/2016	30/09/2016	DE	38440	Wolfsburg	DE	27568	Bremerhaven	0.0200	l/tkm	135,000

Calculating scope 3 logistics emissions on the basis of requested consumption factors

Once the transport service provider /carrier has provided the consumption factors, shippers can calculate their scope 3 logistics emissions. Providing consumption factors in liters or kilogrammes per tonne-kilometer ensures that calculations relating to consignments or start and end points can be carried out independently of the specific characteristics of the vehicles transporting these consignments.

If shippers do their own accounting, they group the logistics activities to be accounted (total tonne-kilometers) into appropriate clustered transport service categories. They then multiply each cluster by the relevant consumption factor:

- the cluster distribution transports is multiplied by the truck distribution consumption factor;
- the cluster refrigerated transportation is multiplied by the refrigerated transportation consumption factor;
- the cluster EU-Asia transports is multiplied by the consumption factor for sea freight on the EU-Asia route, and so forth.

In this way, total fuel consumption can be calculated per transport service category.

The GHG emissions are then calculated using fuel-related emission factors (CO_2e per kilogram or liter diesel/petrol/kerosene/etc). The GLEC Framework provides an overview of regionally differentiated conversion factors (kg CO_2e / kg fuel) for all fuels world-wide.[6] For instance, in Europe, one kilogram of petrol corresponds to 3.86 kg CO_2e (well-to-wheel, WTW) and one kilogram of diesel corresponds to 3.90 kg CO_2e WTW. For the sake of simplicity, the conversion factors given in the (fee-based) DIN EN 16258/Annex A can be used for all fuel types without differentiating according to origin.[7] Table 4 shows the process for calculating GHG emissions using consumption factors.

Method 2b: Requesting consumption factors for transport service categories per tonne freight

The GLEC Framework provides a fall-back option in cases where the carrier is unable to determine the tonne-kilometers. This involves an aggregation of the consignment weights (in tonnes) for each mode of transport or transportation cluster by the shipper. The carrier then provides the shipper with a consumption factor (in I or kg) for each mode of transport or transportation for one tonne freight. This requires the service provider to initially aggregate shipments according to transportation clusters and transports with the

Table 4: Calculating logistics emissions using specific consumption factors

Determine the tonne-kilometer by transportation cluster	**Multiply by the consumption factor requested from the carrier**	**Determine the total fuel consumption(s)**	**Calculate the GHG emissions using fuel-related emission factors (WTW)**
All tkm EU-Asia trade lane sea freight	Consumption factor for sea freight on the EU-Asia trade lane (kg/tkm)	Total kg HFO	Conversion factor CO_2e for HFO (kg/kg or kg/l)
All tkm truck distribution transport	Consumption factor for truck distribution transport (kg/tkm)	Total kg or liters diesel	Conversion factor CO_2e for diesel, including the proportion of biodiesel (kg/kg or kg/l)
All tkm refrigerated transportation	Consumption factor for refrigerated transportation (kg/tkm)	Total kg or liters diesel	Conversion factor CO_2e for diesel including the proportion of biodiesel (kg/kg or kg/l)
…	…	…	…

6 http://www.bit.ly/glecframework (see Module 2)

7 http://www.bit.ly/DINEN16258-en
Where necessary, this means taking into consideration biofuel shares that could demand specific conversion factors by DIN EN 16258.

**Table 5:
Calculating logistics emissions using consumption factors in liters per tonne freight**

Determine the shipment weight by mode of transport/ transportation cluster	Multiply by the consumption factor requested from the carrier	Calculate the total fuel consumption	Calculate the GHG emissions using fuel-related emission factors (WTW)
All weights Distribution haulage <50 km	Consumption factor for distribution haulage <50 km (in l or kg/t freight)	Total kg or liters diesel	Conversion factor (kg CO_2e / l or kg diesel)
All weights Long-haul >50 km	Consumption factor for long-haul >50 km (in l or kg/t freight)	Total kg or liters diesel	Conversion factor (kg CO_2e / l or kg diesel)
...	...	...	...

same or a similar distance radius, and based on this to derive consumption per tonne freight, while preferably indicating the average distance. Finally, the shipper/reporting company multiplies this consumption factor by shipment weight for each transportation cluster/distance radius (see Table 5).

Any shipper calculating emissions based on transportation-cluster-specific consumption factors must ensure that data on shipment or start- and end-point is available, and that details about the transport modes used for the relevant scope 3 logistics activities are also available. However, they do not need to know the actual consignment allocation to individual vehicles or details about those vehicles. Such calculations will also require the carrier to issue specific consumption factors.

In the following, Methods 3, 4 and 5, which offer alternative procedures, will be described; these are associated, however, with a lower level of precision in the calculation.

Option 3: Own calculation using average consumption factors

If consumption factors or complete emission datasets cannot be obtained from the service provider, then a company can perform their own similar, simplified calculation with the data and parametres available to them. Compared to the above methods, the results of this calculation will be slightly less accurate, but will nonetheless provide a reasonable basis for management purposes. Especially when scope 3 logistics emissions constitute less than 10% of total emissions, this method can reduce the level of effort and input required.

Here, the shipper needs the consignment weights by mode of transport, differentiating between the shipments of each mode of transport according to typical "transport scenarios" or average distances (in km). The total transported tonnage per mode of transport is then added up and multiplied by the average distance. The result in tonne-kilometers for each mode of transport is then multiplied by the average consumption factor, obtained from secondary sources. For instance, consumption factors for containerized sea freight can be found on the Clean Cargo Working Group (CCWG) website.[8] These factors need to be adjusted according to capacity and environmental factors, and

8 http://www.bit.ly/CCWG_EmissionFactors
9 See the DSLV Guide, http://www.bit.ly/DSLV-Guide (p. 12)

Table 6: Calculating logistics emissions using average distances and consumption factors

Determine the shipment weights by mode of transport	Calculate the tonne-kilometers (tkm)	Multiply tkm by the average consumption factor	Calculate the total fuel consumption	Calculate the GHG emissions (WTW) using (fuel-related) emission factors
All weights sea freight (tonnes or TEU); optional differentiation between tradelanes	Multiply by average km from individual definition of typical transport scenarios (or calculate the representative distances using EcoTransIT)			Emission factor (g CO_2/TEU km) from representative tradelanes as per CCWG9 (divided by 10 to match tkm)
All weights truck transport; optional differentiation between truck size categories	Multiply by average km	Consumption factor (g or l/tkm) according to truck size categories in accordance with DSLV Guidelines	Total kg or liters diesel	Conversion factor CO_2e for diesel including proportion of biodiesel (kg/kg) in accordance with EN 16258 [9]
...	...	...	...	...

Table 7: Calculating logistics emissions using average distances and emission factors from representative routes, using EcoTransIT (for rail and air transport)

Determine the shipment weights by mode of transport	Calculate CO_2e per tonne freight for representative route	Calculate the emission factor in CO_2e WTW per tonne freight	Calculate the GHG emissions WTW
All weights rail transport; aggregated according to representative routes	Enter the representative routes into EcoTransIT for 1 tonne freight	Divide the resulting CO_2e (t) WTW from EcoTransIT by distance (km) = CO_2e t/t freight	Multiply by total consignment weight per route and sum up GHG emissions WTW
All weights air freight; aggregated according to representative routes	Enter the representative routes into EcoTransIT for 1 tonne freight	Divide the resulting CO_2e (t) WTW from EcoTransIT by distance (km) = CO_2e t/t freight	Multiply by total consignment weight per route and sum up GHG emissions WTW

(if required) converted from TEU-km to tkm.[10] Average factors (parameters) for truck transport are listed in the DSLV Guidelines (based on EN 16258).[11] The procedure is outlined in Table 6.

Calculations involving rail transport require country-specific average values. Here, the emissions for a representative distance can be derived with EcoTransIT for one tonne freight: The emissions (CO_2e) are divided by the distance (km), giving an immediate emission factor in t CO_2e/t freight. This procedure is illustrated in Table 7.

Method 4: Calculating scope 3 logistics emissions with EcoTransIT

The web-based calculation tool EcoTransIT[12] enables the calculation of emissions for simple as well as complex transport chains. This includes shipping (maritime, domestic) and air, road and rail freight transport. The tool incorporates the rationale of GLEC and combines fuel- and distance-based methods. The underlying method is fuel-based as it derives consumption factors specific to each mode of transport and region and differentiated by vehicle size and age, etc. by conducting regular and comprehensive research. Furthermore, it is distance-based in that the various stages of the travelled distance are calculated according to the specific mode of transport. Since EcoTransIT relies on precise knowledge of distances travelled and can be customised to all parameters, its calculations tend to be more precise than own calculations, provided that all transport distances are entered individually. If representative sample routes are applied and total emissions are extrapolated to total transport volume, the resulting projection would then be less precise.

The use of EcoTransIT requires details about transport amounts (tonnes or standardised containers), types of goods (optional) and transhipment centres, or at least of respective start and end points, for individual shipments. The number of pallets cannot be entered as a unit. As the GLEC framework works with metric tonnes as its "common currency", it is necessary that an average weight per pallet be submitted to enable comparison. Users can draw from a range of available standardised values; these can, however, also be customised manually in the extended version of EcoTransIT. Through the intuitive user interface, results can quickly be obtained (energy consumption, GHG emissions, NOx, SOx).

In addition to the web-based version of EcoTransIT, there is also the option of submitting an online entry to calculate several transport chains in succession, as well as calculating a number of datasets through batch processing. These require a subscription to a fee-based version of EcoTransIT ("Business Solution"), which can interact with a company-wide IT system.

EcoTransIT is particularly suited for companies who consider their scope 3 transport emissions to be highly significant, but lack knowledge on their transport supply chains and have limited financial resources.

Method 5: Rough estimation of scope 3 logistics emissions on the basis of financial data

Finally, there is the option of roughly estimating scope 3 logistics emissions on the basis of transport costs. Spend-based emission factors are available in the databases of Environmentally Extended Input-Output (EEIO) models.[13] The Scope 3 Evaluator[14] by GHG Protocol and Quantis is a free, web-based tool which allows spend-based calculations; input parametres for these are the purchase costs (in US$) for road, rail, sea or air freight. Compared to the calculation methods described above, this approach is imprecise. For example, the emissions intensity of a small versus a large vehicle per tonne transported freight can vary by a factor of four.

10 It is recommended adding a flat rate of 15% to the consumption factor, which generally is based on the shortest possible distance, in order to allow for standard detours. To allow for the 70% standard load factor, the consumption factor should also be multiplied by 0.7. The conversion factor of TEU to tonne-kilometers is 0.1 (1 TEU corresponding on average to 10 tonnes). For further details, see the CCWG methodology paper. http://www.bit.ly/CCWG_Methods

11 http://www.bit.ly/DSLV-Guide (Chapter 11, Table 17)

12 http://www.bit.ly/ecotransit_tool

13 An overview of current EEIO models can be found in the DGCN Discussion Paper "Scope 3.1 – Practical guidelines for data collection and calculation of greenhouse gas emissions from purchased goods and services", http://www.bit.ly/DGCN-Scope-3-1-EN

14 http://www.bit.ly/QuantisScope3

4. CORPORATE EXAMPLES

On their A list, the global disclosure system CDP names the companies that received the highest ratings for transparency and performance in dealing with climate change. The study of the A list companies from the DACH region (Germany, Austria and Switzerland) and their way of addressing outsourced logistics emissions provides good insight into current corporate practices concerning data collection and calculation of emissions. Of the 15 German, Austrian, and Swiss companies on the CDP 2017 A list, ten consider scope 3.4 and 3.9 to be relevant and have outlined their calculation methodologies (see Tables 8 and 9).

Table 8: Application of methods to calculate scope 3.4 emissions as reported by companies in DACH countries on the CDP A List (Source: CDP; own evaluation)

Company	**Scope 3.4 emissions** (in metric tonnes CO_2e)	**Calculation method**	Approach in calculating emissions
BMW	1,427,399	Request for emission data from carriers & individual calculation	► Coverage: Approx. 90% of logistics, including both the transport of inbound materials and spare parts, as well as downstream transportation (vehicles and spare parts) all the way to the respective markets, or in part, all the way to the distributors ► Activity data: Real activity data in tonne-kilometers ► Emission factors: Request for carbon footprint data from the carriers and standardised emission factors from TREMOD ► Calculation: In tonne-kilometers in accordance with DIN EN 16258
Deutsche Bahn	12,165,968	Request for CO_2 data from carriers & individual calculation using EcoTransIT	► Emission factors: From the Clean Cargo Working Group (sea freight), Handbook Emission Factors in Heavy Duty Vehicles 3.2 (road transport), Eurocontrol Small Emitters Tool (air freight), TREMOD, EcoTransIT and the Deutsche Bahn Environmental Mobility Check ► Calculation: In accordance with DIN EN 16258/GLEC
Deutsche Telekom	588,255	Individual calculation & spend-based estimation	► Coverage: Inbound shipment of purchased products and capital goods, including end user devices ► Activity data: average weight of end user devices; estimated costs for outsourced transport services ► Calculation: Defining typical transport scenarios for purchased end user devices and use of standardised emission factors; estimation of the transport costs (as a rule of thumb, 5%) for all other purchased goods and services based on the purchase price; calculation using spend-based emission factors
Givaudan	27,470	Individual calculation	► Activity data: Weight of the purchased materials and country of origin from the Enterprise Resource Planning System ► Calculation: Using standardised emission factors based on product weight, country of origin and mode of transport
LANXESS	434,000	Individual calculation	► Activity data: Purchase volume from the business data management system ► Emission factors: Standardised emission factors for transport on road, rail or ship, based on the standardised emission factors provided by DEFRA (UK) in their tables “Freighting goods” and “WTT - delivery vehs & freight” ► Calculation: Clustering the purchase into continental and intercontinental transport; determining typical transport distances to LANXESS sites; calculation on the basis of total transports by mode of transport using standardised emission factors
Nestlé	2,419,966	Individual calculation	► Activity data: Volume of purchased products ► Emission factors: Standardised emission factors for road transport from Ecoinvent v.2.2 ► Calculation: Allocating the purchased goods to three typical transport scenarios: 20% to small markets (on average, 200 km road transport), 30% to medium-sized markets (on average, 300km road transport), 50% to large markets (on average, 1500 km road transport); calculated using standardised emission factors based on these transport scenarios
Austrian Post	19,630	Individual calculation	► Activity data: Data on transport period, distance, consignment weight, vehicle type (incl. emissions standard) from internal IT system; estimation of the carriers' fuel consumption ► Emission factors: Standardised emission factors for GHG emissions per liters fuel ► Calculation: Using standardised emission factors based on the suppliers' estimated fuel consumption
Swisscom	22,100	Individual calculation	► Activity data: Consignment data from carriers ► Emission factors: Standardised emission factors from Ecoinvent Version 2.2 (2010) and 3.1 (2013) / Mobitool ► Calculation: Determining typical transport distances; calculation using standardised emission factors

Company	Scope 3.4 emissions (in metric tonnes CO_2e)	Calculation method	Approach in calculating emissions
Symrise	21,346	Individual calculation using a tool	▸ Coverage: The most important purchase volumes of raw materials from the most important suppliers ▸ Activity data: Transport volume in tonnes from the most important suppliers; calculated transport distances ▸ Emission factors: EcoTransIT-tool ▸ Calculation: Using Eco-TransIT based on transports from the most important suppliers; extrapolated to total transport volume
thyssenkrupp	5,400,000	Individual calculation	▸ Coverage: Purchase data; data on the modes of transport and distances ▸ Emission factors: Modelled standardised emission factors ▸ Calculation: Using standardised emission factors

Table 9: Application of methods to calculate scope 3.9 emissions as reported by companies in DACH countries on the CDP A List (Source: CDP; own evaluation)[15]

Company	Scope 3.9 emissions (in metric tonnes CO_2e)	Calculation method	Approach in calculating emissions
Basel Cantoner Bank	30	Individual calculation	▸ Coverage: Mail ▸ Emission factors: Thinkstep's SoFi software
Coca Cola Hellenic Bottling Company	196,959	Individual calculation (using a tool)	▸ Coverage: Downstream outsourced transportation and distribution ▸ Activity data: Estimated total kilometers ▸ Emission factors: GHG Protocol calculation tool ▸ Calculation: Using this tool, based on quarterly estimation of total kilometers
Deutsche Telekom	353,165	Spend-based estimation	▸ Coverage: Downstream transportation from Deutsche Telekom distribution centres all the way to the respective retail outlets ▸ Activity data: Transport costs ▸ Emission factors: Spend-based standardised emission factors from EEIO databases
Givaudan	40,991	Individual calculation	▸ Coverage: Transportation between Givaudan sites and downstream transportation to customers ▸ Activity data: Weight of purchased materials and country of origin from the Enterprise Resource Planning System ▸ Emission factors: Standardised emission factors based on tonne-kilometers by mode of transport ▸ Calculation: Using standardised emission factors, based on product weight, country of origin and mode of transport
INDUS Holding	9	Individual calculation	▸ Activity data: Costs for downstream transportation, differentiated by mode of transport ▸ Emission factors: Spend-based emission factors provided by DEFRA (currency and inflation adjusted) ▸ Calculation: Using transport costs by mode of transport and standardised emission factors
LANXESS	661,000	Individual calculation	▸ Coverage: Transport information (number of consignments, shipment weight, start and end points) from the LANXESS Transport & Logistics Information System ▸ Emission factors: Standardised emission factors from DEFRA (2016) and McKinnon / Piecyk (2011): Measuring and Managing CO_2 Emissions of European Chemical Transport, Logistics Research Centre, Heriot-Watt University, Edinburgh, UK ▸ Calculation: Using standardised emission factors for shipment weight and transport distance of sold products to the customers
Nestlé	3,265,924	Individual calculation	▸ Coverage: 40% of total distribution logistics; extrapolated to 100% ▸ Activity data: Consignment data by transport route (distance, number of deliveries, transport mode/type, tonnage) by market ▸ Emission factors: Standardised emission factors from DEFRA ▸ Calculation: For road transport: Using standardised emission factors based on estimated fuel consumption by vehicle type and transport distance for road transports; for air freight: on the basis of tonne-kilometers
Swisscom	5,600	Individual calculation	▸ Activity data: Logistics data from suppliers; approximation of typical transport distances ▸ Emission factors: Ecoinvent Version 3.1 (2013) / Mobitool ▸ Calculation: Using standardised emission factors based on typical distances
Symrise	135,950	Individual calculation (using a tool)	▸ Coverage: Transport of the most important product volumes from regional hubs to the most important customers; extrapolated to all sales; transport of goods between company sites ▸ Activity data: Distances and shipment weights in tonnes ▸ Emission factors: EcoTransIT tool ▸ Calculation: On the basis of tonne-kilometers transported using the EcoTransIT tool
thyssenkrupp	4,200,000	Individual calculation	▸ Activity data: Customer data on different modes of transport and transport distances ▸ Emission factors: Modelled standardised emission factors ▸ Calculation: Using standardised emission factors

15 The representation of some companies in the CDP report on the calculation of scope 3.9 emissions raises questions about clear demarcations between scope 3.4 and scope 3.9 according to the GHG Protocol. The distinctions between these two categories is described here in Chapter 1.

5. CONCLUSION AND RECOMMENDATIONS

As illustrated by the corporate examples, most companies currently determine their scope 3 logistics emissions by carrying out their own calculations based on standardised emission factors from various sources or spend-based estimations. In fact, they rarely use tools such as EcoTransIT and seldom request consumption factors or emission data from their logistics service providers and carriers. This demonstrates that the accounting of scope 3 emissions is still far from adequately taking into account both the complexity of multi-modal logistics supply chains as well as the massive differences in GHG emission levels for the various transport scenarios.

Presumably, this picture will drastically change in the coming years due to the increasing professionalisation of GHG accounting and growing expectations towards the disclosure and management of climate impact along the value chain. Multi-stakeholder initiatives bringing together different stakeholders from the logistics supply chains, such as the Global Emissions Logistics Council, the Clean Cargo Working Group (focusing on containerized sea freight) and the Sustainable Airfreight Initiative (focusing on air freight) can significantly contribute to this process. This paper itself aims to encourage the further development of methods for the accounting of scope 3 logistics emissions.

Companies should assess the relevance of outsourced logistics emissions and the extent to which they can influence them. Based on this information, they should consider their options for improving the level of accuracy of their calcualtions and, together with logistics providers, actively work towards reducing their transport emissions. This can be accomplished by selecting specific emission and consumption factors, using tools such as EcoTransIT or, in the best instance, requesting data from transport service providers or carriers.

FURTHER READING

Smart Freight Centre (2016):
GLEC framework for Logistics Emissions Methodologies, Version 1.0.
Available online at: :
http://www.bit.ly/glecframework

World Resources Institute und WBCSD (2013):
Greenhouse Gas Protocol –Technical Guidance for Calculating Scope 3 Emissions.
Available online at:
http://www.bit.ly/ghgp-guidance

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