INTERNATIONAL WORKSHOP AGREEMENT

IWA 16

First edition
2015-02-01

International harmonized method(s) for a coherent quantification of CO_2e emissions of freight transport

Méthode(s) internationale(s) harmonisée(s) pour une quantification cohérente des émissions de CO_2e par le transport de fret

Reference number
IWA 16:2015(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TMBG, *Technical Management Board Groups*.

Introduction

Transport and logistics are based by 95 % on fossil fuels and currently contribute to an estimated 20 to 25 % of overall global CO_2 emissions (ITF International Transport Forum (2012): Greenhouse Gas Emissions: Country Data 2010. http://www.internationaltransportforum.org/Pub/pdf/10GHGcountry.pdf, Rodrigue J-P., Comtois C, Slack B (2009): The Geography of Transport Systems. New York: Routledge). Therefore, governments and industry are interested in improved efficiency of transportation and transport chains. Transport chains as considered within this IWA encompass the handling processes and transportation of goods from the producing entity to the next level(s). These transport chains connect industry and commercial processes. In order to identify best practice and to improve the efficiency of transport chains, an accepted and standardised method for calculating emissions values is needed together with a specification of data requirements. This IWA develops a framework and maps out requirements toward a global CO_2e emission calculation standard, based on existing standards.

As thorough analysis of existing standards and calculation methods has shown, there are several gaps within the currently existing methods, which leave space for interpretation in regards to calculation. A comparability of calculated results is therefore not necessarily given (see COFRET EU-project deliverables D 2.4 Methodologies for emission calculations[12], D 3.1 Assessment of typology of existing CO_2 calculation tools and methodologies[13], D 3.2 Methodology for integration of CO_2 emission calculation-tools[14] and D 3.3 Suggestions and recommendations towards global harmonization of carbon footprint calculation principles and comparable reporting[15]). Identifying these gaps and addressing them in a next standardization process step is important though, in order to ensure that ambiguities are eliminated and to achieve a compatible level of accuracy across all modes of transport as well as across all elements of the transport chain.

As analysis has shown, optimization of emissions for shipments and for networks of individual transport providers requires different approaches. All other things being equal, for isolated cargo direct routings are usually those with the lowest emissions. For transport service providers avoiding empty transportation space will often lead to optimization. Furthermore the characteristics of the various transportation modes need to be taken into consideration as well as those of handling processes, logistics hubs and transhipment centres. The calculation approach suggested in this document therefore distinguishes three levels of calculation: operation specific level, transport company network level and cargo level, reflecting the differing perspectives of carriers, logistics service providers and shippers. Transport chains are almost always very complex, often encompassing various modes of transport and handling processes or storage etc. In order to enable the calculation of emissions, this IWA suggests the approach of calculation of emissions of separate transport chain elements. Another emphasis within this IWA is given to the aspect of data quality. As tracked fuel consumption is not always available, the question of default data needs to be addressed.

Terms like logistics chain and supply chain are often used within the transport sector. For a better orientation Figure 1, originated from the COFRET project (see [11]), provides a generic example showing logistics operations as elements of the transport chain and transport chain within a supply chain. Each logistics operation forms a transport chain element (TCE), the sum of all TCEs builds the transport chain.

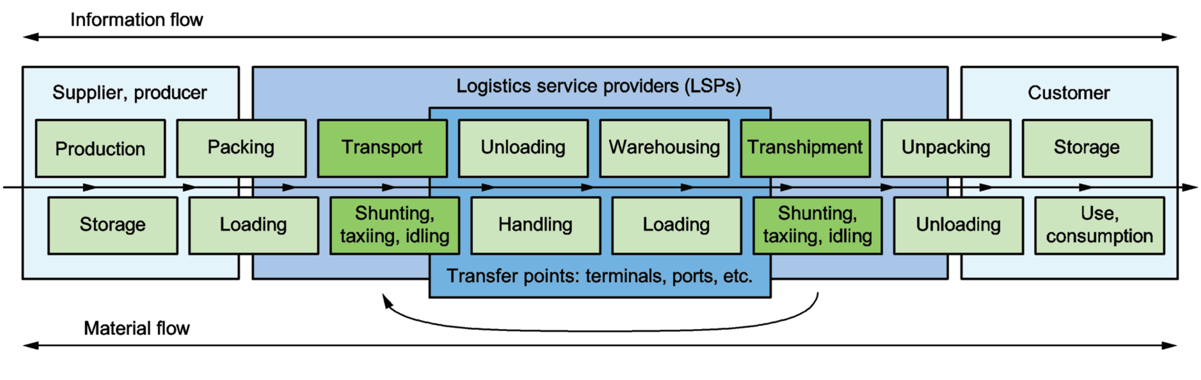

Figure 1 — Logistics operations as elements of the transport chain

International Workshop Agreement IWA 16 was launched at a workshop held in Berlin, Germany, in July 2014, and approved at workshops held in Berlin, Germany, in September 2014 and in November 2014. All workshops were hosted by DIN, the German Institute for Standardization.

This IWA was developed in the following format:

1st and kick-off meeting on 2014-07-08: Adoption of the scope and objectives of the IWA, agreement on a two-tiered approach: (1) identification of recommended existing standards suitable as basis and gaps, (2) identification of suitable approaches for closure of identified gaps;

2nd meeting from 2014-09-01 to 2014-09-02: Discussion of gaps per mode and in general, summarizing and agreement on gaps;

3rd meeting from 2014-11-13 to 2014-11-14: Discussion of suggested approaches for closing gaps and summarizing recommendations on way forward.

Between the 2nd and 3rd meeting further consultation in the format of telephone conferences took place between the workshop participants in order to complete the mode specific gap analysis.

During meetings, findings were discussed and the content of the following document was agreed.

International harmonized method(s) for a coherent quantification of CO_2e emissions of freight transport

1 Scope

This International Workshop Agreement (IWA) defines the framework for methods for coherent quantification of CO_2e emissions of freight transport (total and intensity) on the following three levels:

1) Level of operation of transport chain element (TCE).

2) Level of network including company level.

3) Level of cargo.

It provides a gap analysis identifying starting points and recommending further specification and possible alignment on mode specific and intermodal levels, including transhipment centres and warehouses. Consideration needs to be given to the practicality of the methods and the intended use of the outputs to the potential user groups, particularly providers of freight transport and logistic services as well as their customers.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
vehicle operation system
VOS
set of vehicle operations

[SOURCE: EN 16258:2012, 2.2.22]

2.2
vehicle operation
deployment of a vehicle to fully or partially provide a transport service for one or more transport service users

[SOURCE: EN 16258:2012, 2.2.21]

2.3
vehicle
any means of transport

Note 1 to entry: Within this standard, this definition includes vessels (watercraft and aircraft like ships, boats and planes), for reasons of simplification only.

[SOURCE: EN 16258:2012, 2.1.19]

2.4
transport network
system of connections covered by transport organizers including connections covered by subsidiaries and subcontractors

2.5
cargo
collection/quantity of goods (carried on a means of transport) transported from one place to another

Note 1 to entry: Cargo can consist of either liquid or solid materials or substances, without any packaging (e.g. bulk cargo), or of loss items of unpacked goods, packages, unitised goods (on pallets or in containers) or goods loaded on transport units and carried on active means of transport.

[SOURCE: EN 14943:2005, 3.151]

2.6
intermodal container
inter-modal transport unit (ITU)
inter-modal loading unit (ILU)
transport unit which may be a container, swap body, semi-trailer or road-trailer suitable for inter-modal transport

[SOURCE: EN 14943:2005, 3.512]

2.7
transport chain
sequence of transport activities and logistics operations

Note 1 to entry: See Figure 1 which shows logistics operations as elements of the transport chain.

2.8
logistics
planning, execution and control of the movement and placement of people and/or goods and of the supporting activities related to such movement and placement, within a system organized to achieve specific objectives

[SOURCE: EN 14943:2005, 3.575]

2.9
carbon dioxide equivalent
CO_2e
unit for comparing the radiative forcing of a GHG to carbon dioxide

Note 1 to entry: The carbon dioxide equivalent is calculated using the mass of a given GHG multiplied by its global warming potential.

[SOURCE: ISO 14064-1:2006, 2.19]

3 Initiatives and documents included into the gap analysis

Different tools are taken into consideration in the gap analysis and in the way forward in addressing these gaps. These tools are listed in the gap-analysis tables and in Bibliography.

4 Boundaries of analysis

4.1 General

It is important that for all three levels of calculation it is defined which processes and elements are included and which not.

4.2 Processes included

4.2.1 On operation level

Calculations on vehicle operational level shall include operation of all on-board vehicle systems including propulsion and ancillary services.

4.2.2 On network level

Calculation on network level includes all segments within the commercial boundaries of one operator or logistics service provider. It covers all transport modes, all services and activities of the operator's network.

Calculation on network level also includes processes consisting of short-term assistance to the vehicle for security or movement reasons, with other devices like tugboats for towing vessels in harbours, aircraft tractors for planes in airports, etc.

4.2.3 On cargo level

Calculation on cargo level includes all transport elements and services from the commercial boundaries of the shipper to the commercial boundaries of the next receiving unit which is performing substantial changes to the cargo and its elements.

4.2.4 Definition and use of transport chain elements

Given the complexity of transport chains the notion of transport chain element (TCE) as a modular and independent operation that brings the goods close to their final destination is introduced (see also COFRET D.3.1[13], there referenced as supply chain element). Figure 2 presents an example of a transport chain composed of TCEs. Not only transport operations are considered as TCEs, but terminal and warehousing operations are also treated as standalone TCEs. The resulting CO_2e emissions at the product level are the sum of the emissions resulting from the TCEs that constitute the transport chain.

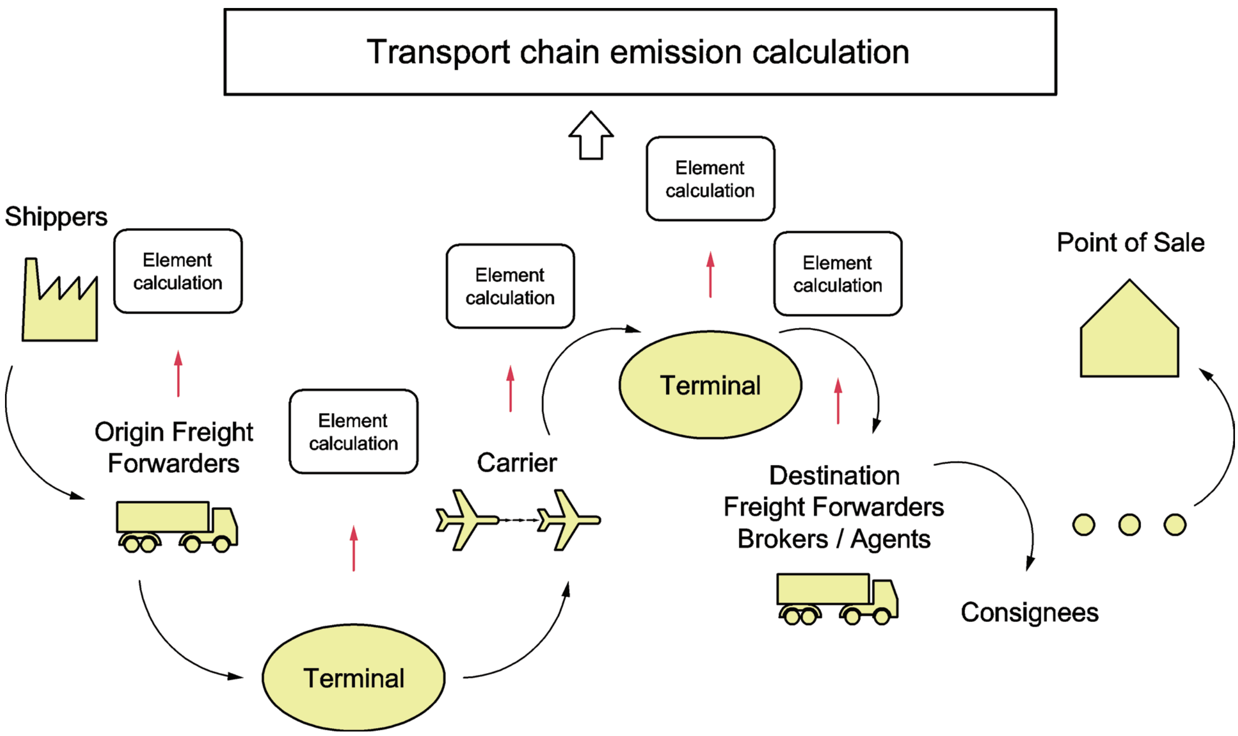

Figure 2 — Example of a transport chain split into transport chain elements

The division of any transport chain into a number of sequential TCEs greatly simplifies the effort necessary to compute cargo-level emissions. Any transport chain can be decomposed on a limited number of TCEs, such that TCEs can be used and reused in any arbitrary situation, functioning as building blocks. The Logistics Node Elements (LNE), such as terminals and warehouses include processes of external handling or transhipment devices for the movement or transhipment of freight. Furthermore, handling operations that take place inside platforms, and which consist of loading and unloading of parcels or pallets of express delivery services and other transport services organized in networks, belong to this category of processes.

4.3 Processes included on all calculation levels

4.3.1 Energy operational processes

The assessment of energy consumption and Greenhouse Gas (GHG) emissions of TCE shall include both vehicle operational processes and energy operational processes that occur during the operational phase of the lifecycle.

The vehicle operational processes shall include operation of all on-board vehicle systems including propulsion and ancillary services.

The energy operational processes shall include:

— for fuels (except electricity): extraction or cultivation of primary energy, refining, transformation, transport and distribution of energy at all steps of the production of the fuel used;

— for electricity: extraction and transport of primary energy, transformation, power generation, losses in electricity grids.

4.3.2 Fugitive emissions

Direct emissions of GHG resulting from leakage during operational processes (e.g. of refrigerant gas or natural gas) should be included.

4.4 Processes not included

Processes not to be included in the analysis are:

— processes for the construction, maintenance and scrapping of vehicles and logistic nodes;

— processes of construction, service, maintenance and dismantling of transport infrastructures used by vehicles;

— non-operational energy processes, like the production or construction of extraction equipment of transport and distribution systems, of refinery systems, of enrichment systems, of power production plants, etc. so as their reuse, recycle and scrap;

— additional impacts of combustion of aviation fuel in high atmosphere, like contrails, cirrus, etc.

4.5 Processes and issues that should be assessed as to their inclusion

Processes at the administrative (overhead) level of the organisations involved in the transport and logistics services might be relevant for the overall emission result. It is to be assessed in detail to which extent and how they are to be included on the three calculation levels.

Consideration of the extension of the approach to local air pollutant emissions in context of calculation of CO_2e/GHG emissions should be given.

5 Gap analysis

5.1 General aspects

The following aspects apply to gaps on all three levels of the defined framework (operation, network, cargo) and need to be unambiguously defined and included in the next standardization efforts on a global level.

a) Appropriateness in emission allocation:

1) Consistent set of CO_2, GHG and CO_2e emissions factors to be used in calculations in order to provide a truly comparable set of outputs for well-to-tank, tank-to-wheel and well-to-wheel fuel life cycle phases for the main commercial transport fuels. This is needed at the global level to take into account regional or national differences in fuel specification/composition and/or production processes as well as to ensure consistency across modes/between operators (GLEC has recently initiated a study on this topic).

2) Consistent approach to electricity emissions – this is crucial in the railway sector and is being addressed by ECO TransIT, EN 16258, French info CO_2 transport law, GHG Protocol and UIC among others. These all quote or are developing electricity emission factors by country, based on national generation, consumption or other (e.g. railway-specific purchase) mixes, but a consistent approach across the transport chain within and between countries and modes still needs to be developed.

3) Consistent approach to definition of empty runs across all modes and mechanisms to establish industry recognized default data sources to be used are needed where they are not present. GLEC has recently initiated an initial scoping study on this.

4) Consistent approach to definition of default load factors across all modes is required (in the circumstances where actual/averaged data are not available and an aggregated approach is to be applied).

5) Aligned allocation rules for vehicles carrying e.g. freight and passengers at the same time or consolidated freight, and also at nodes and terminals when handling freight.

b) Quality of data:

1) Consistent approach to:

i) requirements for operational data collection (frequency, granularity) and data quality, especially towards data quality measurement and quality indicators. Guidelines for the monitoring and verification of real input data as well as rules for the use of real input data on the basis of sampling, e.g. definition of application fields, frequency, sampling size. Definition of time frame of data, e.g. on yearly base to avoid influence of temporal, seasonal and economic effects;

ii) use of default data in absence of tracked information;

iii) define data quality levels (mix between use of measured data and default data) and provide guidance on how to apply and to declare them.

2) Definition of TCEs scope and their boundaries, including definition of standard VOS examples as well as auxiliary processes, to be included in the calculation.

3) Consistency of reporting (metric vs. imperial).

4) Standardization of reporting.

5) A quality verification process.

c) Consistent approach to definitions of an operator’s network and its organizational boundaries (e.g. overhead) needs to be developed.

d) Transport auxiliary processes (e.g. tugboat, cold ironing, shunting, yard logistics, air-conditioning of goods) including (indirect) emissions caused by auxiliary material consumption (e.g. lubricants, additives, packaging).

e) Consistent approach to consideration and avoidance of double counting.

5.2 Mode specific gap analysis

In addition to the general aspects and gaps listed already, the following tables reflect mode specific gaps.

For this analysis the most appropriate and best aligned starting points (per mode and for logistics hubs) have been used as the basis and reference for future standardization, as indicated in the following tables. Based on these suggested starting points the most pressing gaps that still need to be addressed were identified.

The gap analysis for the transport mode road is given in Table 1.

Table 1 — Gap analysis road

Investigated aspect	Starting points		Identified gaps and comments
	EN 16258	Smartway	
TTW/WTW **(Tank-To-Wheel/ Well-To-Wheel)**	TTW/WTW	TTW	Consistency of approach Reliable information about upstream processes
CO_2/CO_2e	CO_2e	CO_2	Consistency of approach
Allocation units in general	Preferred unit is tkm (tonne kilometre), but other units can be used if they are justified Marginal accounting is not allowed	CO_2/ton mile Also CO_2/vehicle mile and CO_2 per cubic foot mile	Unified allocation units per type of cargo and/or transport service
Specific allocation units	Preferred allocation unit for collection and distribution: tkm based on GCD (Great Circle Distance)	—	use of this allocation unit in practice (recommendation: uniform calculation unit for every service type: dense network transport, loose network transport, point-to-point-transport)
Energy consumption of auxiliary processes	Only on-board processes are included, they are not specified in detail though	Not specified	Treatment of temperature control/reefer to be consistent across all modes
Processes included	Loaded and unloaded (empty) trips, subcontractor’s transports, on-board handling if measured	Own fleet Empty running included	Auxiliary processes (e.g. non-onboard handling), secondary energy used for temperature controlled processes, maintenance, preparation and aftercare of vehicle and transportation units (e.g. cleaning of tank containers)
Allocation notes	—	—	—

