



BSI Standards Publication

Greenhouse gases — Quantification and reporting of greenhouse gas emissions arising from transport chain operations

National foreword

This British Standard is the UK implementation of EN ISO 14083:2023. It is identical to ISO 14083:2023. It supersedes BS EN 16258:2012, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee SES/1/7, Greenhouse gas management and related activities.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Date	Text affected
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English Version

**Greenhouse gases - Quantification and reporting of
greenhouse gas emissions arising from transport chain
operations (ISO 14083:2023)**

Gaz à effet de serre - Quantification et déclaration des
émissions de gaz à effet de serre résultant des
opérations des chaînes de transport (ISO 14083:2023)

Treibhausgase - Quantifizierung und Berichterstattung
über Treibhausgasemissionen von
Transportvorgängen (ISO 14083:2023)

This European Standard was approved by CEN on 10 March 2023.

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European foreword

This document (EN ISO 14083:2023) has been prepared by Technical Committee ISO/TC 207 "Environmental management" in collaboration with Technical Committee CEN/TC 320 "Transport - Logistics and services" the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2023, and conflicting national standards shall be withdrawn at the latest by October 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 16258:2012.

Any feedback and questions on this document should be directed to the users' national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

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Endorsement notice

The text of ISO 14083:2023 has been approved by CEN as EN ISO 14083:2023 without any modification.

Annex Z

(informative)

Table 1 lists the main technical differences between EN16258 and ISO 14083:2022. The terms used in this table are the ones of ISO 14083:2023.

A comparison of the terms used in EN 16258:2012 and ISO 14083:2023 is provided in Table 2.

Beyond these main technical differences, further minor differences exist, related to terms, structure of the documents, and methodological presentation.

Table 1 – Main technical differences

	EN 16258	ISO 14083
Title	Methodology for calculation and declaration of <u>energy consumption</u> and GHG emissions of transport <u>services</u> (freight and passengers)	Greenhouse gases — Quantification and reporting of greenhouse gas emissions arising from transport chain <u>operations</u>
Scope	Quantification and reporting of <u>energy consumption</u> and GHG emissions related to a transport <u>service</u>	Quantification and reporting of GHG emissions arising from the <u>operations</u> of transport chains of passengers and freight
Operations	Transport operations	Transport operations: Cable cars added Pipelines added Hub operations included to support full transport chain GHG calculations
Passengers, Freight	Both – focus is primarily on individual vehicle operation	Both – focus is on how the transport and hub operations combine to move a consignment or passenger from origin to ultimate destination.
Modes of transport	All modes (not listed)	Air, Sea, Inland waterway, Road, Rail, Pipelines, Ropeway
GHG sources (processes) included	Energy carriers combustion Energy carriers leakage Energy carriers production and supply	Energy carriers combustion Energy carriers leakage Energy carriers production and supply Refrigerant leakage <i>Use of ICT equipment and data servers (related to transport and/or hub operations) (optional)</i> <i>Packaging (optional)</i>

		<i>Black carbon emissions from transport operations (optional)</i>
Cut-off criteria	No	Yes
Distances for transport activity	<u>Actual distances</u> should be used, except for collection and delivery rounds, where SFD or GCD should be used.	<u>SFD or GCD</u> should be used to calculate transport activity (activity distance). A <u>DAF</u> (Distance Adjustment Factor) shall be used to convert actual distance into activity distance if activity distance is not available.
GHG mission factor values	Detailed table of values for transport fuels (<u>recommended if no value specified from energy supplies</u>)	Detailed tables of values for transport fuels and <u>electricity</u> for Europe and for North America (<u>recommended if no value specified from energy supplier</u>) Acknowledges emission factors may be specified in national or international legislation.
GHG emission intensity default values	List of sources in an informative annex	List of sources in an informative annex
Data categories	By order of preference: 1. Primary data for the TO 2. Primary data for the TOC 3. Primary data for the whole fleet 4. Default values	By order of preference: 1. Primary data 2. Secondary data: Modelled data 3. Secondary data: Default values
Scope of reporting	Transport services	Reporting may be: 1. at organizational level 2. at transport chain or transport chain element level
Report for a TCE or a TC	1. Total GHG emissions = vehicle use GHG emissions (energy carrier combustion) + vehicle energy provision GHG emissions 2. Vehicle use GHG emissions (energy carrier combustion) 3. <u>Total energy consumption</u> = energy consumption for vehicle use (energy carrier combustion) + energy consumption for vehicle energy provision 4. <u>Energy consumption for vehicle use</u> (energy carrier combustion)	1. Total GHG emissions = vehicle/ <u>hub</u> use GHG emissions (energy carrier combustion + <u>refrigerant leakages</u>) + vehicle/hub energy provision GHG emissions 2. Total GHG emission intensity (total GHG emissions reported to transport activity)
Class of passenger transport	No	Optional reporting to distinguish differing emission intensity of

		passenger transport classes
Allocation where passengers and freight are transported using the same vehicle	Detailed changes in the allocation mechanisms in these circumstances to align better between different modes	

Table 2 – Main terms changes

EN 16258	ISO 14083
tank-to-wheels (TTW)	vehicle use (includes leakages of refrigerant)
well-to-tank (WTT)	vehicle energy provision
well-to-wheels (WTW)	total (vehicle use + vehicle energy provision)
vehicle operation system (VOS)	transport operation category (TOC)
leg (of a transport service)	transport chain element (TCE)
specific measured values	primary data (for the transport operation)
transport operator specific values	primary data (for the TOC)
transport operator fleet values	primary data (for the whole fleet)

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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 (see 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 (see 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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 207, *Environmental management*, Subcommittee SC 7, *Greenhouse gas and climate change management and related activities*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 320, *Transport — Logistics and services*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition cancels and replaces IWA 16:2015, which has been technically revised throughout to expand the framework to a methodology.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document provides requirements and guidance for the quantification and reporting of greenhouse gas (GHG) emissions for transport chains for passengers and freight.

This document provides such a calculation with its related reporting. It specifies how to source data as input for the calculation, taking into account that transport operations vary hugely, from multinational organizations operating multiple transport modes to deliver transport services across the globe, through small local operators delivering a simple service to a single user; hence this document has adopted a structure to make it widely applicable. To ensure that values for GHG emissions that result from vehicle and hub operation and associated energy provision are considered, this document takes into account the GHG emissions associated with production and distribution of energy (including, for example, production and distribution of liquid energy carriers or grid transmission of electricity). As a result, calculation results can enable a consistent comparison of possible different energy carriers by transport service operators, users and any other interested parties. Calculation results are only directly comparable if all options chosen are internally consistent.

This document covers all modes of transport (land, water or in the air, irrespective of the means of transport, i.e. vessel, vehicle or pipeline) and includes the operational GHG emissions from hubs where they facilitate transfer of freight or passengers from one element of a transport chain to the next. It takes account of operation of empty trips required for subsequent transportation of freight or passengers. It is applicable at all stages along the entire transport chain (see also illustrative examples in [Figure 1](#) and [Figure 2](#)).

[Figure 1](#) provides an illustrative example of a freight transport chain from the point where freight leaves its last point of production or transformation (A, freight consignor) to the point where freight reaches its first non-transport related operation (B, freight consignee). This transport chain consists of five transport chain elements (TCEs), the GHG emissions of which are calculated separately. The first and last TCEs (TCE 1, TCE 5) represent road services (C) covering pre- and on-carriage; TCE 2 to TCE 4 represent a rail freight service (D) composed of road/rail terminal operations (TCE 2, TCE 4) and main carriage by rail transport (TCE 3).

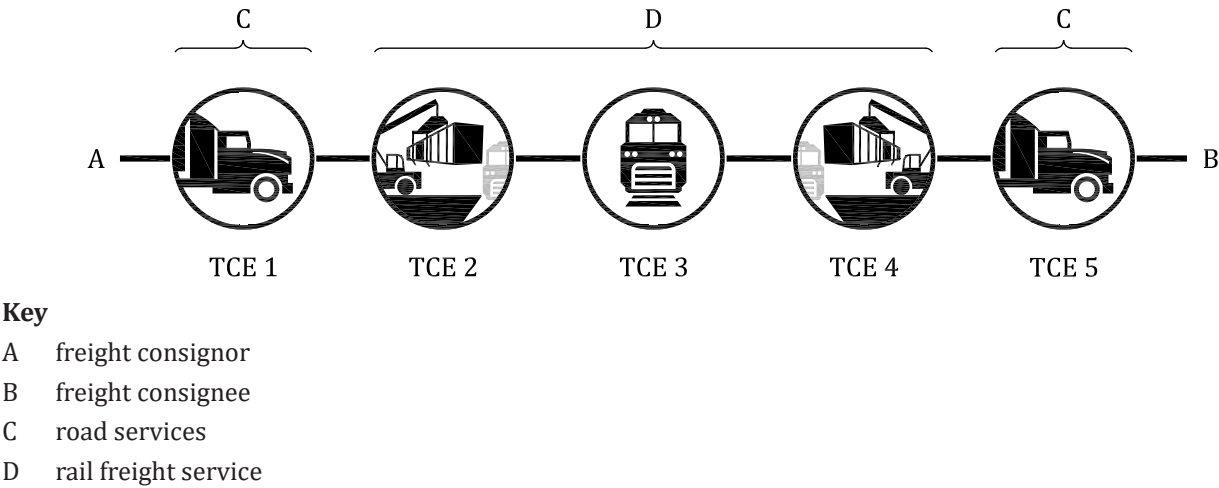
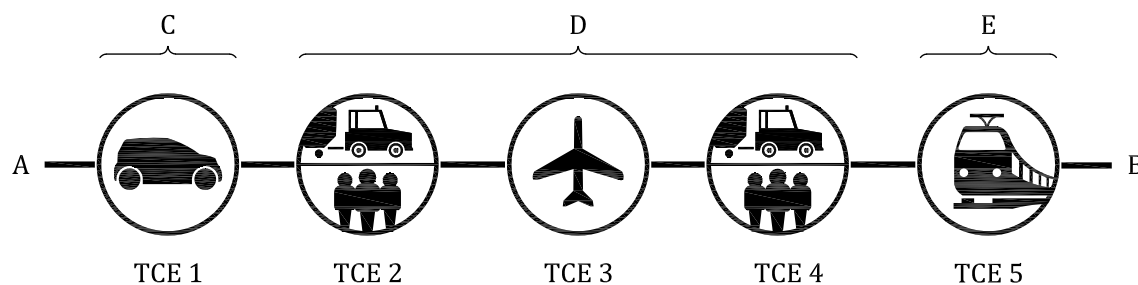


Figure 1 — Illustrative example of a multi-element freight transport chain

[Figure 2](#) provides an illustrative example of a passenger transport chain from the point where passengers leave their departure location, A, to their destination, B. This transport chain consists of TCEs, the GHG emissions of which are calculated separately. The first TCE (TCE 1) represents transport of the passenger from home to the airport by private car (C); TCE 2 to TCE 4 represent an air travel service (D) composed of passenger terminal operations for the passenger and luggage (TCE 2, TCE 4) and main carriage by plane (TCE 3). The on-carriage represented by TCE 5 shows shuttle express via rail (E).

**Key**

- A departure location
- B destination
- C private car service
- D air travel service
- E shuttle express service via rail

Figure 2 — Illustrative example of a multi-element passenger transport chain

The reporting set out in this document reflects the need to report information between the parties in a transport chain because information known to the transport or hub operator, when reported to the user of their service, helps the latter to quantify, better manage and reduce the impacts of their transport or hub activities. This is a standard for GHG emission calculation only; therefore, offsetting is not part of this document.

This document is complementary to several existing standards. It is aligned with the ISO 14064 series and ISO 14067 (see [Figure 3](#)). It contributes to the carbon footprint of products (see ISO 14067) and the life cycle assessment in accordance with the ISO 14040 family of standards and ISO 14044. [Figure 3](#) shows the relationship of this document to other International Standards of the ISO 14040 family of standards and the ISO 14060 family of standards, using the example of a freight transport chain and including possible stages within the life cycle of a product bought online as well as example topics to be covered by a company's GHG inventory.

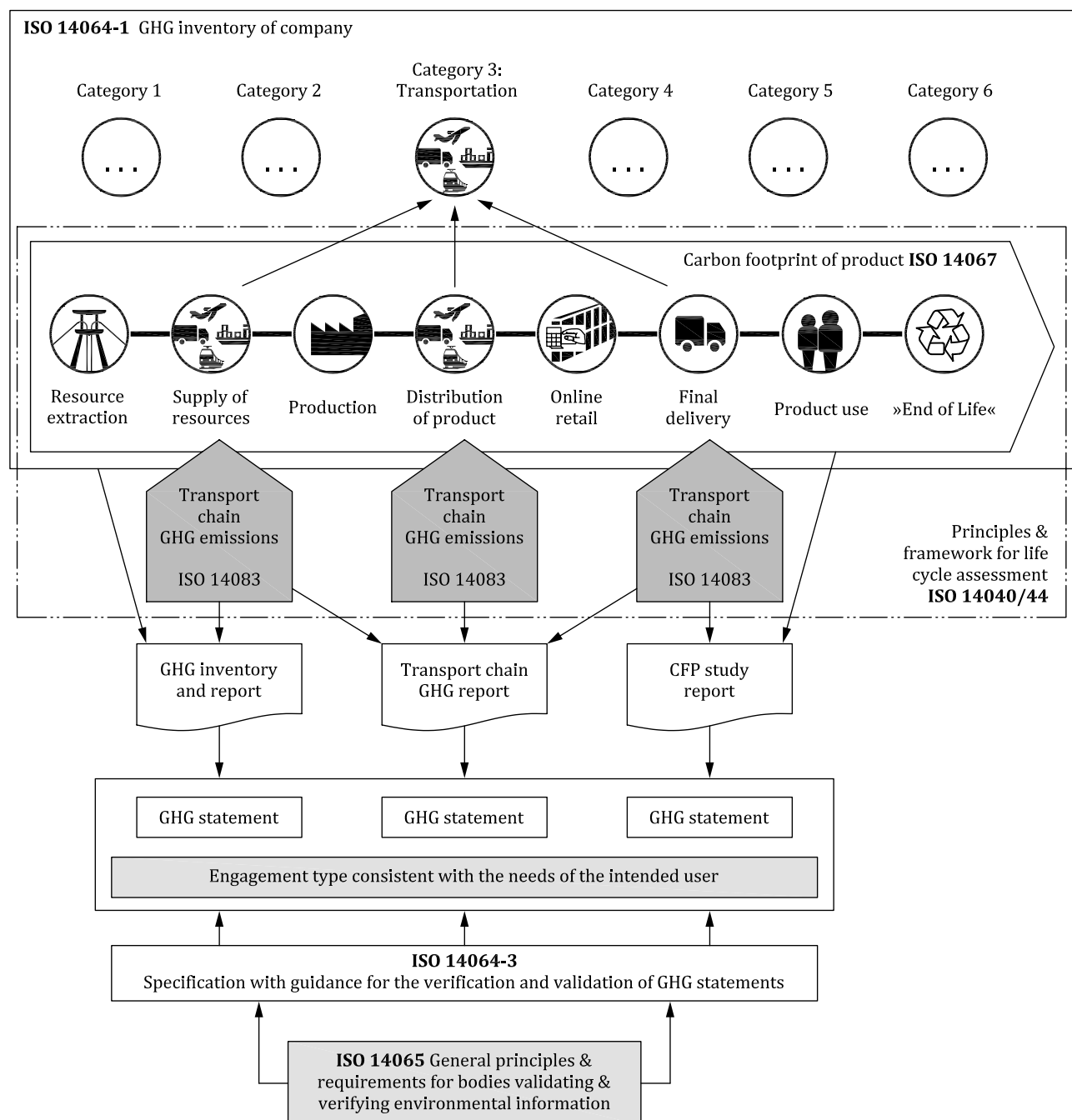


Figure 3 — Relationship between the ISO 14040 family of standards and the ISO 14060 family of standards, using the example of a freight transport chain

NOTE GHG emission intensity per tonne- or passenger-km calculated in accordance with this document can be used as primary or secondary data for GHG quantification projects in accordance with ISO 14067 and/or ISO 14064-1. These data require adaptation or modification if full life cycle based GHG-emissions are needed, e.g. vehicle manufacture or transport infrastructure provision.

The approach acknowledges, and is in line with, the valuable work conducted on GHG calculation and reporting that is documented in the aforementioned standards and by other protocols and organizations, including but not limited to, the United Nations Framework Convention on Climate Change (UNFCCC)[37] the GHG Protocol[16] and the Global Logistics Emissions Council (GLEC) Framework for Logistics Emissions Accounting and Reporting[15].

Greenhouse gases — Quantification and reporting of greenhouse gas emissions arising from transport chain operations

1 Scope

This document establishes a common methodology for the quantification and reporting of greenhouse gas (GHG) emissions arising from the operation of transport chains of passengers and freight.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 Terms related to transport chain operations

3.1.1

cable car

ropeway

transport system where *vehicles* (3.1.35) are moved by at least one cable motorized by a machinery

Note 1 to entry: Vehicles circulating on cable(s) whose movement is not transmitted by at least one cable are not considered cable cars. Vertical elevators are also not considered cable cars.

3.1.2

charter

contract for the hire of a specific *vehicle* (3.1.35) from an owner for a specified period of time for the charterer's purposes subject to agreed restrictions

3.1.3

collection and delivery round

trip with the purpose to collect and/or deliver *freight* (3.1.7) at successive locations along the trip

Note 1 to entry: Typically, but not necessarily, the trip starts and ends at the same location.

3.1.4

consignment

separately identifiable amount of *freight* (3.1.7) transported from one consignor to one consignee via one or more modes of transport

Note 1 to entry: Although "consignment" and "*shipment*" (3.1.20) are common terms often considered as synonyms, in this document and other technical publications, a consignment is differentiated to a shipment. Indeed, a shipment refers to a grouping of freight corresponding to the shipper needs, whereas a consignment refers a grouping of freight according to a carrier or freight forwarder's transport solutions.

[SOURCE: ISO 26683-1:2013, 3.9, modified — “freight” replaced “goods items (available to be)”. “and specified in one single transport document” deleted. Note 1 to entry added.]

3.1.5

empty trip

section of the route of a *vehicle* (3.1.35) during which no *freight* (3.1.7) or *passenger* (3.1.16) is transported

EXAMPLE Vehicle (re)positioning trips, empty backhauls.

3.1.6

fleet

set of *vehicles* (3.1.35) operated by one *transport operator* (3.1.30)

3.1.7

freight

goods, materials, commodities, parcels, etc. being transported from one location to another

[SOURCE: EN 14943:2005, 3.437, modified — “materials, commodities, parcels, etc.” added.]

3.1.8

hub

DEPRECATED: node

DEPRECATED: site

DEPRECATED: station

DEPRECATED: facility

DEPRECATED: centre

DEPRECATED: depot

location where *passengers* (3.1.16) transfer and/or *freight* (3.1.7) is transferred from one *vehicle* (3.1.35) or mode of transportation to another before, after or between different elements of a *transport chain* (3.1.25)

Note 1 to entry: Hubs include, but are not limited to, rail/road terminals, cross-docking sites, airport terminals, terminals at seaports and distribution centres.

3.1.9

hub activity

parameter that quantifies the *throughput* (3.1.21) of a *hub* (3.1.8)

3.1.10

hub equipment

equipment and facilities used within a *hub* (3.1.8) to transfer *freight* (3.1.7) or *passengers* (3.1.16)

3.1.11

hub operation

operation in order to transfer *freight* (3.1.7) or *passengers* (3.1.16) through a *hub* (3.1.8)

3.1.12

hub operation category

HOC

group of *hub operations* (3.1.11) that share similar characteristics

Note 1 to entry: [Annex H](#) contains examples of HOCs.

3.1.13

hub operator

entity that carries out *hub operations* (3.1.11) involving carriage of *freight* (3.1.7) or *passengers* (3.1.16), or both

3.1.14

hub service

service provided within a *hub* (3.1.8) *transport chain element* (3.1.26)

3.1.15**load factor**

ratio of the actual load to the maximum legally authorized load of a particular *vehicle* ([3.1.35](#))

3.1.16**passenger**

person carried by a *vehicle* ([3.1.35](#))

Note 1 to entry: The term and its abbreviation “pax” are also used as a unit for quantity of passengers.

Note 2 to entry: Where the word “passengers” is used, it refers to one or more passengers unless specified in the context.

3.1.17**pipeline**

long continuous line of pipes, including ancillary equipment, used for transporting *freight* ([3.1.7](#))

[SOURCE: ISO 6707-1:2020, 3.1.2.30, modified — “freight” replaced “liquids or gases”.]

3.1.18**pipeline transport**

movement of a medium (liquid, gas, liquefied gas, slurry) through a system of pipes from one location to another

3.1.19**round trip**

group of sequential journeys that start and end in the same place, whatever the intermediate routing

3.1.20**shipment**

identifiable collection of one or more *freight* ([3.1.7](#)) items (available to be) transported together from the original shipper to the ultimate consignee

Note 1 to entry: A shipment may be transported in one or a multiple number of *consignments* ([3.1.4](#)).

Note 2 to entry: A shipment can be aggregated or disaggregated to different consignments according to the requirements of the means of transportation on any one element of the *transport chain* ([3.1.25](#)), e.g. single bulk units and packages can be aggregated on a pallet and such pallet can be handed over as a unit for aggregation in a container, which in turn is treated as a consignment in a *vehicle* ([3.1.35](#)).

Note 3 to entry: Although “consignment” and “shipment” are common terms often considered as synonyms, in this document and other technical publications, a consignment is differentiated to a shipment. Indeed, a shipment refers to a grouping of freight corresponding to the shipper needs, whereas a consignment refers a grouping of freight according to a carrier or freight forwarder’s transport solutions.

[SOURCE: ISO 26683-1:2013, 3.34, modified — “freight” replaced “goods”. Notes 2 and 3 to entry added.]

3.1.21**throughput**

quantity of *passengers* ([3.1.16](#)) or *freight* ([3.1.7](#)) handled, sorted, cross-docked or transferred within and between modes at a *hub* ([3.1.8](#))

3.1.22**transshipment**

action by which *freight* ([3.1.7](#)) is transferred from one means of transport to another during the course of one *transport chain* ([3.1.25](#))

[SOURCE: EN 14943:2005, 3.1154, modified — “transport chain” replaced “transport operations”, and the second part of the definition deleted.]

3.1.23

transport

movement of *passengers* (3.1.16) and/or *freight* (3.1.7) from one location to another performed by modes of transport such as air, *cable car* (3.1.1), inland waterway, *pipeline* (3.1.17), rail, road and sea

[SOURCE: ISO 26683-1:2013, 3.37, modified — “passengers and/or freight” replaced “people and “goods”, “of transport” added and the following list changed, “and the field comprises the attributes of infrastructure, vehicles and operations” deleted.]

3.1.24

transport activity

parameter that quantifies *passenger* (3.1.16) or *freight* (3.1.7) *transport* (3.1.23)

3.1.25

transport chain

sequence of elements related to *freight* (3.1.7) or a (group of) *passenger(s)* (3.1.16) that, when taken together, constitutes its movement from an origin to a destination

Note 1 to entry: A passenger or a group of passengers can include their luggage and, if any, their *vehicles* (3.1.35).

Note 2 to entry: Where there are two or more elements, in the majority of cases, one of them implies that the freight or passengers use a *hub* (3.1.8).

3.1.26

transport chain element

TCE

section of a *transport chain* (3.1.25) within which the *freight* (3.1.7) or a (group of) *passenger(s)* (3.1.16) is carried by a single *vehicle* (3.1.35) or transits through a single *hub* (3.1.8)

EXAMPLE If a multimodal trip of a passenger includes taking a bus from stop “L4” to stop “L7” of bus line “L”, then one TCE is the trip of the passenger from “L4” to “L7”.

Note 1 to entry: See [Figures 4](#) and [5](#).

3.1.27

transport distance

distance between the origin and the destination of a *passenger* (3.1.16), a *consignment* (3.1.4) or a *vehicle* (3.1.35) along a specified route

Note 1 to entry: For the use of this document, the route followed by the passenger, the *freight* (3.1.7) or the vehicle may be different from that originally planned. This leads to two categories of transport distances: *actual distances* (3.1.27.1), and distances used for calculation of *greenhouse gas emissions* (3.2.8), i.e. *transport activity distances* (3.1.27.4).

3.1.27.1

actual distance

transport distance (3.1.27) along the actual route taken by a *vehicle* (3.1.35)

EXAMPLE Distance measured by an on-board device (odometer).

3.1.27.2

great circle distance

GCD

transport distance (3.1.27) determined as the shortest distance between any two points measured along the surface of a sphere

3.1.27.3**shortest feasible distance****SFD**

DEPRECATED: planned distance

DEPRECATED: network distance

transport distance (3.1.27) determined as the distance achievable by the shortest practical route available according to the infrastructure options for a particular *vehicle* (3.1.35) type

Note 1 to entry: “Shortest practical route” implies that small detours from the shortest distance, e.g. to avoid congested city centres or rural roads unsuitable for certain vehicle sizes, can be included.

3.1.27.4**transport activity distance**

transport distance (3.1.27) related to *passengers* (3.1.16) or *freight* (3.1.7) moved, used as a parameter for calculation of *transport activity* (3.1.24)

3.1.28**transport operation**

operation of a *vehicle* (3.1.35) in order to transport *passengers* (3.1.16) and/or *freight* (3.1.7)

EXAMPLE If a multimodal trip of a passenger includes taking a bus from stop “L4” to stop “L7” of bus line “L”, this requires a transport operation being the operation of this bus on line “L”, from the first stop “L1” to the last stop of this bus line.

Note 1 to entry: It includes cases where the destination is the same as the origin passing through other locations on the way.

3.1.29**transport operation category****TOC**

group of *transport operations* (3.1.28) that share similar characteristics

Note 1 to entry: [Annexes A](#) to [G](#) contain recommendations for the characteristics used to specify the TOCs for each transport mode.

3.1.30**transport operator**

entity that carries out *transport operations* (3.1.28) involving carriage of *freight* (3.1.7) or *passengers* (3.1.16), or both

3.1.31**transport service**

service provided to a *transport service user* (3.1.33) for the *transport* (3.1.23) of *freight* (3.1.7) or a *passenger* (3.1.16) from an origin to a destination

Note 1 to entry: A transport service can imply multiple *transport chain elements* (3.1.26), requiring both *transport operations* (3.1.28) and *hub operations* (3.1.11), as shown in [Figure 1](#) and [Figure 2](#).

3.1.32**transport service organizer**

entity that provides *transport services* (3.1.31), within which the operation of some *transport chain elements* (3.1.26) are subcontracted to one or more other entities that operate them

Note 1 to entry: A transport service organizer acts as an intermediary between the *transport operator* (3.1.30) or *hub operator* (3.1.13) and the *transport service user* (3.1.33). A transport service organizer can act as the transport operator or hub operator for some of the transport chain elements that comprise the overall service.

Note 2 to entry: A transport service organizer can be, for example, a freight forwarder, an entity organizing trips/travel (e.g. travel agency, tour operator) or a local authority responsible for public passenger transport.

3.1.33

transport service user

entity that buys and/or uses a *transport service* ([3.1.31](#))

Note 1 to entry: A transport service user can be a *passenger* ([3.1.16](#)), a shipper or a *transport service organizer* ([3.1.32](#)).

3.1.34

twenty-foot equivalent unit

TEU

standard unit used to express a number of containers of various lengths and for describing the capacities of container ships or terminals

[SOURCE: EN 14943:2005, 3.1166]

3.1.35

vehicle

any means of *transport* ([3.1.23](#))

Note 1 to entry: Including, for example, vessels, drones and *pipeline* ([3.1.17](#)), whether driven by an operator or wholly (or partially) autonomous.

3.1.36

vehicle operation

deployment of a *vehicle* ([3.1.35](#)) to fully or partially provide a *transport operation* ([3.1.28](#))

3.2 Terms related to greenhouse gases and energy

3.2.1

carbon dioxide equivalent

CO₂e

unit for comparing the radiative forcing of a *greenhouse gas* (GHG) ([3.2.5](#)) to that of 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* ([3.2.4](#)).

[SOURCE: ISO 14064-1:2018, 3.1.13]

3.2.2

energy carrier

substance or phenomenon that can be used to produce mechanical work or heat or to operate chemical or physical processes

Note 1 to entry: For the purposes of this document, energy carriers can be electricity, fuels (fossil, biofuels, synthetic and blends), steam, heat, compressed air or other similar media, which can be purchased, stored, treated or used in a piece of equipment or in a process, or recovered.

Note 2 to entry: Where required for the quantification of *greenhouse gas activities* ([3.2.6](#)), quantities of energy carriers should be expressed in a manner that is unambiguous for subsequent calculation steps. This may be in units of volume (e.g. litre, m³), mass (e.g. kg) or energy (J, kWh), or multiples thereof.

[SOURCE: ISO 52000-1:2017, 3.4.9, modified — Notes 1 and 2 to entry added.]

3.2.3

energy consumption

quantity of energy applied

Note 1 to entry: Energy consumption is a specific form of *greenhouse gas activity data* ([3.2.7](#)).

[SOURCE: ISO 50001:2018, 3.5.2, modified — Note 1 to entry added.]

3.2.4 global warming potential GWP

index, based on radiative properties of *greenhouse gas (GHG)* (3.2.5), measuring the radiative forcing following a pulse emission of a unit mass of a given GHG in the present-day atmosphere integrated over a chosen time horizon, relative to that of carbon dioxide (CO₂)

[SOURCE: ISO 14064-1:2018, 3.1.12.]

3.2.5 greenhouse gas GHG

gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds

Note 1 to entry: For a list of GHGs, see the latest Intergovernmental Panel on Climate Change (IPCC) Assessment Report^[32].

Note 2 to entry: Water vapour and ozone are anthropogenic as well as natural GHGs but are not included as recognized GHGs due to difficulties, in most cases, in isolating the human-induced component of global warming attributable to their presence in the atmosphere.

[SOURCE: ISO 14064-1:2018, 3.1.1]

3.2.6 greenhouse gas activity GHG activity

activity that results in a *GHG emission* (3.2.8)

EXAMPLE Consumption of energy, refrigerant leakage, methane slip.

3.2.7 greenhouse gas activity data GHG activity data

quantitative measure of *GHG activity* (3.2.6)

[SOURCE: ISO 14064-1:2018, 3.2.1, modified — “GHG activity” replaced “activity that results in a GHG emission or GHG removal”. Example deleted.]

3.2.8 greenhouse gas emission GHG emission

release of a *GHG* (3.2.5) into the atmosphere

Note 1 to entry: It is expressed in mass of *carbon dioxide equivalent* (3.2.1).

Note 2 to entry: GHG emissions are categorized in this document according to their sources, as follows:

- *hub equipment energy provision GHG emissions* (G_{HEEP}) (3.2.8.1);
- *hub equipment operation GHG emissions* (G_{HEO}) (3.2.8.2);
- *packaging life cycle GHG emissions* (G_{PL}) (3.2.8.3);
- *vehicle energy provision GHG emissions* (G_{VEP}) (3.2.8.4);
- *vehicle operation GHG emissions* (G_{VO}) (3.2.8.5);
- *total operation GHG emissions* (G_{TO}) (3.2.8.6);
- *total energy provision GHG emissions* (G_{TEP}) (3.2.8.7);
- *total GHG emissions* (G_{T}) (3.2.8.8).

Note 3 to entry: The symbol notation within this document follows the following procedure: “ $G_{X,Y}$ ” refers to the GHG emissions of category X (“X” being vehicle operation, hub equipment operation, etc.) for Y, where “Y” can be a *transport operation category* (3.1.29), a *hub operation category* (3.1.12), a *transport chain* (3.1.25), a *transport chain element* (3.1.26), or any set thereof.

[SOURCE: ISO 14064-1:2018, 3.1.5, modified — Notes 1, 2 and 3 to entry added.]

3.2.8.1

hub equipment energy provision greenhouse gas emission **hub equipment energy provision GHG emission**

G_{HEEP}

release of a *GHG* (3.2.5) into the atmosphere during the process of producing, storing, processing and distributing an *energy carrier* (3.2.2) for *hub equipment* (3.1.10) operation

3.2.8.2

hub equipment operation greenhouse gas emission **hub equipment operation GHG emission**

G_{HEO}

release of a *GHG* (3.2.5) into the atmosphere as a result of *hub equipment* (3.1.10) operation

3.2.8.3

packaging life cycle greenhouse gas emission **packaging life cycle GHG emission**

G_{PL}

release of a *GHG* (3.2.5) into the atmosphere during the life cycle *processes* (3.4.3) of *packaging* (3.4.2)

3.2.8.4

vehicle energy provision greenhouse gas emission **vehicle energy provision GHG emission**

G_{VEP}

release of a *GHG* (3.2.5) into the atmosphere during the process of producing, storing, processing and distributing an *energy carrier* (3.2.2) for *vehicle operation* (3.1.36)

3.2.8.5

vehicle operation greenhouse gas emission **vehicle operation GHG emission**

G_{VO}

release of a *GHG* (3.2.5) into the atmosphere as a result of *vehicle operation* (3.1.36)

3.2.8.6

total operation greenhouse gas emission **total operation GHG emission**

G_{TO}

sum of *GHG emissions* (3.2.8) from operational *processes* (3.4.3) included in the system boundaries

3.2.8.7

total energy provision greenhouse gas emission **total energy provision GHG emission**

G_{TEP}

sum of *GHG emissions* (3.2.8) from energy provision *processes* (3.4.3) included in the system boundaries

3.2.8.8

total greenhouse gas emission **total GHG emission**

G_T

sum of *GHG emissions* (3.2.8) from all *processes* (3.4.3) included in the system boundaries

3.2.9**greenhouse gas emission factor****GHG emission factor**

coefficient relating *GHG activity data* (3.2.7) with the *GHG emission* (3.2.8)

[SOURCE: ISO 14064-1:2018, 3.1.7, modified — Note 1 to entry deleted.]

3.2.10**greenhouse gas emission intensity****GHG emission intensity**

coefficient relating specified *GHG activity data* (3.2.7) with the *GHG emission* (3.2.8)

Note 1 to entry: It can be expressed as:

- mass carbon dioxide equivalent (CO₂e) per tonne kilometre, or equivalent units, for freight transportation;
- mass CO₂e per tonne for freight hub *throughput* (3.1.21);
- mass CO₂e per passenger kilometre, or equivalent units, for passenger transport;
- mass CO₂e per passenger for passenger hub throughput.

3.2.11**greenhouse gas source****GHG source**

process (3.4.3) that releases a *GHG* (3.2.5) into the atmosphere

[SOURCE: ISO 14064-1:2018, 3.1.2]

3.3 Terms related to quantification**3.3.1****allocation**

partitioning the input or output flows of a *process* (3.4.3) or product system between the product system under study and one or more other product systems

Note 1 to entry: In this document, the definition is understood as partitioning *greenhouse gas (GHG) activity* (3.2.6) or *GHG emissions* (3.2.8) related to *transport operations* (3.1.28) and *hub operations* (3.1.11) with multiple functionalities, between groups of entities (*freight* (3.1.7) and/or *passengers* (3.1.16)) carried or transferred that benefit from the same functionality.

EXAMPLE 1 For an air transport operation with an aircraft carrying both passengers and belly freight, the total GHG emissions of the transport operation can be partitioned between freight and passengers.

EXAMPLE 2 For a sea transport operation on a container ship carrying both dry and reefer containers, the GHG activity for temperature control of reefer containers can be allocated to reefer containers only.

[SOURCE: ISO 14040:2006, 3.17, modified — Note 1 to entry, Example 1 and Example 2 added.]

3.3.2**class factor**

z

ratio based on a calculation, aiming to characterize a class of *passengers* (3.1.16) in comparison with the lowest class

3.3.3**primary data**

quantified value of a *process* (3.4.3) or an activity obtained from a direct measurement or a calculation based on direct measurements

Note 1 to entry: Primary data can include *greenhouse gas (GHG) emission factors* (3.2.9) and/or *GHG activity data* (3.2.7).

[SOURCE: ISO 14067:2018, 3.1.6.1, modified — Note 1 to entry deleted. Note 2 to entry renumbered as Note 1 to entry.]

3.3.4

secondary data

data which do not fulfil the requirements for *primary data* ([3.3.3](#))

Note 1 to entry: Secondary data can include data from databases and published literature, default *greenhouse gas emission factors* ([3.2.9](#)) from national inventories, calculated data, estimates or other representative data, and data obtained from proxy processes or estimates.

Note 2 to entry: In this document, secondary data are either *modelled data* ([3.3.4.1](#)) or *default value* ([3.3.4.2](#)).

[SOURCE: ISO 14067:2018, 3.1.6.3, modified — “greenhouse gas” and “and data obtained from proxy processes or estimates” added, and “validated by competent authorities” deleted in Note 1 to entry. Note 2 to entry replaced.]

3.3.4.1

modelled data

data established by use of a model that takes into account *primary data* ([3.3.3](#)) and/or greenhouse gas (GHG) emission-relevant parameters of a *transport operation* ([3.1.28](#)) or *hub operation* ([3.1.11](#))

Note 1 to entry: Relevant parameters can be vehicle size, *load factor* ([3.1.15](#)), fuel type and quality, topography, speed, etc., thereby reflecting a representative value of the transport operation's *GHG emissions* ([3.2.8](#)).

3.3.4.2

default value

secondary data ([3.3.4](#)) value drawn from a published source

Note 1 to entry: Such values can be established by use of a model, but they will not necessarily correspond to the greenhouse gas emission-relevant parameters of the *transport operation* ([3.1.28](#)) or *hub operation* ([3.1.11](#)) being evaluated.

Note 2 to entry: See [Annex Q](#) for examples of sources for default values.

3.3.5

distance adjustment factor

DAF

ratio between the *actual distance* ([3.1.27.1](#)) and the *transport activity distance* ([3.1.27.4](#)), related to same origin and destination locations

EXAMPLE Ratio between “actual distance” and “*shortest feasible distance*” ([3.1.27.3](#)).

3.3.6

cut-off criteria

specification of the amount of material or energy flow or the level of significance of *greenhouse gas (GHG) emissions* ([3.2.8](#)) associated with unit *processes* ([3.4.3](#)) or the *transport chain* ([3.1.25](#)) to be excluded from a GHG quantification

Note 1 to entry: See [5.2.3](#) for examples.

Note 2 to entry: “Energy flow” is defined in ISO 14040:2006, 3.13.

[SOURCE: ISO 14044:2006, 3.18, modified — “significance of greenhouse gas (GHG) emissions” has replaced “environmental significance”, “the transport chain” has replaced “product system”, “GHG quantification” has replaced “study”. Notes to entry added.]

3.3.7

passenger equivalent

peq

unit of quantification of *freight* ([3.1.7](#)), *passengers* ([3.1.16](#)) and passenger vehicles in the case of combined *transport* ([3.1.23](#)) of freight with passengers, for which each of these entities is compared to an average passenger

3.3.8**passenger of lowest class equivalent**

plceq

unit of quantification of *passengers* (3.1.16) in the case of passenger transport with different classes, for which passengers of each class are compared to a passenger in the lowest class

3.4 Other terms**3.4.1****offsetting**

mechanism for compensating for *greenhouse gas (GHG) emissions* (3.2.8) of a *process* (3.4.3) through the prevention of the release of, reduction in, or removal of, an equivalent amount of GHG emissions in a process outside the boundary of the process system

[SOURCE: ISO 14021:2016, 3.1.12, modified — “greenhouse gas (GHG) emissions of a process” replaced “the carbon footprint of a product” and “process system” replaced “product system”.]

3.4.2**packaging**

materials used for the containment, protection, handling, delivery and presentation of *freight* (3.1.7)

Note 1 to entry: Packaging may be further categorized into:

- primary packaging, which is designed to come into direct contact with the product;
- secondary packaging, which is designed to contain one or more products together with any primary packaging required;
- *transport packaging* (3.4.4).

3.4.3**process**

set of interrelated or interacting activities that transforms inputs into outputs

[SOURCE: ISO 14044:2006, 3.11]

3.4.4**transport packaging**

tertiary packaging

distribution packaging

protective packaging

packaging (3.4.2) designed to contain one or more articles or packages, or bulk material, for the purposes of *transport* (3.1.23), handling and/or distribution

Note 1 to entry: Transport packaging does not include road, rail, ship and air containers.

4 General principles**4.1 General**

The application of principles is fundamental to ensure that GHG-related information is a true and fair account. The principles are the basis for, and will guide the application of, the requirements in this document.

4.2 Relevance

Select the GHG sources, data and methodologies appropriate to the needs of the intended user.

4.3 Completeness

Include all relevant GHG emissions, subject to cut-off criteria, as described in [5.2.3](#).

4.4 Consistency

Enable meaningful comparisons in GHG-related information.

4.5 Accuracy

Reduce bias and uncertainties as far as is practical.

4.6 Transparency

Disclose sufficient and appropriate GHG-related information to allow intended users to make decisions with reasonable confidence.

4.7 Conservativeness

When assessing comparable alternatives, use a selection of data that is cautiously moderate.

5 Quantification principles

5.1 General

The requirements as outlined below determine the approach set out in the subsequent clauses of this document:

- The methodology for calculating GHG emissions shall be substantively similar for each transport mode or hub across passenger and freight operations.
- All GHG emissions resulting from transport chain operation shall be treated equally, irrespective of the energy carrier used.
- All GHG emissions shall be assigned across the passengers and/or freight carried or transferred.
- In cases of unavoidable divergence, the sum of calculated GHG emissions shall not be less than the total GHG emissions calculated.

In cases where national or international legislative bodies stipulate the use of a specific quantification methodology that takes precedence over this document, the processes of the legislative approach shall be clearly documented.

[Annexes A](#) to [H](#) include further specifications that shall be followed for transport modes (air, cable car, inland waterway, pipeline, rail, road, sea) and hubs, respectively. Reference values for GHG emission factors are presented in [Annex K](#) together with guidance on their production in [Annex J](#).

5.2 System boundaries

5.2.1 Transport operations and hub operations included

The quantification of GHG emissions shall include all transport operations by the following modes and means, as well as the hub operations that precede, follow or link them together (see [Figure 1](#) and [Figure 2](#) for illustrative examples):

- air transport;
- cable car transport;

- inland waterway transport;
- pipeline transport;
- rail transport;
- road transport;
- sea transport.

Transport of passengers by lift, escalator, conveyor belt, moving walkway, etc. and transport of freight by forklift, pallet truck, etc. shall be part of hub operations.

5.2.2 Processes included

The quantification of GHG emissions of a transport chain shall include the following processes, which produce GHG by combustion or by leakage, regardless which organization operates them:

- vehicle operational processes;
- hub equipment operational processes;
- vehicle energy provision processes;
- hub equipment energy provision processes;
- loaded and empty trips made by vehicle, hence including diversionary and/or out-of-route distance;
- start-up and idling of vehicles, pipelines, transshipment and (de)boarding equipment;
- cleaning/flushing operations for pipelines;
- combustion and/or leakage of energy carriers at vehicle or hub equipment level;
- leakage of refrigerants used by vehicles or hubs.

EXAMPLE 1 For the following vehicles using two different energy carriers, both energy carriers are taken into account for the calculation: road vehicle using liquefied petroleum gas (LPG) and gasoline, road vehicle using electricity (plug in) and gasoline, ship using heavy fuel oil (HFO) and marine diesel oil (MDO).

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

EXAMPLE 2 Main engines, auxiliary equipment used to maintain the temperature and/or functionality of the freight and/or passenger space are on-board devices used to facilitate loading or unloading of the vehicle.

NOTE Auxiliary units also include those used to power refrigerated containers when not connected to the primary vehicle energy source or grid; e.g. chassis generators.

Hub operational processes shall include operation of all handling, on-site transportation, transshipment and (dis)embarking equipment and facilities, including heating and temperature control.

Through the use of recommended or best available (e.g. national) GHG emission factors, the energy operational processes shall include the following:

- For solid, liquid and gaseous energy carriers: Production and dismantling of energy source infrastructure, e.g. power plant manufacture, extraction or cultivation of primary energy, chemical processing, transport and distribution (including pipeline) of energy at all steps of the production of the energy carrier used.
- For electricity: Extraction, processing and transport of primary energy, power generation, power generation infrastructure, e.g. solar panel or wind turbine manufacture, grid losses associated with transmission and distribution of electricity.

Where best available GHG emission factors do not include production and dismantling of energy source infrastructure this shall be noted in the reporting, (see [Clause 13](#)), in accordance with the cut-off criteria guidance in [5.2.3](#).

5.2.3 Application of cut-off criteria

In general, all processes and flows that are attributable to the analysed system shall be included.

The omission of processes, inputs or outputs from the calculation are not permitted as a general rule. Any decisions to omit processes, activities, inputs or outputs shall be clearly stated; the reasons for and implications of their omission shall be explained. Reference to the use of cut off criteria shall be made if relevant.

Application of cut-off criteria to a given transport chain can rely on the following three possible quantifications:

- a) Transport activity: inclusion in the study of all inputs that cumulatively contribute more than a defined percentage of the transport activity within the transport chain.
- b) Energy: inclusion in the study of all inputs that cumulatively contribute more than a defined percentage of the transport activity within the transport chain.
- c) Environmental significance: inclusion of all GHG sources that cumulatively contribute more than a defined percentage of the GHG emissions of the transport chain.

NOTE This percentage can be specified by national regulations.

5.2.4 Processes not included

The quantification of GHG emissions of a transport chain shall not include, in particular:

- production and supply processes of refrigerants;
- waste produced;
- processes at the administrative (overhead) level of the organizations involved in the transport services;
- processes for the construction (e.g. embedded GHG emissions associated with vehicle production), maintenance, and scrapping of vehicles or transshipment and (de)boarding equipment;
- processes of construction, service, maintenance, and dismantling of transport infrastructures used by vehicles (e.g. roads, inland waterways, rail infrastructure) or transshipment and (de)boarding infrastructure;
- businesses co-located within a hub such as retail and hospitality services, whose functions are severable and incidental to the transportation operation of the hub.

5.2.5 Optional processes

The annexes include specifications for optional elements that can be quantified in addition to the core elements of the GHG calculation. Where these optional elements are calculated, this shall be clearly stated. Guidance regarding the use of default GHG emission intensities is provided for reference purposes in [Annex Q](#).

The following processes may be included in the calculation:

- storage of freight at hubs, such as warehousing;
- use of information and communications technology (ICT) equipment and data servers related to transport and/or hub operations (see [Annex N](#));

— (re)packing (see [Annex O](#)).

5.2.6 Optional quantification of black carbon emissions from transport operations

In addition to the quantification of GHG emissions, the user may estimate black carbon emissions from transport operations (see [Annex P](#)).

5.2.7 Carbon offsetting and GHG emissions trading

Outcomes from carbon offsetting actions or GHG emissions trading (e.g. under the European Union Emissions Trading System (EU ETS)^[31]) shall not be taken into account for quantification and reporting of GHG emissions from transport operations.

5.3 Conversion of energy carrier data into GHG emissions

5.3.1 General

Quantification of the conversion of energy carriers (used to power transport operations and associated auxiliary processes or to facilitate hub operations) into GHG emissions shall be done using the corresponding GHG emission factor, expressed as the mass of CO₂ equivalent per amount of energy carrier consumed. [Annex J](#) provides requirements and guidance on GHG emission factors.

NOTE [Annex R](#) provides a table that shows the relationship between the GHG emission scopes used in the GHG Protocol^[16] and the categorization of GHG emissions as used in this document.

5.3.2 Global warming potential

For the release of GHGs to the atmosphere, the global warming potential (GWP) acts as the conversion factor from the mass of gas released to the mass of CO₂ equivalent.

The source of the GHG factors shall be clearly stated and used consistently. The IPCC's latest GWP with a 100 year perspective (not including climate-carbon feedback) should be used.^[34] Any deviation should be explained.

5.4 Calculation of transport activity

5.4.1 Passenger transport

The transport activity for passenger transportation shall be the number of passengers multiplied by the transport activity distance. The quantity of passengers shall account for all individual passengers carried per transport operation plus their baggage.

NOTE For non-commercial transport (e.g. driving an owned vehicle or self-drive hire), the driver and any persons participating in the operation of the vehicle are included in the quantity of passengers. For commercial transport (e.g. taxis, trucks, trains), these people are not included in the quantity of passengers.

The transport activity distance shall be either the shortest feasible distance (SFD) or the great circle distance (GCD). In situations where the transport activity distance travelled by each passenger is unknown, passenger transport activity can be calculated by multiplying the number of passengers by the mean actual distance travelled by passengers on journeys included within this transport operation category (TOC).

The standard unit for expressing distance shall be the kilometre (km). Where alternative systems are in use (e.g. miles or nautical miles), these units may be used.

5.4.2 Freight transport

The transport activity for freight transportation shall be the quantity of freight multiplied by the transport activity distance.

The quantity of freight shall be the actual freight mass. The standard unit for expressing units of mass (e.g. quantities of freight) shall be kg or metric tons (1 000 kg or tonnes). Where alternative systems are in use (e.g. pounds and tons) these units may be used as long as this is unambiguously signalled.

NOTE 1 The phrase “ton” is commonly and incorrectly used to denote 1 000 kg, a mistake that can lead to systematic inaccuracies in calculation and reporting. The correct phrases for 1 000 kg are tonne or metric ton.

In specific circumstances (post and parcels operations and containerized transport) alternatives to the standard units for the quantity of freight may be used. If such a choice is made, it shall be clearly documented.

NOTE 2 In these circumstances any references to tonne kilometres in the text of this document can be considered as twenty-foot equivalent unit (TEU) kilometres or item kilometres as appropriate for calculation purposes unless indicated otherwise.

For post and parcel operations, where knowledge of individual items is limited, the quantity of freight may be the number of items.

For container transport, the quantity of freight may be the number of freight number of TEUs. Where such a choice is made, the mass of freight should be calculated using the actual mass of freight per TEU, if known, or otherwise using an average mass per TEU. Any such choice should be justified and documented.

NOTE 3 Alternate container types and sizes exist, e.g. one standard 40-foot ISO Series container is equivalent to two TEUs; one ISO Series 45-foot container is equivalent to 2,25 TEUs; one high cube 40-foot container is equivalent to 2,25 TEUs.

Where the actual mass of freight per TEU is not known, a standard conversion factor of 10 tonnes per TEU may be used (so 20 tonnes for a 40-foot container). Alternatively, a value of 6 tonnes may be used for lightweight cargo or 14,5 tonnes for heavyweight cargo if the use of these categories can be justified.

The quantity of freight shall include the mass of the packaging initially provided by the organization responsible for sending a consignment, and shall not include any additional transport packaging, pallets or containers used by the transport operator specific to the transport operation in question.

In cases of slurry pipelines, the mass of freight shall not include the transport medium (e.g. water).

The transport activity distance shall be either the SFD or the GCD. In cases where the transport operator does not have access to the SFD or the GCD, the actual distance and a distance adjustment factor (DAF), as described in [5.4.4](#) and [10.4](#), should be used.

The specific case of the transport activity distance for collection and delivery rounds is described in [F.4.2](#).

NOTE 4 Those who are inexperienced in calculating transport activity can easily make a mistake. The result of multiplying the total mass of all consignments by the total transport distance travelled by all the consignments is a significant over-estimate of the transport activity. The result of multiplying the average mass of all consignments by the average transport distance travelled by all the consignments can introduce a significant error in the estimation of the transport activity. See GLEC Framework,^[15] for further information.

The standard unit for expressing distance shall be the kilometre (km). Where alternative systems are in use (e.g. miles or nautical miles), these units may be used.

5.4.3 Combined transport of freight and passengers (including passenger vehicles)

The transport activity for combined transport of freight and passengers (including passenger vehicles where appropriate) shall be the quantity of freight and passengers multiplied by the transport activity distance.

Two options can be required when considering the quantity of freight and passengers for combined transport of freight and passengers. The first option can be used both for allocation and for the calculation of GHG emission intensity. The second option may only be used for allocation in situations where the data needed to apply the first option is not available.

In the first option:

- the quantity of passengers shall be the total passenger mass (as defined in [8.4.7](#));
- the quantity of passenger vehicles shall be the mass of these vehicles;
- the quantity of freight shall be the actual freight mass.

In the second option:

- each passenger is counted as one passenger equivalent;
- the quantity of passenger vehicles shall be the number of passenger equivalents of these vehicles (guidance on passenger-equivalent values for different types of passenger vehicles is provided in [Annexes E](#) and [G](#));
- the quantity of freight shall be the number of passenger equivalents (guidance on passenger-equivalent values for freight transport is provided in [Annexes E](#) and [G](#)).

The quantity of passengers shall account for all individual passengers carried per transport operation plus their baggage.

The quantity of freight shall include the mass of the packaging initially provided by the organization responsible for sending a consignment, and shall not include any additional transport packaging, pallets or containers used by the transport operator specific to the transport operation in question.

The transport activity distance shall be either the SFD or the GCD. In cases where the transport operator does not have access to the SFD or the GCD, the actual distance and a DAF, as described in [5.4.4](#) and [10.4](#), should be used.

5.4.4 Use of distance adjustment factor

A DAF shall be used each time the actual distance is used in the calculation of transport activity. The DAF is used by multiplication of the actual distance by a specific DAF value.

The DAF serves to increase the transport activity distance used in the calculation of GHGs to allow for systematic differences between the actual distance and the SFD or the GCD.

Recommended values of the DAF are provided for different modes in [Annexes A](#) to [G](#).

NOTE In cases where the actual distance and the transport activity distance correspond, the DAF can equal 1.

5.5 Calculation of hub activity

5.5.1 Passenger hub

The hub activity for passenger shall be the number of passengers.

5.5.2 Freight hub

The hub activity for freight shall be the quantity of freight (outbound). In specific circumstances, alternative units for the quantity of freight may be used in addition to the standard units.

EXAMPLE For maritime container hubs, the number of containers or the number of TEUs.

The quantity of freight shall include the mass of the packaging initially provided by the organization responsible for sending a consignment, and shall not include any additional transport packaging, pallets or containers used by the transport operator specific to the transport operation in question.

5.5.3 Combined freight and passenger hub (including passenger vehicles)

The hub activity for combined freight and passenger hubs (including passenger vehicles where appropriate) shall be the quantity of passengers and the quantity of freight (outbound).

The quantity of passengers shall account for all individual passengers plus their baggage. The quantity of passengers shall be the total passenger mass (first option) or the number of passenger equivalents (second option).

With the second option, each passenger is counted as one passenger equivalent.

The quantity of passenger vehicles shall be either the mass of these vehicles (first option) or the number of passenger equivalents (second option).

If a value for total mass of these vehicles is not available, the second option should be used. Passenger-equivalent values for different types of passenger vehicles are provided in [Annexes E](#) and [G](#).

The quantity of freight shall be either the actual freight mass (first option) or the number of passenger equivalents (second option). Guidance on passenger-equivalent values for freight transport is provided in [Annexes A](#), [E](#) and [G](#).

The quantity of freight shall include the mass of the packaging initially provided by the organization responsible for sending a consignment, and shall not include any additional transport packaging, pallets or containers used by the transport operator specific to the transport operation in question.

5.6 Allocation

5.6.1 General

Allocation may be implemented when multiple functionalities are fulfilled by the same vehicle or hub, and all passengers and/or freight carried do not benefit equally.

Wherever possible, allocation should be avoided by dividing the process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes.

In circumstances where it is required, allocation shall partition GHG sources or GHG emissions between the freight and/or passengers that benefit equally from the same functionality.

The implementation of the partitioning between these groups shall consider the different needs of GHG sources and the different GHG emissions resulting from these needs.

EXAMPLE Within a truck carrying ambient and refrigerated freight, the energy consumption for cooling and the leakage of refrigerants are partitioned between these two groups with consideration of this difference of temperature.

The transport or hub activity of each group may be used for this partitioning, but other criteria and parameters can be necessary. Once set, the allocation parameter used within a given TOC or hub operation category (HOC) shall remain constant.

5.6.2 Allocation between passengers and freight

For combined transport of passengers (including their vehicles where appropriate) and freight, the transport or hub activity should be used for allocation, in combination with the passenger-equivalent unit.

5.6.3 Allocation between passengers of different travel classes

For transport of passengers with different classes, the transport or hub activity should be used for allocation, in combination with the passenger of lowest class equivalent unit.

5.6.4 Allocation between ambient and temperature-controlled freight

For freight with different temperature conditions, the GHG activity data related to temperature control for each group of temperature conditions should be collected and used for allocation, when such association of data per group is feasible. If not, the transport or hub activity shall be used for allocation, each entity of freight being quantified with a unit of equivalence based on ambient freight.

6 General principles related to transport chains, transport chain elements, transport operation categories and hub operation categories

6.1 Transport chains and TCEs

As set out in [Clause 5](#), for the purposes of GHG quantification, the transport chain shall be broken down into the discrete, sequential TCEs that reflect the related vehicle types, pipelines or hubs that carry, handle or transfer the freight and/or the passengers as part of the whole transport chain.

EXAMPLE 1 When a passenger first travels by bus, then by metro and finally using a second bus, with the same ticket, the corresponding transport chain is composed of five elements, including the intermediate hubs such as bus or metro stations.

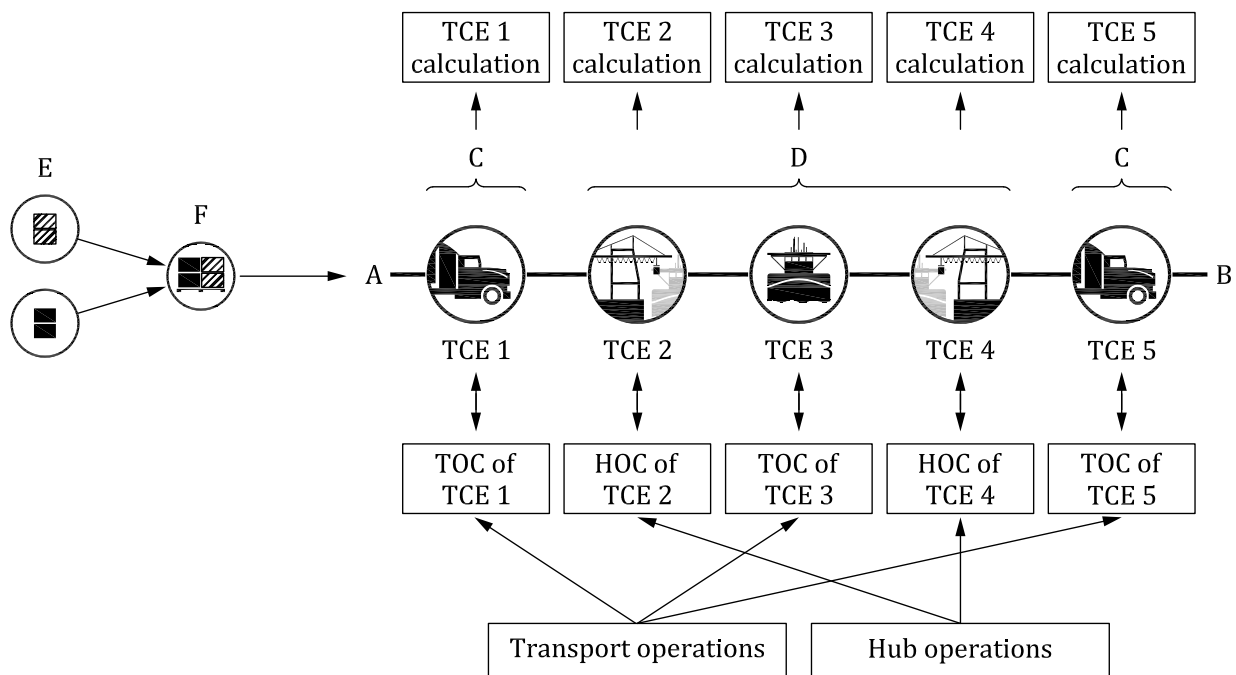
EXAMPLE 2 When a passenger first travels by local bus and then by long-distance bus, then the corresponding transport chain is composed of either two or three elements, depending on whether there is a hub (bus station) at the point of transfer between buses.

EXAMPLE 3 When a shipment first travels by truck, then is cleared and handled for export at the airport, flown to a different country, cleared and handled for import at the airport, transported by train, reloaded and handled, and finally brought by truck to its final destination, the corresponding transport chain is composed of seven elements, including the intermediate hubs such as airport handling terminals and the logistics hub at the interface rail/truck.

6.2 Transport operations and hub operations related to TCEs

Each TCE shall be related to a corresponding transport operation or hub operation, which is the operation of the vehicle(s) or the hub (s) for this TCE.

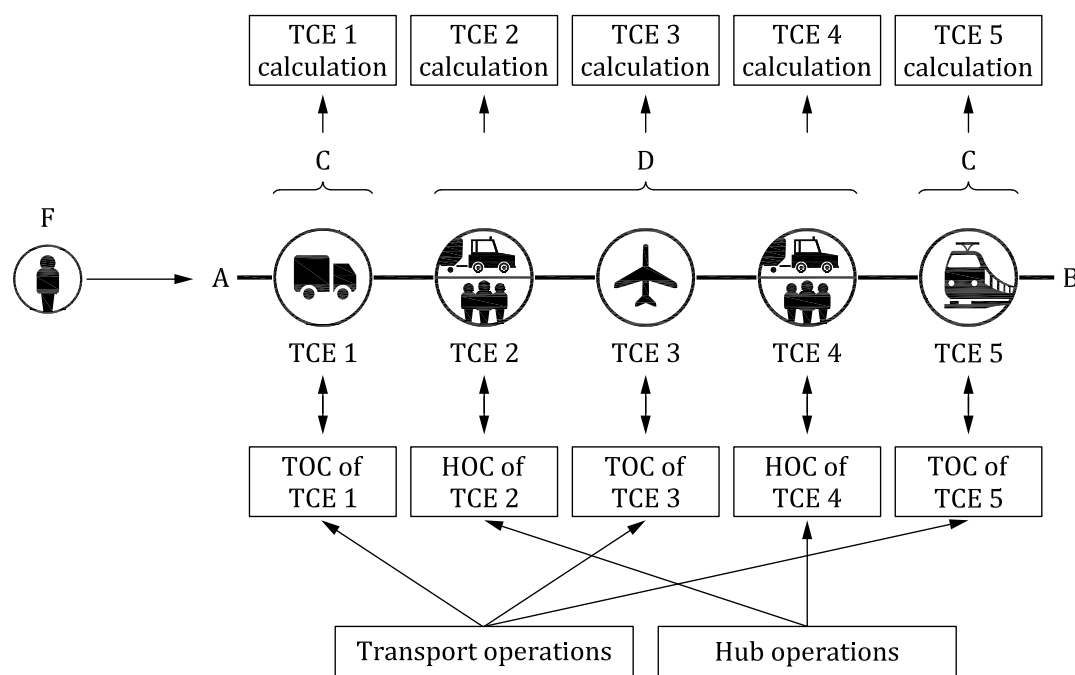
The relationship between TCEs, transport operations and hub operations is illustrated in [Figure 4](#) for freight transportation and in [Figure 5](#) for a passenger transport chain.



Key

- A cargo consignor
- B cargo consignee
- C road services
- D maritime shipping service
- E shipment
- F consignment

Figure 4 — Diagrammatic relationship between operations and TCEs for an example freight transport chain



Key

- A origin
- B destination
- C private car
- D air travel service
- F passenger

Figure 5 — Diagrammatic relationship between operations and TCEs for an example passenger transport chain

6.3 Transport operation categories and hub operation categories

6.3.1 General

Any single transport operation or hub operation shall always be considered in the context of the overall system in which it takes place. The concept of a TOC or a HOC, as a group of operations sharing similar characteristics, in a defined time period (up to one year), is the key reference point for the calculation of the GHG emissions of a TCE. The characteristics of each TOC/HOC shall reflect the combined characteristics of the transport mode, hub type and the freight/passengers, as required to meet the relevant contractual agreement.

6.3.2 Transport operation categories

6.3.2.1 Categorization of transport operations into TOCs

When defining the characteristics of a TOC, consideration shall be given to factors that affect the scale and composition of the TOC, for example:

- number and type of vehicles, or length and type (diameter) of pipeline, to be included in the TOC;
- nature and consistency of the vehicle or pipeline operations included;
- any processes associated with maintaining the condition of the freight (e.g. temperature control);
- (freight transport only) nature of the freight carried;

- period of activity of the vehicles or pipelines in the TOC.

[Annexes A](#) to [G](#) provide further examples of how such characteristics can be combined to establish TOCs.

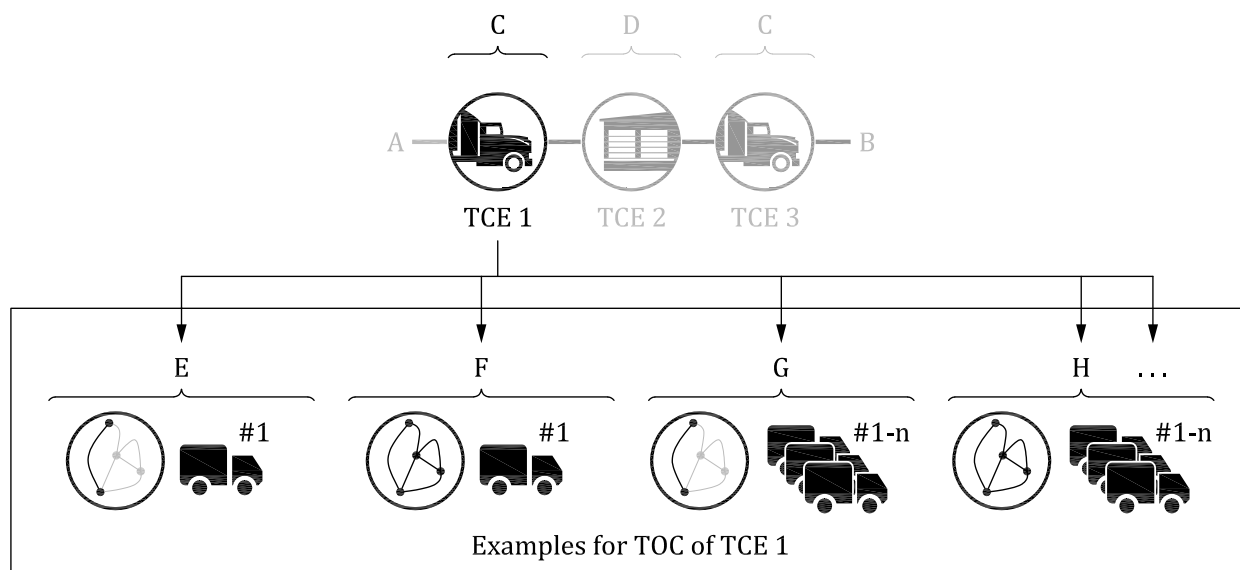
TOCs can have different levels of granularity, for example:

- TOC of a single vehicle on a single journey or specific schedule;
- TOC of a single vehicle in multiple schedules/trade lanes, based on network/trade lane characteristics;
- TOC of a specific vehicle type in a single schedule;
- TOC of a specific vehicle type in multiple schedules/trade lanes;
- TOC of a specified group of vehicles in a single schedule;
- TOC of a specified group of vehicles in multiple schedules/trade lanes.

A TOC shall fully include each transport operation, meaning that a transport operation shall not be split between two TOCs, even if this relates to two TCEs (e.g. a TCE for passengers and a TCE for freight) carried by the same vehicle.

A single TOC can include transport operations with vehicles using different energy carriers for propulsion, e.g. a container line operator uses vessels, some powered by MDO and some powered by liquefied natural gas (LNG), interchangeably on a given trade lane.

[Figure 6](#) provides examples to establish TOCs for an example transport chain of freight from the origin (A, cargo consignor) to the destination (B, consignee). The first and last transport chain element (TCE 1, 3) represent road services C, TCE 2 represents hub operation (D). In this step, the user shall establish a relevant TOC for TCE 1, e.g. a single vehicle in a single schedule E or in a multiple schedule (F), a specific vehicle type in single schedule (G) or in a multiple schedule (H), etc.



Key

- A cargo consignor
- B consignee
- C road services
- D hub operation
- E single schedule
- F multiple schedules
- G specific vehicle type in single schedule
- H specified group of vehicles in multiple schedules

Figure 6 — Diagrammatic relationship between operations and TCEs for an example freight transport chain

Transport operations which constitute a TOC should include entire round trips made by the vehicles in order to balance out GHG emissions within asymmetric transport flows. Hence, any GHG emission calculation performed by the user of a transport service cannot be performed in isolation from knowledge of the TOC. The calculation shall be based on information provided by the transport or hub operator or transport service organizer or the appropriate default values that takes into consideration all defining characteristics of the TOC.

An exception to this is when a vehicle or vessel is chartered to perform a one-way journey that can be specifically identified within both the transport operator's and transport purchaser's systems. Pipelines are another exception due to the fixed nature of the infrastructure.

NOTE 1 A roundtrip does not require an immediate return to the point of origin. It can be a group of sequential journeys that start and finish in the same place. For a train, that can be its depot at start and end of the day.

NOTE 2 Pipeline TOCs are not concerned by this recommendation, as their transport operations are not performed by moving vehicles.

For the benefit of specific investigations and analysis, the TOC can be limited to the transport operation itself and taken individually.

EXAMPLE 1 A transport user needing to quantify the effect (on load factor, energy consumption and finally GHG emissions) of different palletizations of their products, between their factory and their distribution centre, for a full-truck load.

The TOC should include loaded trips (possibly with varying loading levels) and all the empty trips related to them. Hence, the GHG emissions for a single transport or hub operation cannot be calculated

without reference to the TOC or HOC in which it takes place. This means, for example, the GHG emissions from point A to point B for a full truckload truck cannot be calculated without taking into consideration the movements and transport operations of this truck before A and after B that make a complete match to the TOC definition. It is therefore crucial to create transparency on the TOC definition and its level of granularity.

Where empty containers, roll cages or pallets are transported on behalf of a purchaser of transport services for the purpose of relocation in order to move a new load they become a consignment in their own right and GHG emissions should be assigned to them accordingly. In cases where these GHG emissions cannot be assigned to a specific purchaser or transport service, GHG emissions shall be allocated to the network.

NOTE 3 The approaches to inclusion of empty trips and round-trip characteristics depend on the level of detail used to specify the TOC.

NOTE 4 If the fleet and the operation types are homogeneous, then the whole activity of the fleet of a transport operator over one year can be the TOC for all operations performed by this fleet.

Different processes, among those listed in [5.2.2](#), can be distinguished within a single movement of a vehicle, in circumstances where they are dedicated to only a part of freight and/or passengers. A single TOC can include transport operations with different categories of freight or passengers in terms of requirements, such as temperature control for freight or classes for passengers.

EXAMPLE 2 If a container ship carries both ambient (“dry”) containers and temperature-controlled (“reefer”) containers, the operation of this container ship is included in a single TOC. Different GHG emission intensities are established within the TOC for the ambient and temperature-controlled consignments to reflect the additional energy consumption of the temperature control processes.

To implement the next steps of the calculation, each TOC shall be identified as part of one of the following types:

- TOC of passengers only (general case);
- TOC of freight only (general case);
- TOC of passengers only with multi-classes vehicles;
- TOC of freight only with multi-temperature vehicles;
- TOC of vehicles with passengers, passenger vehicles and freight;
- TOC of any other case.

6.3.2.2 Associating a TOC with a transport operation

Each transport operation shall be associated with an existing TOC.

6.3.3 Hub operation categories

6.3.3.1 Categorization of hub operations into HOCs

When defining the parameters of a HOC, consideration shall be given to factors that affect the scale and composition and characteristics of the HOC such as:

- number and type of hub operations contributing to the HOC;
- for freight: e.g. handling of freight, (un-) loading, (de-) boarding, transport on-site;
- for passenger: e.g. transfer on-site, (de-)boarding equipment, handling of luggage;
- nature and consistency of the hub operations included in the HOC (e.g. electrified or non-electrified);

- inbound and outbound transport mode and relevance of intermodal change;
- any processes essential for maintaining the condition of the freight or ensuring passenger health and safety;
- for freight: e.g. temperature control, repacking (see [Annex O](#));
- for passenger: e.g. air conditioning;
- for freight: nature of the freight handled (e.g. palletized, containerized, piece good).

HOCs can have different levels of granularity, for example:

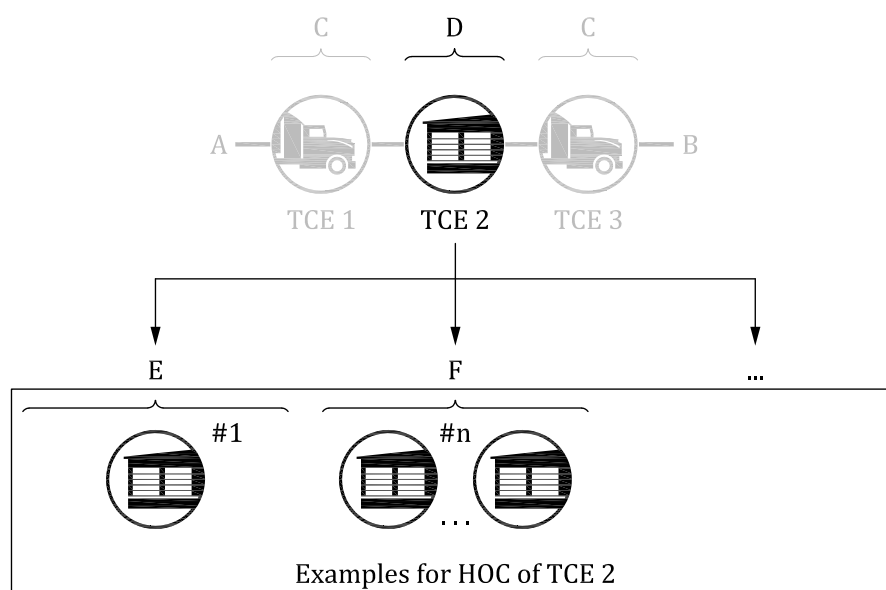
- HOC of a single hub;
- HOC of a specific hub type.

A HOC may include freight and passengers, mainly when they transit via the same hub.

A HOC shall fully include each hub operation, meaning that a hub operation shall not be split between two HOCs, even if this operation simultaneously benefits different TCEs (e.g. TCEs for passengers and freight, TCEs for ambient and temperature-controlled freight).

A hub may perform different hub operations that form part of different HOCs.

[Figure 7](#) provides examples to establish HOCs for an example transport chain of freight from the origin (A, cargo consignor) to the destination (B, consignee). The first and last transport chain element (TCE 1, 3) represent road services C, TCE 2 represents hub operation (D). In this step, the user shall establish a relevant HOC for TCE 2, e.g. a single hub E or various hubs (F) within a network, etc.



Key

- A cargo consignor
- B consignee
- C road services
- D hub operation
- E single hub
- F multiple hubs on one hub type

Figure 7 — Example transport chain of freight highlighting the potential HOC definitions