Content

General framework

Procedure

Screening phase (step 1)

Calculation of emissions

Road transport
Rail transport
Air transport
Maritime navigation
Inland navigation
Logistics sites
Administration
Employee commuting
Business travel
Road transport may be realized

a) In own vehicles
b) In vehicles leased and operated by the reporting company (and not already included in scope 1 & 2)
c) As sub-contracted services (external transport)

<table>
<thead>
<tr>
<th>Activities covered</th>
<th>Scope of emissions&lt;sup&gt;(1)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation (goods transportation incl. empty trips), including</td>
<td>a) Scope 1 (for fuel use (diesel, gasoline, H₂)), Scope 2 (for electricity use)</td>
</tr>
<tr>
<td>– Drive energy</td>
<td>b) Scope 3, category 8 “Upstream leased assets”</td>
</tr>
<tr>
<td>– If any: refrigeration of goods with extra tank (e.g., articulated trailer)</td>
<td>c) Scope 3, category 1 “Purchased goods and services”</td>
</tr>
<tr>
<td>Loss of refrigerants in case of refrigeration of goods</td>
<td>a) Scope 1</td>
</tr>
<tr>
<td></td>
<td>b) and c) Scope 3, category 1 “Purchased goods and services”</td>
</tr>
<tr>
<td>Supply of fuels (production and distribution to fuel station)</td>
<td>Scope 3, category 3, „Fuel and energy related activities, not included in scope 1 or scope 2“</td>
</tr>
<tr>
<td>Production of</td>
<td>Scope 3, category 1 „Purchased goods and services“</td>
</tr>
<tr>
<td>– Vehicles purchased or acquired by the reporting company</td>
<td>Scope 3, categories</td>
</tr>
<tr>
<td>– Road infrastructure</td>
<td>4 „Upstream transportation and distribution“</td>
</tr>
<tr>
<td></td>
<td>2 “Capital goods”</td>
</tr>
</tbody>
</table>
Definition of calculation approach

Is it a scope 1/2 or a relevant scope 3 process? 
- no → Is activity data (consumption of energy carrier) on-hand? 
  - yes → Approach A  
  - no → Is data on distance, load factor of transport service on-hand? 
    - yes → Approach B  
    - no → Industry average

- yes

Company-specific
Input data required for calculating emissions

- Approach A: quantity of consumed energy carrier (e.g., diesel, gasoline, gas, electricity); transport performance; if refrigeration\(^{(1)}\): quantity of additional consumed fuels, quantity of refilled refrigerants (in case of loss)
- Approach B: total transport distance, distance of empty trips, average load factor and transport capacity or average payload, operating fleet; if refrigeration\(^{(1)}\): quantity of additional consumed fuels, quantity of refilled refrigerants (in case of loss)
- Approach C: transport performance; if refrigeration\(^{(1)}\): differentiated between ambient and refrigerated transport

Optional: Input data required for allocation of emissions (step 3)\(^{(2)}\)

- Quantity of passenger transport \([\text{pkm}]\) in case of combined freight and passenger transport (e.g. belly freight within air transport)
- Transport performance \([\text{tkm}]\) of ambient and refrigerated freight transport
- Database for company-specific allocation factor \(\gamma\) (refrigerated transport) see Annex

\(^{(1)}\) For refrigerated transport: see further background information in Annex

\(^{(2)}\) Depending on assessment scope and allocation objective
Calculation of road transport emissions

### Calculation rules

<table>
<thead>
<tr>
<th>A</th>
<th>( E_{t}^{\text{road}}(A) = \sum Q_{ec} * EFA_{ec} + \sum Q_{refr} * EFA_{refr} + \sum m_g * (d_g + d_e) * (EFA_v^{\text{road}} + EFA_{inf}^{\text{road}}) ) with ( Q_{ec} = d_g * q_{ec}^{\theta} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>( E_{t}^{\text{road}}(B) = \sum Q_{ec} * EFA_{ec} + \sum Q_{refr} * EFA_{refr} + \sum m_g * (d_g + d_e) * (EFA_v^{\text{road}} + EFA_{inf}^{\text{road}}) ) with ( Q_{ec} = d_g * q_{ec}^{%} + d_e * q_{ec}^{e} ) and e.g. ( q_{ec}^{%} = q_{ec}^{100%} - (q_{ec}^{100%} - q_{ec}^{e}) \frac{(m_g^{100%} - m_g^{%})}{(m_g^{100%} - m_g^{%})} )</td>
</tr>
<tr>
<td>C</td>
<td>( E_{t}^{\text{road}}(C) = \sum m_g * (d_g + d_e) * (EFA_t^{\text{road}} * (1 + %tkm_{refr} * (c_{refr}^{\text{road}} - 1)) + EFA_v^{\text{road}} + EFA_{inf}^{\text{road}}) )</td>
</tr>
</tbody>
</table>

---

For recommended databases for approach B see »Supplement«.

Calculation of the overall road transport emissions (2)

\( E_{t,\text{total}}^{\text{road}} = E_{t}^{\text{road}}(A) + E_{t}^{\text{road}}(B) + E_{t}^{\text{road}}(C) = E_{t}^{\text{road, int}}(A) + E_{t}^{\text{road, ext}}(A) + E_{t}^{\text{road, int}}(B) + E_{t}^{\text{road, ext}}(B) + E_{t}^{\text{road, int}}(C) + E_{t}^{\text{road, ext}}(C) \)

---

(1) In case of the use of [HBEFA] database

(2) shall also include road transport of multi-modal transport chains
Consumption of energy carriers/fuels
- The reporting company records the quantity of energy carriers/fuels, which was consumed for
  - Driving the vehicles
  - Running the cooling system, in case of refrigerated goods with extra tank (e.g., articulated trailer)
- This may be realized in different ways:
  - For the whole fleet for the whole balance year: $Q_{ec}$
  - With representative samples\(^{(1)}\) for deriving specific fuel consumption factors: $q_{ec}^\varnothing$ (e.g., [liter diesel per km]) that is extrapolated for the whole fleet, with $Q_{ec} = q_{ec}^\varnothing \times \sum d_g$.

### Requirements on data quality (1)

<table>
<thead>
<tr>
<th>Energy carrier</th>
<th>Unit</th>
<th>Data source (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel (diesel, gasoline)</td>
<td>Liter</td>
<td>Fuel receipts, fuel card, on-board unit</td>
</tr>
<tr>
<td>Electricity</td>
<td>kWh</td>
<td>(Smart) meter at power outlet, on-board unit</td>
</tr>
<tr>
<td>Compressed natural gas CNG</td>
<td>Nm³</td>
<td>Fuel receipts, fuel card, on-board unit</td>
</tr>
<tr>
<td>Liquefied natural gas LNG</td>
<td>Liter</td>
<td>Fuel receipts, fuel card, on-board unit</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^{(1)}\) Further information on sampling see »Supplement«.
Sampling to derive an annual average value for fuel consumption

- Two general levels of detail for real data on fuel consumption
  - Documentation of an annual average of specific vehicle (e.g. license plate) covering all trips travelled in balance year (highest level)
  - Deriving an annual average of specified vehicle classes covering a sample of routes travelled in balance year (minimum requirement)
- For definition of vehicle classes see »Supplement«.

Focus on fuel consumption relevant for running the cooling system, in case of refrigerated goods with extra tank (e.g., articulated trailer)

- Often, the relevant activity data is available in terms of [liter per hour] for the respective cooling unit. The conversion to distance-based consumption is possible by means of the average vehicle speed $v_v^\bar{\theta}$

\[
q_{ec,\bar{\theta},km} \left[\frac{l}{km}\right] = \frac{q_{ec,\bar{\theta},h,\bar{\theta}} \left[\frac{l}{h}\right]}{v_{v,\bar{\theta},km}} \left[\frac{km}{h}\right]
\]
Consumption of refrigerants

- The reporting company records the quantity of refrigerants, which was required in case of loss.
- This shall be realized by means of the total quantity of each specific refrigerant or on the basis of sampling, equivalent to fuel consumption.

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>Unit</th>
<th>Data source (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of refrigerants</td>
<td>Liter</td>
<td>Protocols of workshop, purchase, invoice</td>
</tr>
</tbody>
</table>

Quantity of freight [kg]

- Input data shall cover the cargo being carried, including any packaging, container and means of handling or transport except those that are not part of the shipment, e.g.\(^{(1)}\) for a cargo
  - Carried on pallets, the quantity of freight includes the pallets
  - That is bundled by the transport service organizer/operator to allow easy handling (e.g., on a pallet or in a container), the quantity of freight does not include the cargo carriers.

\(^{(1)}\) [EN 16258, p. 18f]
Requirements on data quality (4)

// Distance

- Transport distance covers that with load/cargo on vehicle ($d_g$).
  If the real transport distance is unknown, it is possible to use a fictional “direct” distance (great circle distance GCD), including a mode-specific correction factor:\(^{(1)}\)
  \[ d_g = d \cdot c_{km}^{road} \]

- Distance of empty running covers that without load/cargo, but possibly with empty containers ($d_e$), e.g.,
  - Empty return trip in case of shuttle transport
  - Empty trip to starting point or return trip to starting point in case of round trip
  - Balance traffic

In case of unavailability of data for $d_e$, the reporting company may use statistical data\(^{(2)}\) for estimation (for $\%km_e$ see »Supplement«)
  - If total distance is available: $d_e = \%km_e \times d_{total}$
  - If transport distance is available: $d_e = \frac{\%km_e \times d_g}{1 - \%km_e}$

(1) Correction factor for network density (surcharge for detours)
(2) [Euro Stat 2012]
See »Supplement« for the following parameters and emissions factors

Parameters
- Weight of exemplary containers $m_c$
- Correction factor, transport distance $c_{km}^{road}$
- Correction factor, refrigeration $c_{refr}^{road}$

Emission factors, e.g. greenhouse gas emissions per
- Ton-kilometer for average vehicle class, refrigerated/ambient $EFA_t^{road}$
- Ton-kilometer for average vehicle and infrastructure $EFA_v^{road}$, $EFA_{inf}^{road}$
- Quantity of energy carrier $EFA_{ec}$ or in case of electric drive: $EFA_{elec}$
- Quantity of refrigerants $EFA_{refr}$
Content

General framework

Procedure

Screening phase (step 1)

Calculation of emissions

- Road transport
- Rail transport
- Air transport
- Maritime navigation
- Inland navigation
- Logistics sites
- Administration
- Employee commuting
- Business travel
## Assessment of emissions - Rail transport

---

### Rail transport may be realized

- a) In own trains
- b) In trains leased and operated by the reporting company (and not already included in scope 1 and 2)
- c) As sub-contracted services (external transport)

### Activities covered

<table>
<thead>
<tr>
<th>Activities covered</th>
<th>Scope of emissions$^{(1)}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation (goods transportation (regional and long distance), empty trips, shunting), including</td>
<td>a) Scope 1 (for diesel traction or electric traction with own energy supply), Scope 2 (for electric traction if not scope 1)</td>
</tr>
<tr>
<td>– Drive energy</td>
<td>b) Scope 3, category 8 “Upstream leased assets“</td>
</tr>
<tr>
<td>– If any: refrigeration of goods (air circulation or cooling unit)$^{(2)}$</td>
<td>c) Scope 3, category 1 „Purchased goods and services“</td>
</tr>
<tr>
<td>Loss of refrigerants in case of refrigeration of goods</td>
<td>a) Scope 1 (own trains and container)</td>
</tr>
<tr>
<td></td>
<td>b) and c) Scope 3, category 1 „Purchased goods and services“</td>
</tr>
<tr>
<td>Supply of fuels/electricity (production and distribution)</td>
<td>Scope 3, category 3, „Fuel and energy related activities, not included in scope 1 or scope 2“</td>
</tr>
<tr>
<td>Production of additives, e.g., refrigerants, lubricants</td>
<td>Scope 3, category 1 „Purchased goods and services“</td>
</tr>
<tr>
<td>Production of</td>
<td>Scope 3, categories</td>
</tr>
<tr>
<td>– Locomotives, wagons purchased or acquired by the reporting company</td>
<td>– 4 „Upstream transportation and distribution“</td>
</tr>
<tr>
<td>– Rail infrastructure</td>
<td>– 2 “Capital goods“</td>
</tr>
<tr>
<td>Switch heating</td>
<td>– Scope 2 (for electric heating and own energy supply)</td>
</tr>
<tr>
<td></td>
<td>– Scope 3, category 3, „Fuel and energy related activities, not included in scope 1 or scope 2“</td>
</tr>
</tbody>
</table>

---

$^{(1)}$ According to [Scope 3 Standard, Table 5.7]

$^{(2)}$ Generally required fuel provided by owner of reefer container
Definition of calculation approach

**Is it a scope 1/2 or a relevant scope 3 process?**
- **Yes** → **Is activity data (consumption of energy carrier) on-hand?**
  - **Yes** → **Approach A**
  - **No** → **Approach B**
- **No** → **Approach C**

**Industry average**

**Company-specific**

Approach B is not provided for the time being.
Input data required for calculating emissions

- Approach A: quantity of consumed energy carrier (e.g., diesel, electricity); transport performance; if refrigeration\(^{(1)}\): quantity of additional consumed fuels\(^{(2)}\), quantity of refilled refrigerants (in case of loss)
- Approach B: not provided for the time being
- Approach C: transport performance (in case of multi-national rail transport: transport performance specified per country\(^{(3)}\)); if refrigeration\(^{(1)}\): differentiated between ambient and refrigerated transport

Optional: Input data required for allocation of emissions (step 3)\(^{(4)}\)

- Quantity of passenger transport \([\text{pkm}]\) in case of combined freight and passenger transport
- Transport performance \([\text{tkm}]\) of ambient and refrigerated freight transport
- Database for company-specific allocation factor \(\gamma\) (refrigerated transport)
- ...

---

\(^{(1)}\) For refrigerated transport: see further background information in Annex

\(^{(2)}\) For electricity demand for air circulation cooling unit

\(^{(3)}\) There exists national mix of diesel and electricity traction as well as national electricity mix

\(^{(4)}\) Depending on assessment scope and allocation objective
Calculation of rail transport emissions

Calculation rules

A

\[ E_{t}^{rail} = \sum Q_{ec} \times EFA_{ec} + \sum Q_{refr} \times EFA_{refr} + \sum (m_g + m_c) \times d_g \times (EFA_{v}^{rail} + EFA_{inf}^{rail}) \]

with \( Q_{ec} = d_g \times q_{ec} \)

B

Not provided for the time being

C

\[ E_{t}^{rail} = \sum [(m_g + m_c) \times d_g \times \left( EFA_{t}^{rail} \times (1 + %tkm_{rail}^{refr} \times (c_{refr}^{rail} - 1)) + EFA_{v}^{rail} + EFA_{inf}^{rail} \right)] + \sum E_{shunt}^{rail} \]

Calculation of the overall rail transport emissions

\[ E_{t, total}^{rail} = E_{t}^{rail} + E_{t}^{rail} + E_{t}^{rail} + E_{t}^{rail,int} + E_{t}^{rail,int} + E_{t}^{rail,int} + E_{t}^{rail,int} + E_{t}^{rail,ext} \]

Relevant links and assumptions

- In case of “rolling road”, additional emissions caused by passenger transport (driver) are neglected.
Consumption of energy carriers/fuels

- The reporting company records the quantity of energy carriers\(^{(1)}\), consumed for
  - Driving the trains/locomotives
  - Shunting activities
  - Running the cooling system, in case of refrigerated goods with cooling unit
- This may be realized in two different ways:
  - For the total number of locomotives and items for the whole balance year: \(Q_{ec}\)
  - With representative samples\(^{(2)}\) for deriving specific consumption factors for energy carriers: \(q_{ec}^\varnothing\) (e.g., [kWh per km]) that is extrapolated for the whole scope, with \(Q_{ec} = q_{ec}^\varnothing \times \sum d_g\).

<table>
<thead>
<tr>
<th>Energy carrier</th>
<th>Unit</th>
<th>Data source (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>kWh</td>
<td>On-board unit, TMS, invoices</td>
</tr>
<tr>
<td>Diesel</td>
<td>Liter</td>
<td>On-board unit, TMS, invoices</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^{(1)}\) The consumption of energy carriers consumed for switch heating systems are added as a flat rate.

\(^{(2)}\) Further information on sampling see »Supplement«.
Sampling to derive an annual average value for fuel consumption

- Two general levels of detail for real data on electricity or diesel consumption
  - Documentation of annual average consumption of specific locomotives covering all trips and train combinations travelled in balance year (highest level)
  - Deriving of an annual average consumption of specified train classes covering all trips travelled in balance year (minimum requirement)
- For definition of train classes see »Supplement«.

Electricity mix

- If no company-specific electricity mix (rail net) is available, the reporting company shall use the national electricity mix (rail net) as specified in the »Supplement«.
Consumption of refrigerants

- The reporting company records the quantity of refrigerants, which was required in case of loss.
- This shall be realized by means of the total quantity of each specific refrigerant or on the basis of sampling, equivalent to fuel consumption.

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>Unit</th>
<th>Data source (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of refrigerants</td>
<td>Liter</td>
<td>Protocols of workshop, purchase, invoice</td>
</tr>
</tbody>
</table>

Distance [km]

- Transport distance covers that with load/cargo on vehicle
  - If the real transport distance is unknown, it is possible to use a fictional “direct” distance (great circle distance GCD), including a mode-specific correction factor\(^{(1)}\).
    \[
    d_g = d \cdot c_{rail}^{km}
    \]
  - Distance of empty running covers that without load/cargo, but possibly with empty containers, e.g. empty return trip in case of shuttle transport.
  - In general it is a combination of loaded and empty wagons within a train.

\(^{(1)}\) ...


Requirements on data quality (3)

// Quantity of freight [kg]

- Input data shall cover the cargo being carried ($m_g$), including any packaging, container and means of handling or transport except those that are not part of the shipment ($m_c$), e.g. for a cargo

(1) Carried on a train in a swap body in combined rail road transport, the quantity of freight corresponds to the swap body and its cargo

(2) Carried on e.g. pallets on a train, the quantity of freight corresponds to the cargo including the pallets

(3) That is bundled by the transport service organizer/operator to allow easy handling (e.g., on a pallet or in a container), the quantity of freight does not include the cargo carriers

(4) Carried on a train by means of combined traffic (e.g. rolling road), the quantity of freight corresponds to the trailer (with or without tractor) and its cargo

(1) [EN 16258, p. 18f]
Requirements on data quality (4)

Multi-modal transport chains

- Pre- and on-carriage (road)
  - For calculating the emissions from these transport chain elements\(^1\) the reporting company may use:
    - An average transport distance \(d_g = d_{multi-modal}^{rail}\) \(^2\) for each element
    - An emission factor for road transport (vehicle class truck 40 t), i.e. approach C
      \[
      E_{t}^{road} = \sum (m_g + m_c) \cdot d_g \cdot (EFA_{t,40t}^{road} + EFA_{v}^{road} + EFA_{inf}^{road})
      \]
    - The calculated emissions shall be reported as road transport emissions.

- Transshipment processes
  - Emissions from transshipment processes are defined as emissions from logistics sites and shall be reported as such.

- Shunting processes
  - If the consumption of energy carriers caused by shunting processes is not available, the reporting company shall cover those emissions by an average factor of \(\%tkm_{shunt}^{rail}\).
    \[
    E_{shunt}^{rail} = \sum (\%tkm_{shunt}^{rail} \cdot (m_g + m_c) \cdot d_g) \cdot EFA_{shunt}
    \]

---

\(^1\) As long as they are not already included in the frame of road transport

\(^2\) DB Schenker 2014, analysis for Germany
Parameters and emission factors

See »Supplement« for the following parameters and emissions factors

### Parameters
- Weight of exemplary containers $m_c$
- Correction factor, transport distance $c_{km}^{rail}$
- Correction factor, refrigeration $c_{refr}^{rail}$
- Average transport distance of pre- and on-carriage $d_{multi-modal}^{rail}$
- Country-specific electricity mix (rail net) and share of e- and diesel-traction
- Shunting processes, average factor $\%tkm_{shunt}^{rail}$

### Emission factors, e.g. greenhouse gas emissions per
- Ton-kilometer for average train class, refrigerated/ambient $EFA_t^{rail}$
  Ton-kilometer for road transport (vehicle class truck 40 t) $EFA_{t,40t}^{road}$
- Ton-kilometer for average train (locomotive, wagon) and infrastructure $EFA_v^{rail}, EFA_{inf}^{rail}$
  $EFA_v^{road}, EFA_{inf}^{road}$
- Quantity of energy carrier $EFA_{ec}$ or in case electricity (rail net), country-specific $EFA_{elec}^{nation}$
- Quantity of refrigerants $EFA_{refr}$
- Ton-kilometer for average shunting processes $EFA_{shunt}$
Content

General framework

Procedure

Screening phase (step 1)

Calculation of emissions

- Road transport
- Rail transport
- **Air transport**
- Maritime navigation
- Inland navigation
- Logistics sites
- Administration
- Employee commuting
- Business travel
Assessment of emissions - Air transport

Air transport may be realized:

- In own aircrafts (plane-owner)
- In chartered aircrafts (2)
- As sub-contracted services (external transport)

<table>
<thead>
<tr>
<th>Activities covered</th>
<th>Scope of emissions(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation (goods transportation, empty trips), incl.</td>
<td>a) Scope 1 (for fuel use (e.g., kerosene, Jet B, AvGas))</td>
</tr>
<tr>
<td>- Airborne operation, taxiing, turnaround</td>
<td>b) Scope 3, category 8 “Upstream leased assets”</td>
</tr>
<tr>
<td>- Auxiliary power usage</td>
<td>c) Scope 3, category 1 “Purchased goods and services”</td>
</tr>
<tr>
<td>Refrigeration of goods(3)</td>
<td>a) Scope 1 (own planes)</td>
</tr>
<tr>
<td></td>
<td>b) and c) Scope 3, category 1 “Purchased goods and services”</td>
</tr>
<tr>
<td>Supply of fuels (production and distribution to fuel station)</td>
<td>Scope 3, category 3, „Fuel and energy related activities, not included in scope 1 or scope 2“</td>
</tr>
<tr>
<td>Production of</td>
<td>Scope 3, category 1 „Purchased goods and services“</td>
</tr>
<tr>
<td>- Aircrafts purchased or acquired by the reporting company</td>
<td>Scope 3, categories</td>
</tr>
<tr>
<td>- Air infrastructure, e.g., apron</td>
<td>- 4 „Upstream transportation and distribution“</td>
</tr>
<tr>
<td></td>
<td>- 2 “Capital goods”</td>
</tr>
</tbody>
</table>

(1) According to [Scope 3 Standard, Table 5.7]
(2) Leasing irrelevant here, however: plane-owner and charter are considered as scope 1 process
(3) In case of dry ice use, not relevant for GHG emissions
Definition of calculation approach

Is it a scope 1/2 or a relevant scope 3 process?
- no
  - Is activity data (consumption of energy carrier) on-hand?
    - yes: Approach A
    - no: Industry average

Approach B is not provided for the time being.
Input data required

// Input data required for calculating emissions
- Approach A: quantity of consumed energy carrier (e.g., kerosene); transport performance; if refrigeration: quantity of refilled refrigerants\(^{(1)}\) (in case of loss)
- Approach B: not provided for the time being
- Approach C: transport performance; if refrigeration: differentiated between ambient and refrigerated transport

// Optional: Input data required for allocation of emissions (step 3)\(^{(2)}\)
- Quantity of passenger transport [pkm] in case of combined freight and passenger transport
- Transport performance [tkm] of refrigerated and ambient freight transport
- ...

\(^{(1)}\) In case of dry ice use, not relevant
\(^{(2)}\) Depending on assessment scope and allocation objective
Calculation of air transport emissions

Calculation rules

<table>
<thead>
<tr>
<th>A</th>
<th>$E_{t,(A)}^{\text{air}} = \sum Q_{ec} \cdot EFA_{ec} + \sum Q_{refr} \cdot EFA_{refr} + \sum m_g \cdot d_g \cdot (EFA_{v,air}^{\text{air}} + EFA_{\text{inf} \text{air}}^{\text{air}})$</th>
</tr>
</thead>
<tbody>
<tr>
<td>with</td>
<td>$Q_{ec} = d_g \cdot q_{ec}$</td>
</tr>
<tr>
<td>B</td>
<td>Not provided for the time being</td>
</tr>
<tr>
<td>C</td>
<td>$E_{t,(C)}^{\text{air}} = \sum m_g \cdot d_g \cdot (EFA_{t,air}^{\text{air}} + EFA_{v,air}^{\text{air}} + EFA_{\text{inf} \text{air}}^{\text{air}})$</td>
</tr>
</tbody>
</table>

// Calculation of the overall air transport emissions

$E_{t,\text{total}}^{\text{air}} = E_{t\,(A)}^{\text{air}} + E_{t\,(B)}^{\text{air}} + E_{t\,(C)}^{\text{air}} = E_{t\,(A)}^{\text{air,\text{int}}} + E_{t\,(A)}^{\text{air,\text{ext}}} + E_{t\,(B)}^{\text{air,\text{int}}} + E_{t\,(B)}^{\text{air,\text{ext}}} + E_{t\,(C)}^{\text{air,\text{int}}} + E_{t\,(C)}^{\text{air,\text{ext}}}$

// Relevant links and assumptions

- Emissions caused by refrigeration are negligible in case of dry ice usage. In case of future developments, refrigerated air transport requires appropriate alignment.
Requirements on data quality (1)

Consumption of energy carriers/fuels

- The reporting company records the quantity of energy carriers/fuels, consumed for:
  - Airborne transport incl. landing and take-off cycle (LTO), taxiing, holdings, turnaround, repositioning flights, and auxiliary power usage\(^1\),\(^2\)

- This may be realized in different ways:
  - For the whole fleet for the whole balance year: \(Q_{ec}\)
  - With representative samples\(^3\) for deriving specific fuel consumption factors: \(q_{ec}^\varnothing\) (e.g., [liter kerosene per km]) that is extrapolated for the whole fleet with \(Q_{ec} = q_{ec}^\varnothing \cdot \sum d_g\)

<table>
<thead>
<tr>
<th>Energy carrier</th>
<th>Unit</th>
<th>Data source (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aviation gasoline (AvGas)</td>
<td>Liter, kg</td>
<td>Fuel delivery note/invoice, on-board systems</td>
</tr>
<tr>
<td>Jet gasoline (Jet B)</td>
<td></td>
<td>Note: reporting company should not use planned fuel consumption(^3)</td>
</tr>
<tr>
<td>Jet kerosene (Jet A1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jet kerosene (Jet A2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) [IATA RP1678, Attachment A]

\(^2\) Exclusion of engine run-ups, training flights, aircraft delivery flights, state flights, search & rescue flights, transporting head of states and government ministers, police or military flights, fuel consumption when in Maintenance Repair and Overhaul (MRO) [IATA RP1678 Attachment A]

\(^3\) Further information on sampling see »Supplement«

\(^4\) Otherwise this needs to be outlined in declaration
Sampling to derive an annual average value for fuel consumption

- Two general levels of detail for real data on fuel consumption
  (1) Documentation of annual average of specific aircraft covering all trips travelled in balance year (highest level)
  (2) Deriving of an annual average of specified aircraft classes covering all trips travelled in balance year (minimum requirement)
- For definition of aircraft classes see »Supplement«.

Quantity of freight [kg]

- Input data shall cover the cargo being carried, including any packaging, container and means of handling or transport except those that are not part of the shipment, e.g. for a cargo
  (1) Carried on pallets, the quantity of freight includes the pallets
  (2) that is bundled by the transport service organizer/operator to allow easy handling (e.g., aircraft unit load device ULD), the quantity of freight does not include the cargo carriers.

(1) [EN 16258, p. 18f], [IATA RP1678]
Requirements on data quality (3)

// Quantity of freight (continued)
- Approach A: In case of combined freight and passenger transport (belly freight) the quantity of consumed fuels $Q_{ec}$ may cover the transport of freight and passenger.
  - The reporting company shall proceed as follows: The relevant cargo quantity $m_g$ shall be extended by the additional quantity of passengers $m_p$. The reporting company shall use the parameters for $m^\text{air}_p = \sum m^\text{air}_\text{passenger} + m^\text{air}_v$ as specified in the »Supplement«.
  - Further details are specified in the chapter on allocation (step 3).

// Distance [km]
- If real transport distance is unknown, the use of a fictional “direct” distance (great circle distance (GCD)) including a mode-specific correction factor$^{(1)}$ is possible.
  $$d_g = d + (stp + 1) \times c^\text{air}_{km}$$
  see »Supplement«

$^{(1)}$ stp = average number of stopovers
Multi-modal transport chains

- Pre- and on-carriage (road)
  - For calculating the emissions from these transport chain elements\(^{(1)}\) the reporting company may use:
    - An average transport distance: \(d_g = d_{\text{multi-modal}}^\text{air}\) for each element
    - An emission factor for road transport (vehicle class truck 40 t), i.e. approach C
      \[
      E_{t(C)}^{\text{road}} = \sum m_g \ast d_g \ast (E_{t,40t}^{\text{road}} + E_{v}^{\text{road}} + E_{\text{inf}}^{\text{road}})
      \]
  - The calculated emissions shall be reported as road transport emissions.

- Transshipment processes
  - Emissions from transshipment processes are defined as emissions from logistics sites and shall be reported as such.

Road feeder service (RFS)\(^{(2)}\)

- For calculating the RFS’ emissions\(^{(1)}\) the reporting company may use an emission factor for road transport (vehicle class truck 40 t), i.e. approach C
  \[
  E_{t(C)}^{\text{road}} = \sum m_g \ast d_g \ast (E_{t,40t}^{\text{road}} + E_{v}^{\text{road}} + E_{\text{inf}}^{\text{road}})
  \]

\(^{(1)}\) As long as they are not already included in the frame of road transport
\(^{(2)}\) Air cargo with Master Air Waybill on road segment
// See »Supplement« for the following parameters and emissions factors

// Parameters
- Correction factor, transport distance $c_{km}^{air}$
- Average transport distance of pre- and on-carriage $d_{multi-modal}^{air}$

// Emission factors, e.g. greenhouse gas emissions per
- Ton-kilometer for average aircraft class $EFA_t^{air}$
- Ton-kilometer for road transport (vehicle class truck 40 t) $E_t^{road,40t}$
- Ton-kilometer for average aircraft and infrastructure $EFA_v^{air}, EFA_{inf}^{air}, E_v^{road}, E_{inf}^{road}$
- Quantity of energy carrier $EFA_{ec}$
- Quantity of refrigerants $EFA_{refr}$
Content

General framework

Procedure

Screening phase (step 1)

Calculation of emissions

- Road transport
- Rail transport
- Air transport
- Maritime navigation
- Inland navigation
- Logistics sites
- Administration
- Employee commuting
- Business travel
### Assessment of emissions - Maritime transport

Maritime transport may be realized as:
- **a)** In own vessels (ship-owner)
- **b)** In chartered vessels
- **c)** As sub-contracted services (external transport)

#### Activities covered

<table>
<thead>
<tr>
<th>Activities covered</th>
<th>Scope of emissions&lt;sup&gt;(1)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation (goods transportation, empty trips, tugging/towing), incl.</td>
<td>a) Scope 1 (bunker consumption)</td>
</tr>
<tr>
<td>- Drive energy</td>
<td>b) Scope 3, category 8 “Upstream leased assets”</td>
</tr>
<tr>
<td>- If any: refrigeration of goods (e.g., cooling unit of reefer container)</td>
<td>c) Scope 3, category 1 “Purchased goods and services“</td>
</tr>
<tr>
<td>Loss of refrigerants in case of refrigeration of goods</td>
<td>a) Scope 1 (own vessel)</td>
</tr>
<tr>
<td></td>
<td>b) and c) Scope 3, category 1 „Purchased goods and services“</td>
</tr>
<tr>
<td>Supply of fuels (production and distribution to fuel station)</td>
<td>Scope 3, category 3, „Fuel and energy related activities, not included in scope 1 or scope 2“</td>
</tr>
<tr>
<td>Production of additives, e.g., refrigerants</td>
<td>Scope 3, category 1 „Purchased goods and services“</td>
</tr>
<tr>
<td>Production of</td>
<td>Scope 3, categories</td>
</tr>
<tr>
<td>- Vessels purchased or acquired by the reporting company</td>
<td>- 4 „Upstream transportation and distribution”</td>
</tr>
<tr>
<td>- Inland water infrastructure</td>
<td>- 2 “Capital goods”</td>
</tr>
</tbody>
</table>

---

<sup>(1)</sup> According to [Scope 3 Standard, Table 5.7]<br>
<sup>(2)</sup> Leasing irrelevant here, however: ship-owner and charter are considered as scope 1 process
Definition of calculation approach

Is it a scope 1/2 or a relevant scope 3 process?

- yes
  - Is activity data (consumption of energy carrier) on-hand?
    - yes
      - Approach A
    - no
      - no
      - Industry average

- no
  - Approach C

Approach B is not provided for the time being.
Input data required for calculating emissions

- Approach A: quantity of consumed energy carrier (e.g., fuel/diesel/gas oil); transport performance; if refrigeration\(^{(1)}\): quantity of additional consumed energy carriers (e.g., fuel/electricity), quantity of refilled refrigerants (in case of loss)
- Approach B: not provided for the time being
- Approach C: transport performance, if refrigeration\(^{(1)}\): differentiated between ambient and refrigerated transport

Optional: Input data required for allocation of emissions (step 3)\(^{(2)}\)

- Quantity of passenger transport [pkm] in case of combined freight and passenger transport
- Transport performance [tkm] of ambient and refrigerated freight transport
- Database for company-specific allocation factor \(\gamma\) (refrigerated transport)
- ...
Calculation of maritime transport emissions

<table>
<thead>
<tr>
<th>Calculation rules</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
</tr>
<tr>
<td>[ E_{t}^{\text{sea}}(A) = \sum Q_{ec} \cdot EFA_{ec} + \sum Q_{refr} \cdot EFA_{refr} + \sum (m_g + m_c) \cdot d_g \cdot (EFA_{v}^{\text{sea}} + EFA_{inf}^{\text{sea}}) ]</td>
</tr>
<tr>
<td>with [ Q_{ec} = d_g \cdot q_{ec}^{0} ]</td>
</tr>
<tr>
<td><strong>B</strong></td>
</tr>
<tr>
<td>Not provided for the time being</td>
</tr>
<tr>
<td><strong>C</strong></td>
</tr>
<tr>
<td>[ E_{t}^{\text{sea}}(C) = \sum (m_g + m_c) \cdot d_g \cdot (EFA_{t}^{\text{sea}} + EFA_{v}^{\text{sea}} + EFA_{inf}^{\text{sea}}) ]</td>
</tr>
</tbody>
</table>

Calculation of the overall maritime transport emissions

\[ E_{t,\text{total}}^{\text{sea}} = E_{t}(A) + E_{t}(B) + E_{t}(C) = E_{t}^{\text{sea,\text{int}}}(A) + E_{t}^{\text{sea,\text{ext}}}(A) + E_{t}^{\text{sea,\text{int}}}(B) + E_{t}^{\text{sea,\text{ext}}}(B) + E_{t}^{\text{sea,\text{int}}}(C) + E_{t}^{\text{sea,\text{ext}}}(C) \]

// Relevant links and assumptions
- Energy demand of tug boats might be relevant for short sea shipping (e.g. UK-Germany) but is generally neglected
- Energy demand relevant at the port (e.g. bunker demand instead of cold ironing) is included, however should be handled in a harmonized manner within the assessment scope (i.e. allocated to transport or site emissions)
Consumption of energy carriers/fuels

- The reporting company records the quantity of energy carriers/fuels\(^{(1)}\), consumed for
  - Running the vessels
  - Running additional processes relevant for the logistics service
- This may be realized in different ways:
  - For all vessels for the whole balance year: \(Q_{ec}\)
  - With representative samples\(^{(2)}\) for deriving specific fuel consumption factors: \(q_{ec}^{\phi}\)
    (e.g., [liter diesel per km]) that is extrapolated for all vessels, with \(Q_{ec} = q_{ec}^{\phi} \cdot \sum d_g\).

<table>
<thead>
<tr>
<th>Energy carrier</th>
<th>Unit</th>
<th>Data source (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Fuel oil (HFO)</td>
<td>Liter</td>
<td>Invoices</td>
</tr>
<tr>
<td>Marine diesel oil (MDO)</td>
<td>Liter</td>
<td>Invoices</td>
</tr>
<tr>
<td>Marine gas oil (MGO)</td>
<td>Liter</td>
<td>Invoices</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^{(1)}\) All fuel tanks for main and auxiliary units
\(^{(2)}\) Further information on sampling see »Supplement«
Sampling to derive an annual average value for fuel consumption

- Two general levels of detail for real data on fuel consumption
  1. Documentation of annual average of specific vessel covering all trips travelled in balance year (highest level)
  2. Deriving of an annual average of specified vessel classes covering a sample of trips travelled in balance year (minimum requirement)
- For definition of vessel classes see »Supplement«.

Consumption of refrigerants

- The reporting company records the quantity of refrigerants, which was required in case of loss.
- This shall be realized by means of the total quantity of each specific refrigerant or on the basis of sampling, equivalent to fuel consumption.

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>Unit</th>
<th>Data source (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of refrigerants</td>
<td>Liter</td>
<td>Protocols of workshop, purchase, invoice</td>
</tr>
</tbody>
</table>
Requirements on data quality (3)

// Quantity of freight [kg]
- Input data shall cover the cargo being carried, including any packaging, container and means of handling or transport except those that are not part of the shipment, e.g. for a cargo
  (1) Carried on pallets, the quantity of freight includes the pallets.\(^{(1)}\)
  (2) That is bundled by the transport service organizer/operator to allow easy handling (e.g., on a pallet or in a container), the quantity of freight does not include the cargo carriers.\(^{(1)}\)
  (3) Carried in a container (not (2)), the quantity of freight includes the container.

// Distance [km] or [nm]
- Transport distance covers that with load/cargo on vessel.
- Distance of empty running covers that without load/cargo, but usually with empty containers.\(^{(2)}\)
- In case of unavailability of data on actual distances, the company may use the
  - “Shortest” distance from load port to discharge port (e.g. derived by distance calculators), and
  - Distance correction factor see »Supplement«

\[ d_g = d \times c_{\text{sea}}^{\text{km}} \]

(1) [EN 16258, p. 18f]
(2) In general it is a combination of loaded and empty containers on a vessel.
Multi-modal transport chains

- Pre- and on-carriage (road)
  - For calculating the emissions from these transport chain elements\(^{(1)}\) the reporting company may use:
    - An average transport distance: \(d_g = d_{\text{sea}}^{\text{multi-modal}}\) for each element
    - An emission factor for road transport (vehicle class truck 40 t), i.e. approach C
      \[
      E_t^{\text{road}}(C) = \sum m_g \cdot d_g \cdot (E_{t,40t}^{\text{road}} + E_{v}^{\text{road}} + E_{\text{inf}}^{\text{road}})
      \]
  - The calculated emissions shall be reported as road transport emissions.

- Transshipment processes
  - Emissions from transshipment processes are defined as emissions from logistics sites and shall be reported as such.

\(^{(1)}\) As long as they are not already included in the frame of road transport
See »Supplement« for the following parameters and emissions factors

**Parameters**

- Weight of exemplary containers $m_c$
- Correction factor, transport distance $c_{km}^{sea}$
- Correction factor, refrigeration $c_{refr}^{sea}$

**Emission factors**, e.g. greenhouse gas emissions per

- Ton-kilometer for average vessel class $EFA_t^{sea}$
- Ton-kilometer for average vessel and infrastructure $EFA_v^{sea}, EFA_{inf}^{sea}$
- Quantity of energy carrier $EFA_{ec}$
- Quantity of refrigerants $EFA_{refr}$
Content

General framework

Procedure

Screening phase (step 1)

Calculation of emissions

- Road transport
- Rail transport
- Air transport
- Maritime navigation
- Inland navigation
- Logistics sites
- Administration
- Employee commuting
- Business travel
Assessment of emissions - Inland water transport

// Inland water transport may be realized

- a) In own vessels (ship-owner)
- b) In chartered vessels
- c) As sub-contracted services (external transport)

<table>
<thead>
<tr>
<th>Activities covered</th>
<th>Scope of emissions(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation (goods transportation, empty trips, tugging/towing), incl.</td>
<td>a) Scope 1 (bunker consumption)</td>
</tr>
<tr>
<td>- Drive energy</td>
<td>b) Scope 3, category 8 “Upstream leased assets”</td>
</tr>
<tr>
<td>- If any: refrigeration of goods (e.g., cooling unit of reefer container)</td>
<td>c) Scope 3, category 1 „Purchased goods and services“</td>
</tr>
<tr>
<td>Loss of refrigerants in case of refrigerated of goods(3)</td>
<td>a) Scope 1 (own vessel)</td>
</tr>
<tr>
<td>Supply of fuels (production and distribution to fuel station)</td>
<td>b) and c) Scope 3, category 1 „Purchased goods and services“</td>
</tr>
<tr>
<td>Production of additives, e.g., refrigerants</td>
<td>Scope 3, category 3, „Fuel and energy related activities, not included in scope 1 or scope 2“</td>
</tr>
<tr>
<td>Production of</td>
<td>Scope 3, category 1 „Purchased goods and services“</td>
</tr>
<tr>
<td>- Vessels purchased or acquired by the reporting company</td>
<td>Scope 3, categories</td>
</tr>
<tr>
<td>- Inland water infrastructure</td>
<td>4 „Upstream transportation and distribution“</td>
</tr>
<tr>
<td></td>
<td>2 “Capital goods”</td>
</tr>
</tbody>
</table>

(1) According to [Scope 3 Standard, Table 5.7]

(2) Leasing irrelevant here, however: Ship-owner and charter are considered as scope 1 process

(3) Refrigeration within inland water transport is generally negligible in Europe. For reasons of comparability with other transport means, this issue is still included here.
Definition of calculation approach

Is it a scope 1/2 or a relevant scope 3 process?  
- yes: Is activity data (consumption of energy carrier) on-hand?  
  - yes: Approach A  
  - no: no  
- no: no

Approach B is not provided for the time being.

Company-specific  
Industry average
Input data required for calculating emissions

- Approach A: quantity of consumed energy carrier (e.g., fuel/diesel/gas oil); transport performance; if refrigeration\(^{(1,2)}\): quantity of additional consumed fuels, quantity of refilled refrigerants (in case of loss)
- Approach B: not provided for the time being
- Approach C: transport performance, if refrigeration\(^{(1,2)}\): differentiated between ambient and refrigerated transport\(^{(1)}\)

Optional: Input data required for allocation of emissions (step 3)\(^{(3)}\)

- Quantity of passenger transport [pkm] in case of combined freight and passenger transport
- Transport performance [tkm] of ambient and refrigerated freight transport
- Database for company-specific allocation factor \(\gamma\) (refrigerated transport)\(^{(1)}\)
- ...

\(^{(1)}\) Refrigeration within inland water transport is generally negligible in Europe. For reasons of comparability with other transport means, this issue is still included here.

\(^{(2)}\) For refrigerated transport: see further background information in Annex

\(^{(3)}\) Depending on assessment scope and allocation objective
Calculation of inland water transport emissions

<table>
<thead>
<tr>
<th>Calculation rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>A ( E_{t}^{\text{barge}} (A) = \sum Q_{\text{ec}} \cdot EFA_{\text{ec}} + \sum Q_{\text{refr}} \cdot EFA_{\text{refr}} + \sum (m_{g} + m_{c}) \cdot d_{g} \cdot (EFA_{v}^{\text{barge}} + EFA_{\text{inf}}^{\text{barge}}) )</td>
</tr>
<tr>
<td>( \text{with } Q_{\text{ec}} = d_{g} \cdot q_{\text{ec}} )</td>
</tr>
<tr>
<td>B Not provided for the time being</td>
</tr>
<tr>
<td>C ( E_{t}^{\text{barge}} (C) = \sum (m_{g} + m_{c}) \cdot d_{g} \cdot (EFA_{t}^{\text{barge}} + EFA_{v}^{\text{barge}} + EFA_{\text{inf}}^{\text{barge}}) )</td>
</tr>
</tbody>
</table>

Calculation of the overall inland water transport emissions
\( E_{t,\text{total}}^{\text{barge}} = E_{t}^{\text{barge}} (A) + E_{t}^{\text{barge}} (B) + E_{t}^{\text{barge}} (C) = E_{t}^{\text{barge, int}} (A) + E_{t}^{\text{barge, ext}} (A) + E_{t}^{\text{barge, int}} (B) + E_{t}^{\text{barge, ext}} (B) + E_{t}^{\text{barge, int}} (C) \)

Relevant links and assumptions
- Refrigeration within inland water transport is generally negligible in Europe. Other regions or future developments may require the consideration of refrigerated inland water transport.
- Energy demand of tug boats might be relevant but is generally neglected
Consumption of energy carriers/fuels

The reporting company records the quantity of energy carriers/fuels (1), consumed for

- Running the vessels
- Running additional processes relevant for the logistics service

This may be realized in different ways:

- For all vessels for the whole balance year: $Q_{ec}$
- With representative samples (2) for deriving specific fuel consumption factors: $q_{ec}^\theta$ (e.g., [liter diesel per km]) that is extrapolated for all vessels, with $Q_{ec} = q_{ec}^\theta \times \sum d_g$.

<table>
<thead>
<tr>
<th>Energy carrier</th>
<th>Unit</th>
<th>Data source (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Fuel oil (HFO)</td>
<td>Liter</td>
<td>Invoices</td>
</tr>
<tr>
<td>Marine diesel oil (MDO)</td>
<td>Liter</td>
<td>Invoices</td>
</tr>
<tr>
<td>Marine gas oil (MGO)</td>
<td>Liter</td>
<td>Invoices</td>
</tr>
</tbody>
</table>

(1) All fuel tanks for main and auxiliary units
(2) Further information on sampling see »Supplement«
Sampling to derive an annual average value for fuel consumption
- Two general levels of detail for real data on fuel consumption
  (1) Documentation of annual average of specific vessel covering all trips travelled in balance year (highest level)
  (2) Deriving of an annual average of specified vessel classes covering a sample of trips travelled in balance year (minimum requirement)
- For definition of vessel classes see »Supplement«.

Quantity of freight [kg]
- Input data shall cover the cargo being carried, including any packaging, container and means of handling or transport except those that are not part of the shipment, e.g. for a cargo
  (1) Carried on pallets, the quantity of freight includes the pallets
  (2) That is bundled by the transport service organizer/operator to allow easy handling (e.g., on a pallet or in a container), the quantity of freight does not include the cargo carriers
  (3) Carried in a container (not (2)), the quantity of freight includes the container.
Requirements on data quality (3)

// Distance [km]
- Transport distance covers that with load/cargo on vessel.
- Distance of empty running covers that without load/cargo, but usually with empty containers.
- In case of unavailability of data on actual distances, the company may use the
  - “Shortest” distance from load port to discharge port (e.g. derived by distance calculators), and
  - Distance correction factor see »Supplement«

\[ d_g = d \ast c_{\text{barge}}^{\text{km}} \]
Multi-modal transport chains

- Pre- and on-carriage (road)
  - For calculating the emissions from these transport chain elements\(^{(1)}\) the reporting company may use:
    - An average transport distance: \(d_g = d_{\text{intermodal}}\) for each element
    - An emission factor for road transport (vehicle class truck 40 t), i.e. approach C
      \[E_{t(C)}^{\text{road}} = \sum m_g \times d_g \times \left( E_{t,40t}^{\text{road}} + E_v^{\text{road}} + E_{\text{inf}}^{\text{road}} \right)\]
      - The calculated emissions shall be reported as road transport emissions.

- Transshipment processes
  - Emissions from transshipment processes are defined as emissions from logistics sites and shall be reported as such.

---

\(^{(1)}\) As long as they are not already included in the frame of road transport
See »Supplement« for the following parameters and emissions factors

**Parameters**
- Weight of exemplary containers $m_c$
- Correction factor, transport distance $c_{km}^{\text{barge}}$

**Emission factors**, e.g. greenhouse gas emissions per
- Ton-kilometer for average vessel class $EFA_t^{\text{barge}}$
- Ton-kilometer for average vessel and infrastructure $EFA_v^{\text{barge}}, EFA_{inf}^{\text{barge}}$
- Quantity of energy carrier $EFA_{ec}$
Content

General framework

Procedure

Screening phase (step 1)

Calculation of emissions

- Road transport
- Rail transport
- Air transport
- Maritime navigation
- Inland navigation
- Logistics sites
- Administration
- Employee commuting
- Business travel
Logistics sites can be classified according to their main activities and the corresponding financial processing (to customers). That is either transshipment or warehousing of goods. Transshipment and warehousing activities may also be pooled at one logistics site, i.e. a combined logistics site.

Two types of logistics sites: Differentiation between transshipment and warehousing sites

<table>
<thead>
<tr>
<th></th>
<th>Transshipment sites</th>
<th>Warehousing sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task</td>
<td>Cargo changes transport means (same mode, intermodal)</td>
<td>Cargo is stored for some time (e.g. &gt;48 h) and may change transport means</td>
</tr>
<tr>
<td>Building</td>
<td>Operations may take place in or outside logistics buildings</td>
<td>Operations generally take place in logistics buildings; still, “outdoor” warehousing is possible</td>
</tr>
<tr>
<td>Warehousing</td>
<td>No warehousing needs to be considered, just cross-docking (e.g. within ~48 h)</td>
<td>Warehousing needs to be considered</td>
</tr>
<tr>
<td>Order-picking</td>
<td>No order-picking and no relevant material consumption needs to be considered</td>
<td>Order-picking needs to be considered, generally, even small quantities of material consumption is consumed for cargo safety measures</td>
</tr>
<tr>
<td>Refrigeration</td>
<td>In case of refrigerated cargo, this shall be considered</td>
<td></td>
</tr>
<tr>
<td>Yard logistics</td>
<td>Yard logistics generally takes place and shall be considered</td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>Terminals (e.g. container, sea, air, combined transport); hubs (e.g. piece goods)</td>
<td>Terminals with storage of e.g. containers Warehouses for finished goods, mail order business, piece goods</td>
</tr>
<tr>
<td></td>
<td>Sorting centers (e.g. parcel, letter)</td>
<td></td>
</tr>
</tbody>
</table>
### Assessment of emissions - Logistics sites (1)

<table>
<thead>
<tr>
<th>Activities covered</th>
<th>Scope of emissions&lt;sup&gt;(1)&lt;/sup&gt; Own logistics sites&lt;sup&gt;(2)&lt;/sup&gt;</th>
<th>External logistics sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conveying, sorting, warehousing, transport and transshipment processes by means of</td>
<td>a) Scope 1 (for fuel use), Scope 2 (for electricity use)</td>
<td></td>
</tr>
<tr>
<td>a) Own equipment</td>
<td>b) Scope 3, category 8 “Upstream leased assets”</td>
<td></td>
</tr>
<tr>
<td>b) Equipment leased and operated by the reporting company (and not already</td>
<td></td>
<td></td>
</tr>
<tr>
<td>included in scope 1 and 2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating</td>
<td>Scope 1 (own heating system), Scope 2 (long-distance heating system)</td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Scope 2 (electricity use)</td>
<td>Scope 3, category 1 „Purchased goods and services“</td>
</tr>
<tr>
<td>Refrigerating system</td>
<td>Scope 1 (loss of refrigerants), Scope 2 (electricity use)</td>
<td></td>
</tr>
<tr>
<td>Supply of fuels (production and distribution to logistics site)</td>
<td>Scope 3, category 3, „Fuel- and energy related activities, not incl. in scope 1 or 2“</td>
<td></td>
</tr>
<tr>
<td>Production of additives and material, e.g., refrigerants, packaging, cargo security</td>
<td>Scope 3, category 1 „Purchased goods and services“</td>
<td></td>
</tr>
<tr>
<td>Disposal of waste from packaging material</td>
<td>Scope 3, category 5 “Waste generated in operations”</td>
<td></td>
</tr>
<tr>
<td>Production and demolition of infrastructure/building shell incl. MEP-system&lt;sup&gt;(3)&lt;/sup&gt;</td>
<td>Scope 3, category 2 “Capital goods”</td>
<td></td>
</tr>
</tbody>
</table>

<sup>(1)</sup> According to GHG protocol  
<sup>(2)</sup> Owned or controlled by the reporting company  
<sup>(3)</sup> MEP-system: Mechanical Electrical Plumbing
General assumptions for calculating emissions at logistics sites/nodes

- Consumption of
  - Electricity causes emissions during production/supply and its consumption is influenced i.a. by automated equipment used, installed lighting, refrigeration systems, as well as, by the effectiveness of the intralogistics organization and duration of processes
  - Energy carriers cause emissions during production/supply/use and their consumption is influenced i.a. by intra-/yard logistics equipment used, heating system, as well as, by the effectiveness of the intralogistics organization and duration of processes
  - Packaging material causes emissions during its production/supply and its consumption is influenced i.a. by cargo safety, customer requirements and share of order-picking
  - Refrigeration of goods cause higher electricity consumption (e.g. refrigeration system, reefer container), imposes requirements on building shell and may include loss of refrigerants
  - Production of waste causes emissions within its waste management and disposal systems
  - Rate of automation of intralogistics processes influences the relevant number of staff, whose commuting causes emissions (see employee commuting)
Definition of calculation approach

Is it an own logistics site?

- no
  - Specification of consumption in balance year

- yes
  - Does the reporting company run own comparable logistics sites?\(^{(1)}\)
    - no
      - Approach C
    - yes
      - Extrapolation\(^{(2)}\)

  - Emission factors
    - Electricity, energy carriers, material, waste, refrigerants

- Emission factors
  - Transshipment site with / without refrigeration
  - Warehouse

\(^{(1)}\) Same type, i.e. transshipment site or warehouse site
\(^{(2)}\) E.g. on basis of transshipped tons, stored logistics items
Input data required

// Input data required for calculating emissions:
  - Approach A:
    ▪ Quantity of consumed energy carriers (e.g., diesel, electricity); quantity of consumed packaging material\(^{(1)}\); quantity of produced waste\(^{(1)}\); if refrigeration: quantity of refilled refrigerants (in case of loss)
    ▪ Additional for extrapolation of own sites for external sites: quantity of logistics items at internal and external logistics sites
  - Approach B: not provided for the time being
  - Approach C: quantity of logistics items, average quantity of transshipments/storing per item differentiated concerning ambient and refrigerated goods

// Optional: Input data required for allocation of emissions (step 3)\(^{(2)}\)
  - Quantity of outgoing freight per logistics site
  - In case of combined logistics sites\(^{(3)}\): floor area for storage, transshipment and mixed activities; floor area and average stock level for ambient and refrigerated sections; quantity of outgoing freight per logistics site and transport mode; quantity of outgoing freight with and without order-picking (dispatch)
  - Company-specific allocation factors

---

\(^{(1)}\) Warehouse sites only
\(^{(2)}\) Depending on assessment scope and allocation objective
\(^{(3)}\) E.g. sites with warehousing and transshipment, multimodal transshipment sites, sites with refrigeration and ambient warehousing
# Calculation of emissions of transshipment sites

<table>
<thead>
<tr>
<th>Calculation rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ E = \sum Q_{ec} \times EFA_{ec} + \sum Q_{refr} \times EFA_{refr} ]</td>
</tr>
</tbody>
</table>

## A

Extrapolation of own sites for external sites

\[ E = \frac{\sum Q_{ec} \times EFA_{ec} + \sum Q_{refr} \times EFA_{refr}}{Q_{item}^{int}} \times Q_{item}^{ext} \times c_{site} \]

## C

\[ E = \sum Q_{item, amb}^{mode} \times Q_{ts, \emptyset, amb}^{mode} \times EFA_{ts, amb}^{mode} + \sum Q_{item, refr}^{mode} \times Q_{ts, \emptyset, refr}^{mode} \times EFA_{ts, refr}^{mode} \]

### Relevant links and assumptions

- In case of extrapolation of internal transshipment emissions for external transshipment emissions, it is assumed that external transshipment sites may be less efficient than own ones. This is considered with the correction factor \( c_{site} = c_{ts} \).
Calculation of emissions of warehousing sites

### Calculation rules

\[
E = \sum Q_{ec} * EFA_{ec} + \sum Q_{refr} * EFA_{refr} + \sum Q_m * EFA_m + \sum Q_w * EFA_w
\]

A

Extrapolation of own sites for external sites

\[
E = \frac{\sum Q_{ec} * EFA_{ec} + \sum Q_{refr} * EFA_{refr} + \sum Q_m * EFA_m + \sum Q_w * EFA_w}{Q_{item}^{int}} * Q_{item}^{ext} * c_{site}
\]

C

\[
E = \sum Q_{item}^{amb} * Q_{s,\emptyset}^{amb} * EFA_{s,amb} + \sum Q_{item}^{refr} * Q_{s,\emptyset}^{refr} * EFA_{s,refr}
\]

### Relevant links and assumptions

- In case of extrapolation of internal warehouse emissions for external warehouse emissions, it is assumed, that external warehouses may be less efficient than own ones. This is considered with the correction factor \(c_{site} = c_s\).
- The use of reusable loading devices (e.g., pallets, boxes) and their LC emissions are neglected.
Part IV - p. 60

Requirements on data quality (1)

Consumption of energy carriers/fuels

- The reporting company records the quantity of energy carriers/fuels, consumed for
  - Driving vehicles for e.g. intralogistics, yard logistics
  - Running technical equipment, lighting etc.
  - Running the cooling system, in case of refrigerated goods

- This may be realized in two different ways:
  - The total quantity of all logistics sites for the whole balance year: $Q_{ec}$
  - A representative sample for deriving a specific consumption factor for energy carriers: $q_{ec}^{∅}$ (e.g., [Liter diesel per day], [kWh per day]) that is extrapolated for all logistics sites

<table>
<thead>
<tr>
<th>Energy carrier</th>
<th>Unit</th>
<th>Data source (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel (diesel, gasoline, gas)</td>
<td>Liter, kg</td>
<td>Fuel receipts, on-board units, invoices</td>
</tr>
<tr>
<td>Electricity (respective electricity mix)</td>
<td>kWh</td>
<td>(Smart) meter at logistics site or electricity supplier</td>
</tr>
</tbody>
</table>

...
Sampling\(^{(1)}\) to derive an average value for consumption of energy carriers at logistics sites

- General differentiation between transshipment and warehousing sites and refrigeration respectively is required, i.e. 4 basic types
- The logistics sites covered shall have a comparable operation approach
  - Shift operation (e.g., 1 to 3 shifts per day)
  - Weekly days of operation (e.g., 5 to 7 days per week)
- In case of combined logistics sites\(^{(2)}\), the ratio of covered basic types of logistics sites shall be comparable

\(^{(1)}\) For extrapolating consumption of some sites to all sites of reporting company
\(^{(2)}\) E.g. sites with warehousing and transshipment, sites with refrigeration and ambient warehousing
Requirements on data quality (3)

// Definition of electricity-mix

- Emission factor of electricity consumption [CO₂e/kWh] is influenced by underlying energy carriers
- The reporting company shall use emission factors for electricity consumption close to reality(1), i.e.
  - Scope 3: national electricity mix (minimum requirement)
  - Scope 1/2: company-specific
    \[ EFA_{elec-mix} = \sum \%_{ec} \times EFA_{ec} \]  
    (for emission factor see »Supplement«)

- Electricity suppliers are requested(2) to specify the contribution of each energy source to the overall fuel mix of the supplier to the customer
  - The reporting company shall use this information for deriving its company-specific emission factor
  - The specified emission factor, as requested by 2009/72/EC, shall not be used since no underlying aligned methodology is defined by regulation

(1) See also [Scope 2 Standard]
(2) Regulation 2009/72/EC Article 3
Consumption of refrigerants

- The reporting company shall record the quantity of refrigerants, which were required in case of loss.
- This shall be realized by means of the total quantity of each specific refrigerant or on the basis of sampling, equivalent to consumption of energy carriers.

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>Unit</th>
<th>Data source (example)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of refrigerants</td>
<td>Liter</td>
<td>Protocols of workshop, purchase, invoice</td>
</tr>
</tbody>
</table>
Consumption of material

- The reporting company records the quantity of consumed material for packaging and cargo safety, e.g. stretch foil, bubble wrap, strapping tape, shipping carton, filler material, labels.
- When using purchase information, this may differ from real consumption in case of information crossing balance years. The reporting company may choose between the
  - Allocation of the total amount to the year of purchase, or
  - Expert allocation between the two balance years: the sum shall equal the total amount of purchase.
- The inbound transport of the material shall be assessed. The reporting company may choose between
  - Company-specific transport assessment (Approach A or B, see mode respectively)
  - Average transport assessment (Approach C, see mode respectively)

<table>
<thead>
<tr>
<th>Material (examples)</th>
<th>Unit</th>
<th>Source (example)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE foil</td>
<td>kg</td>
<td>Purchase, invoice</td>
</tr>
<tr>
<td>Cardboard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filler material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Production of waste

- The reporting company records the quantity of produced waste, using relevant waste fractions.
- When using invoice information, this may differ from real consumption in case of information crossing balance years. The reporting company may choose between the
  - Allocation of the total amount to the year of invoice, or
  - Expert allocation between the two balance years: the sum shall equal the total amount of invoice.
- For identifying relevant waste fractions see »Supplement«.

<table>
<thead>
<tr>
<th>Waste fraction (examples)</th>
<th>Unit</th>
<th>Source (example)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper, cardboard</td>
<td>kg</td>
<td>Invoice</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Parameters and emission factors

See »Supplement« for the following parameters and emissions factors.

### Parameters
- Correction factor for extrapolation $c_{site}$, $c_{ts}$, $c_{s}$

### Emission factors, e.g. greenhouse gas emissions per quantity of:
- Energy carrier $EFA_{ec}$
- Refrigerants $EFA_{refr}$
- Packaging material $EFA_{m}$
- Waste fraction $EFA_{w}$
- Transshipped cargo (ambient/refrigerated, mode-specific) $EFA_{ts,amb}^{mode}$, $EFA_{ts,refr}^{mode}$
- Stored cargo (ambient/refrigerated, with/without order-picking) $EFA_{s,amb}$, $EFA_{s,refr}$
Content

General framework

Procedure

Screening phase (step 1)

Calculation of emissions

- Road transport
- Rail transport
- Air transport
- Maritime navigation
- Inland navigation
- Logistics sites
- Administration
- Employee commuting
- Business travel
Assessment of emissions - Administration

Only administration sites of the reporting company are covered in the Green Logistics method. External administration sites are, thus, neglected.

The Green Logistics method covers one calculation approach for emissions caused by administration sites, i.e. the company-specific approach A.

<table>
<thead>
<tr>
<th>Activities covered</th>
<th>Scope of emissions&lt;sup&gt;(1)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of energy carriers for heating</td>
<td>Scope 1</td>
</tr>
<tr>
<td>Use of electricity for e.g. lighting, heating, air-conditioning</td>
<td>Scope 2</td>
</tr>
<tr>
<td>Use of refrigerants</td>
<td>Scope 1</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> According to GHG protocol
Input data required and calculation of emissions from administration

// Input data required for calculating emissions (Approach A)
- Quantity of consumed energy carrier (e.g., gas, oil, electricity); company-specific electricity mix; if air-conditioning: quantity of refrigerant loss

// No input data required for allocation of emissions (step 3)

<table>
<thead>
<tr>
<th>Calculation rules</th>
</tr>
</thead>
</table>
| **A** \[
E = \sum \sum Q_{elec}^{nation} \times EFA_{elec}^{nation} + \sum Q_{ec}^{i} \times EFA_{ec}^{i} + \sum Q_{refr}^{i} \times EFA_{refr}^{i}
\] |

// See »Supplement« for the following emissions factors, e.g. greenhouse gas emissions per quantity of:
- Energy carrier \( EFA_{ec} \)
- Electricity (main grid) \( EFA_{nation}^{elec} \)
- Refrigerants \( EFA_{refr} \)
## Content

### General framework

### Procedure

### Screening phase (step 1)

### Calculation of emissions

<table>
<thead>
<tr>
<th>Subcategory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road transport</td>
</tr>
<tr>
<td>Rail transport</td>
</tr>
<tr>
<td>Air transport</td>
</tr>
<tr>
<td>Maritime navigation</td>
</tr>
<tr>
<td>Inland navigation</td>
</tr>
<tr>
<td>Logistics sites</td>
</tr>
<tr>
<td>Administration</td>
</tr>
<tr>
<td><strong>Employee commuting</strong></td>
</tr>
<tr>
<td>Business travel</td>
</tr>
</tbody>
</table>

---

*Image: Green Logistics*
### Assessment of emissions - Commuting

<table>
<thead>
<tr>
<th>Activities covered</th>
<th>Scope of emissions&lt;sup&gt;(1)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions from transportation in vehicles (all modes) owned or controlled by the reporting company</td>
<td>Scope 1 (for vehicles that consume fuel) and Scope 2 (for vehicles that consume electricity)</td>
</tr>
<tr>
<td>Emissions from transportation in leased vehicles (all modes) operated by the reporting company not included in scope 1 and 2</td>
<td>Scope 3, category 8 “Upstream leased assets”</td>
</tr>
<tr>
<td>Emissions from transportation in vehicles (all modes) owned or operated by third parties</td>
<td>Scope 3, category 6 “Business travel”</td>
</tr>
<tr>
<td>Production of vehicles (all modes) purchased or acquired by the reporting company</td>
<td>Scope 3, category 4 “Upstream transportation and distribution”</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> According to [Scope 3 Standard]
Input data required:

// Approach A: quantity of consumed energy carrier (e.g., diesel, gasoline, gas, electricity); transport performance [pkm] (mode and country-specific)

// Approach C: transport performance [pkm] (mode and country-specific)
Calculation of emissions from employee commuting

### Calculation rules

#### A

\[ E = \sum Q_{ec} \cdot EFA_{ec} + \sum pkm^{mode} \cdot (EFA_{pkm,v}^{mode} + EFA_{pkm,inf}^{mode}) \]

#### C

\[ E = \sum Q_p \cdot d_p^{\theta,nation} \cdot 2 \cdot wd^\theta \cdot EFA_{pkm}^{nation} \]

### Relevant links and assumptions

// The number of employees \( Q_p \) shall not be full-time equivalents.

// An average quantity of working days of \( wd^\theta \) may be assumed.

// An average distance of an employee commuting trip \( d_p^{\theta,nation} \) may be assumed.

// The passenger-kilometers of employee commuting are determined per transport mode by multiplying the number of employees using this mode, the number of trips and their trip distance.

\[ pkm^{mode} = (\sum Q_p \cdot 2 \cdot wd \cdot d_p)^{mode} \]
Parameters and emission factors

See »Supplement« for the following parameters and emissions factors

Parameters
- Quantity of working days of $wd^0$
- Average distance of an employee commuting trip $d_{p,nation}^0$

Emission factors, e.g. greenhouse gas emissions per
- Quantity of energy carrier $EFA_{ec}$
- Person-kilometer for average vehicle classes and infrastructure of passenger transport $EFA_{pkm,v}^{mode}, EFA_{pkm,inf}^{mode}$
- Person-kilometer for average passenger transport $EFA_{pkm}^{nation}$
Content

General framework

Procedure

Screening phase (step 1)

Calculation of emissions

- Road transport
- Rail transport
- Air transport
- Maritime navigation
- Inland navigation
- Logistics sites
- Administration
- Employee commuting
- Business travel
Assessment of emissions - Business travel

Business travel covers the transportation of employees for business-related activities

<table>
<thead>
<tr>
<th>Activities covered</th>
<th>Scope of emissions(^{(1)})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions from transportation in vehicles (all modes) owned or controlled by the reporting company</td>
<td>Scope 1 (for vehicles that consume fuel) and Scope 2 (for vehicles that consume electricity)</td>
</tr>
<tr>
<td>Emissions from transportation in leased vehicles (all modes) operated by the reporting company not included in scope 1 and 2</td>
<td>Scope 3, category 8 “Upstream leased assets”</td>
</tr>
<tr>
<td>Emissions from transportation in vehicles (all modes) owned or operated by third parties</td>
<td>Scope 3, category 6 “Business travel”</td>
</tr>
<tr>
<td>Production of vehicles (all modes) purchased or acquired by the reporting company</td>
<td>Scope 3, category 4 “Upstream transportation and distribution”</td>
</tr>
</tbody>
</table>

\(^{(1)}\) According to [Scope 3 Standard]
Definition of calculation approach

// Input data required for calculating emissions
- Approach A: quantity of consumed energy carrier (e.g., diesel, gasoline, gas, electricity); transport performance [pkm] (mode and country-specific)
- Approach C: transport performance [pkm] (mode and country-specific)

// No input data required for allocation of emissions (step 3)
Calculation of emissions from business travel

### Calculation rules

<table>
<thead>
<tr>
<th>A</th>
<th>( E = \sum Q_{ec} \times EFA_{ec} + \sum pkm^{mode} \times (EFA_{pkm,v}^{mode} + EFA_{pkm,inf}^{mode}) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>( E = \sum pkm^{mode} \times EFA_{pkm}^{mode} )</td>
</tr>
</tbody>
</table>

### Relevant links and assumptions

- The passenger-kilometers of business trips are determined per transport mode by multiplying the number of trips and their trip distance.

\[
pkm^{mode} = \sum \left( \sum Q_{travel} \times d_{travel} \right)^{mode}
\]

- An average trip distance per mode may be used.
Consumption of energy carriers/fuels

- The reporting company records the quantity of energy carriers/fuels, consumed for driving the vehicles.
- This may be realized in different ways:
  - For the whole fleet in the whole balance year: $Q_{ec}$
  - With representative samples\(^1\) for deriving specific fuel consumption factors: $q_{ec}^\phi$
    (e.g., [liter diesel per km]) that is extrapolated for the whole fleet, with $Q_{ec} = q_{ec}^\phi \cdot \sum d_g$.

### Requirements on data quality (1)

<table>
<thead>
<tr>
<th>Energy carrier (examples)</th>
<th>Unit</th>
<th>Data source (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel (diesel, gasoline)</td>
<td>Liter</td>
<td>Refueling bill, fuel card, on-board unit</td>
</tr>
<tr>
<td>Electricity</td>
<td>kWh</td>
<td>(Smart) meter at power outlet, on-board unit</td>
</tr>
<tr>
<td>Compressed natural gas CNG</td>
<td>Liter</td>
<td>Refueling bill, fuel card, on-board unit</td>
</tr>
<tr>
<td>Liquefied natural gas LNG</td>
<td>Liter</td>
<td>Refueling bill, fuel card, on-board unit</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Further information on sampling size see »Supplement«.
Sampling to derive an annual average value for fuel consumption

- Two general levels of detail for real data on fuel consumption
  
  1. Documentation of annual average of specific vehicle (e.g. license plate) covering all trips travelled in balance year (highest level)
  
  2. Deriving an annual average of specified vehicle classes covering a sample of routes travelled in balance year (minimum requirement)

- For definition of vehicle classes see »Supplement«.

See »Supplement« for the following emissions factors, e.g. greenhouse gas emissions per

- Quantity of energy carrier $EFA_{ec}$

- Person-kilometer for average vehicle and infrastructure $EFA_{pkm,v}^{mode}$, $EFA_{pkm,inf}^{mode}$

- Person-kilometer for average passenger transport $EFA_{pkm}^{mode}$
## Summary of overall emissions

<table>
<thead>
<tr>
<th>Sub-aspect</th>
<th>Emissions (e.g. kg CO$_2$e)</th>
<th>Share [%]</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>$E_{\text{road,ext}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{\text{road,int}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{\text{rail,ext}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{\text{rail,int}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{\text{air,ext}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{\text{air,int}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{\text{sea,ext}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{\text{sea,int}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{\text{barge,ext}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{\text{barge,int}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{\text{ext _site}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{\text{int _site}}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{\text{admin}}$</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>$E_{\text{employee}}$</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>$E_{\text{travel}}$</td>
<td>-</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$E_{\text{ls}}$</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Content

General framework

Procedure

Screening phase (step 1)

Calculation of emissions

Validation of scope

Allocation of emissions

Declaration

Annex

Supplement: Parameters of Green Logistics method
Steps 1 and 2 of the method (detail)

1.1 General calculation of emissions approach C
1.2 Transfer to Eco-Indicator 99 points
1.3 Definition of relevance
1.4 Definition of level of detail of step 2.1

2.1 Calculation of emissions according to approach A, B, C

Less relevant sub-aspects (<1 %, ∑ max. 5 %)

2.2 Transfer to EI99 & comparison with results of step 1.1

3. Allocation

Assessment scope is valid.

Are the sub-aspects defined as relevant (or less relevant) in step 2.1 the same as in step 1?

1. no
2. yes

Was one sub-aspect, defined as relevant in step 1, defined as relevant in step 2.1?

1. no
2. yes

Was one sub-aspect, defined as less relevant in step 1, defined as less relevant in step 2.1?

1. no
2. yes

Does this sub-aspect require the calculation of emissions according to approach A or B?

1. no
2. yes

Assessment scope is valid.

Assessment scope is valid.

Assessment scope is valid.

---

(1) In case of “administration”: simplified approach A is used
(2) Irrelevant if GHG emissions are focused only
(3) Or several sub-aspects
### Summary of overall emissions

<table>
<thead>
<tr>
<th>Sub-aspect</th>
<th>Step 1: Screening phase</th>
<th>Step 2: Calculation of emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Emissions</td>
<td>%</td>
</tr>
<tr>
<td>$E_{t\text{road,ext}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{road,int}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{rail,ext}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{rail,int}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{barge,ext}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{barge,int}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{sea,ext}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{sea,int}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{air,ext}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{air,int}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{ext site}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{int site}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{admin}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{employee}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E_{t\text{travel}}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$E_{t\text{LS}}$</td>
<td></td>
</tr>
</tbody>
</table>