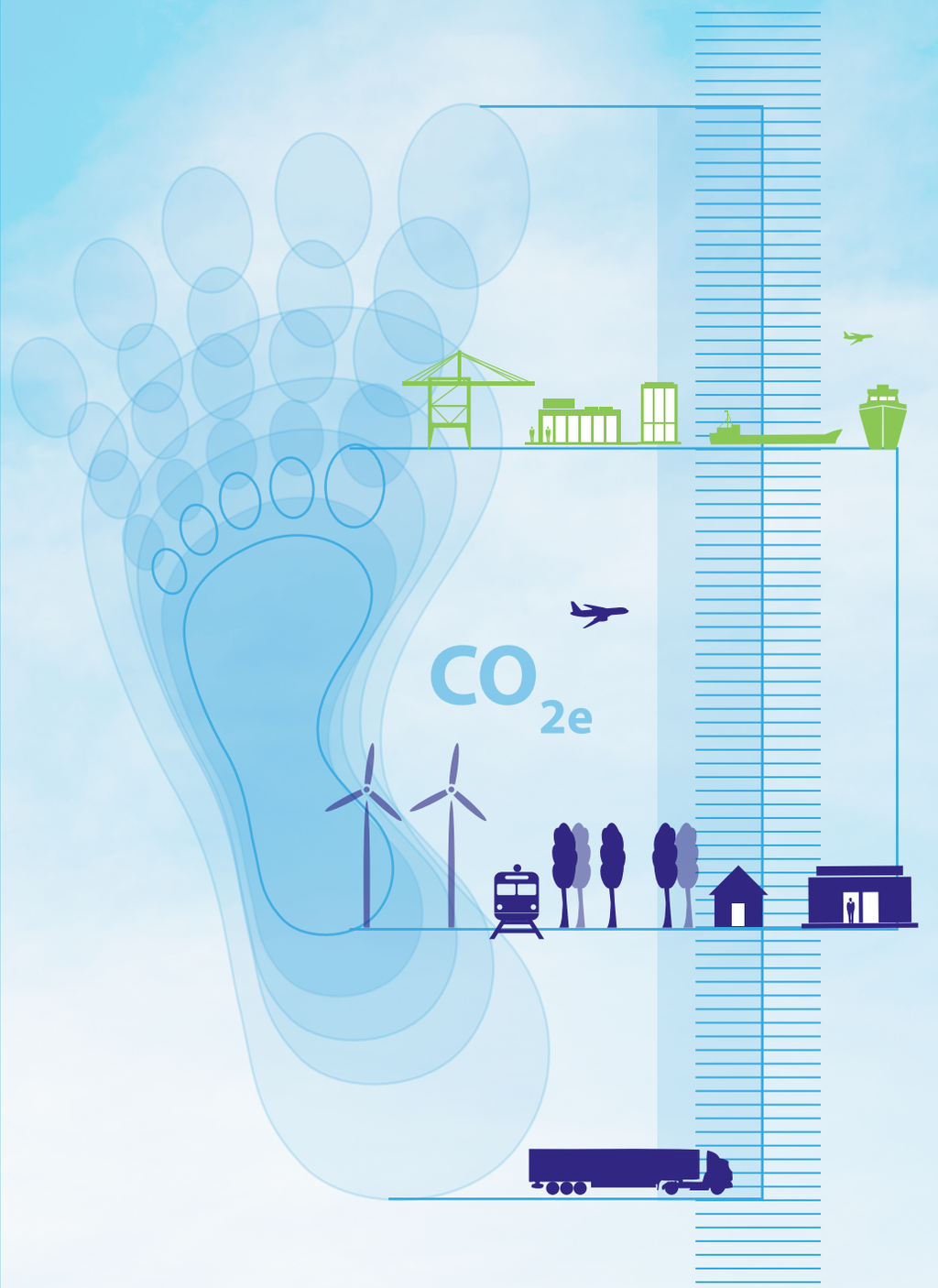
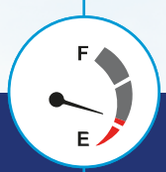
GUIDELINE 4 - CARBON FOOTPRINT IN LOGISTICS





Fuel

Measuring, extrapolating, estimating or using standard values

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LEAN & GREEN EUROPE

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Colophon

Guideline 4** - **Fuel
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Carbon Footprint in logistics

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Fuel

Measuring, extrapolating, estimating or using standard values

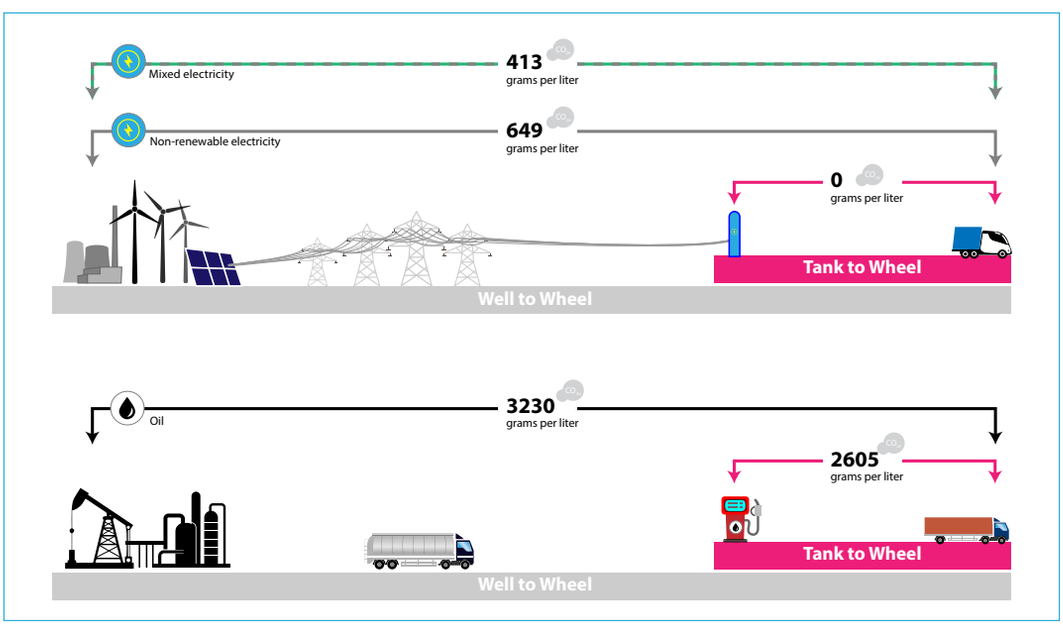
This guideline deals with the fuel and energy data associated with transport orders. In practice, these data are measured or estimated in all kinds of different ways. The guideline sets out how they should be supplied in all these cases.

The intention is to ensure that the data (fuel/energy and cargo/transport orders) belong together - in other words, that they relate to the same work and have the same scope. If the fuel data are known for a 1-month period for 10 trucks, the cargo and orders transported by these 10 trucks over the course of that month belong with these data. If the fuel data originate from an on-board computer that indicates the consumption per trip, they must be accompanied by the cargo and the transport order for the trip in question.

The fuel/energy data can be easily converted to CO_{2e} emissions automatically. The CO_{2e} emissions to be allocated are calculated on the basis of the amount of fuel or energy (kWh) consumed: we will use the word 'fuel' to cover both terms in this guideline.

The conversion figures for the Netherlands, per liter or kWh, and for each type of fuel or energy, can be found at www.co2emissiefactoren.nl. There are always two figures available, each of which has a different purpose: a Tank-to-Wheel (TTW) figure and a Well-to-Wheel (WTW) figure.

A WTW figure takes the whole production chain into account, while the TTW figure only considers the emissions generated during transportation. Non-renewable electricity in the Netherlands has a TTW figure of 0 grams CO_{2e}/kWh and a WTW figure of 649 grams per kWh.



The average for non-renewable and green electricity in the Netherlands is 413 grams per kWh.
Diesel: TTW 2,606 grams CO_{2e} per liter, WTW 3,230 grams CO_{2e} per liter.

When it comes to calculating CO_{2e} emissions, software can easily work out both the WTW and TTW: often only one of the two is required.

The following points are important when determining the amount of fuel:

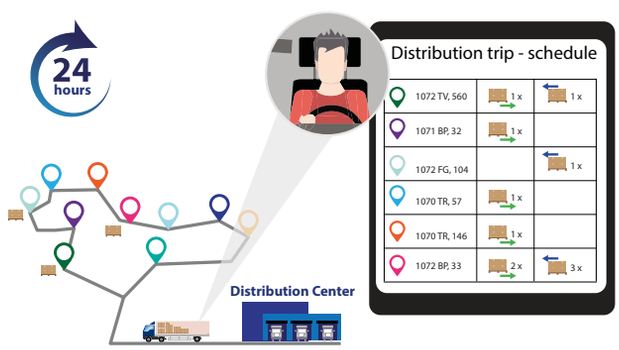
- The scope: fuel and transport orders must match up, but how do you do that?
- Is the amount of fuel measured, extrapolated or estimated, or do standard values need to be used?
- How do subcontractors supply their data?

This guideline focuses primarily on the first two questions. The subject of 'Outsourced transport' is explained in detail in guideline 15.

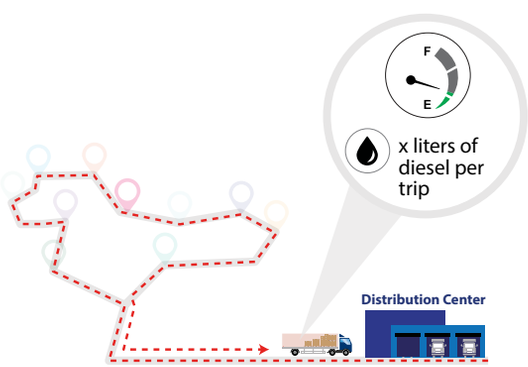
Scope: How do you combine fuel and transport orders? Do you group a large number together or use a lot of small combinations?

Guideline 1 'Allocation' explains how allocation is performed. The basis is the combination of:

- A number of cargoes transported from a place of origin to a destination.
- The amount of fuel consumed during this trip.

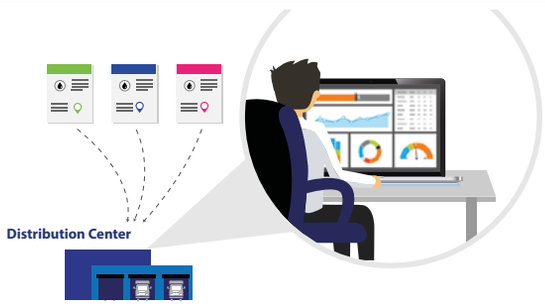


A number of cargoes transported from a place of origin to a destination.



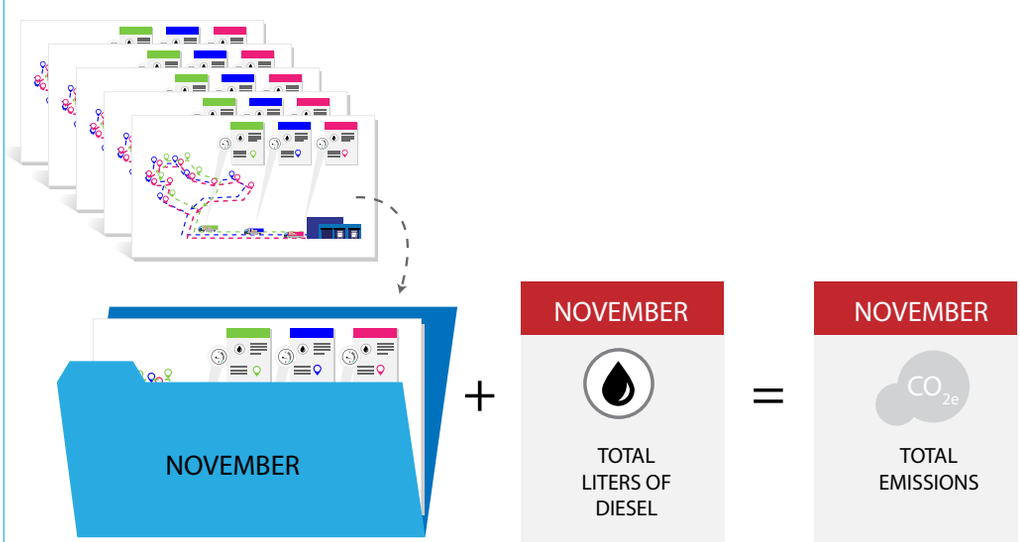
The amount of fuel consumed during this trip.

The combination is referred to as an 'allocation set'. If the data are recorded per trip or per day, this will result in a large number of allocation sets.



Each set can be calculated separately. This gives the transporter precise insights into how efficiently the company is operating, if required. It also provides a wealth of information about and for each customer.

Combined data

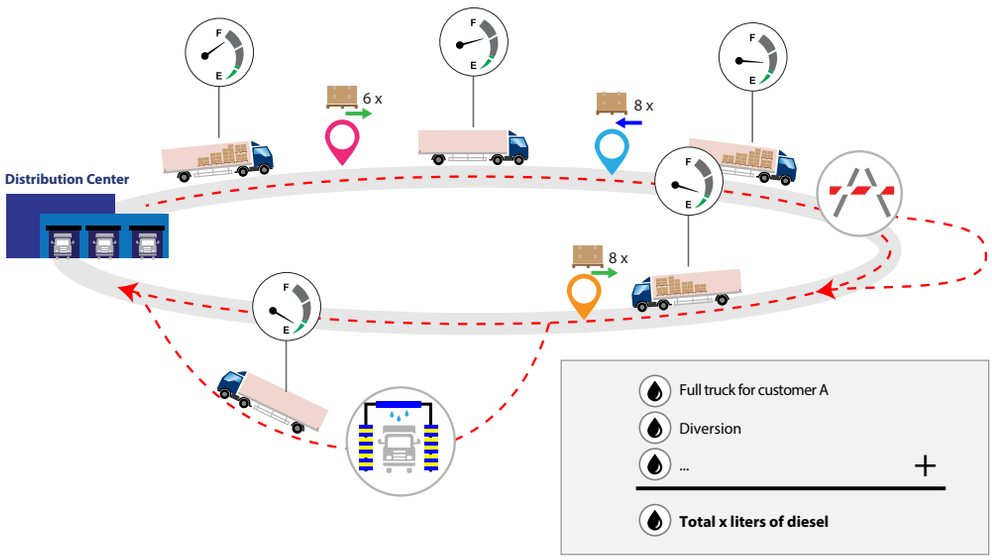


Information on the amount of fuel may also be available as a total for a week or month - as a total for a fleet, for example. The amount of CO_{2e} then has to be allocated to the cargo/orders transported by this fleet over this period.

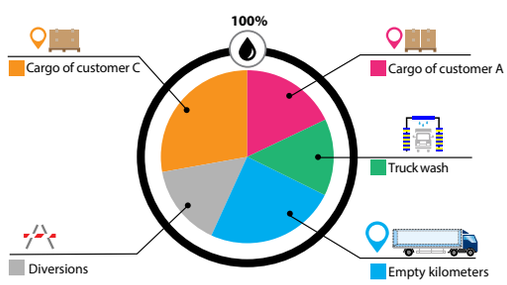
In this case an allocation set looks completely different: numerous transport orders and one emissions figure. Allocation is performed for lots of different transport orders in a single calculation from a large amount of CO_{2e}.

The insights gained are less precise here, but the total is nevertheless correct.

Including all fuel



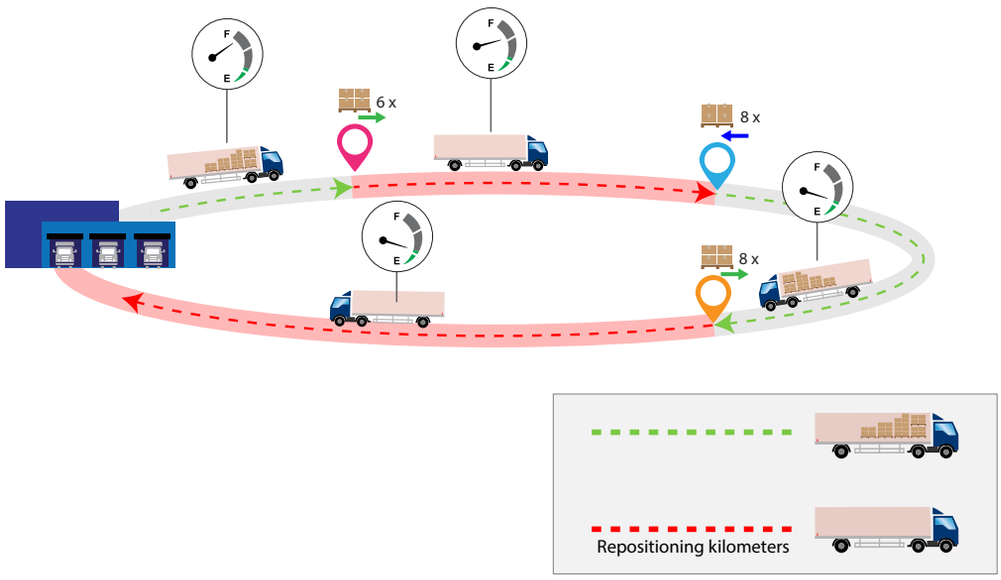
The starting point is that all fuel is included in the calculation and allocated. This means that all kilometers driven as a result of diversions, to reach the pick-up location and for maintenance and cleaning are included in the total. Efficient or inefficient driving, driving when not fully laden - everything is taken into account by including the total fuel.



The company determines itself how all the fuel is distributed across all the different allocation sets, as long as the total is correct.

An auditor can then check these figures easily.

Including all emissions



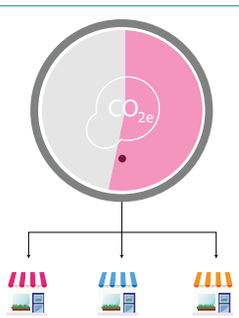
All emissions are distributed across all orders in this way. Given the importance of emissions today, empty kilometers, or repositioning kilometers, will be the subject of discussion. What is a good way to allocate these emissions? Who is responsible?

Empty kilometers

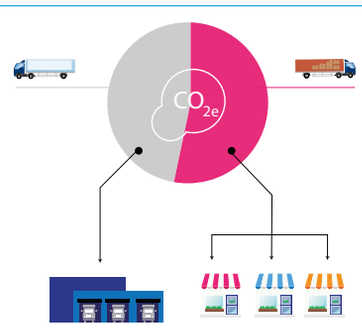
This is examined in more detail in Guideline 16. 'Repositioning and empty kilometers'. The COFRET standard provides for just one possibility: the emissions from repositioning kilometers must be distributed proportionately across the cargo.

In practice, this still gives rise to discussion between some transporters and shippers, especially in the case of FTL orders and bulk transport.

If the COFRET standard is deviated from in such a case, it is important to ensure that no emissions 'disappear'. These emissions resulting from the repositioning kilometers must then be accounted for separately by the transporter, and the emissions allocated to the cargo must also include a clear indication that the approach taken deviates from the standard.

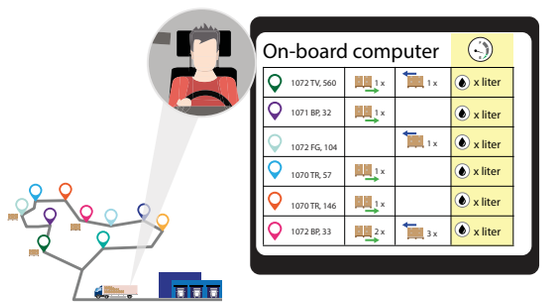


All emissions are distributed across all orders.

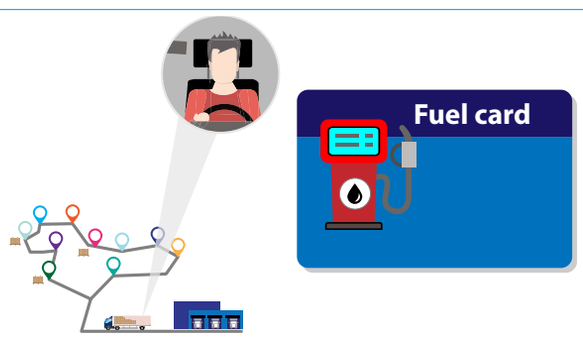


The emissions from repositioning kilometers/unallocated kilometers are accounted for separately as a total by the transporter.

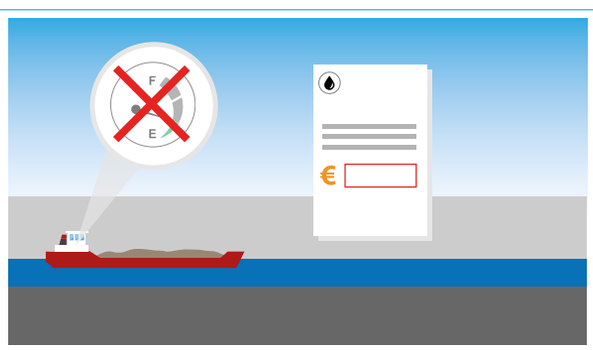
Measuring



Modern on-board computers in trucks indicate how much fuel has been consumed, if necessary per trip or stop.

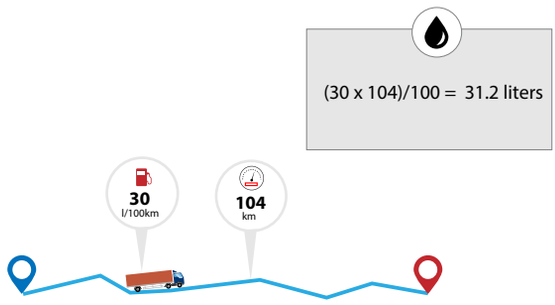


However, the totals per fuel card also represent a measured amount, over a certain period of time.

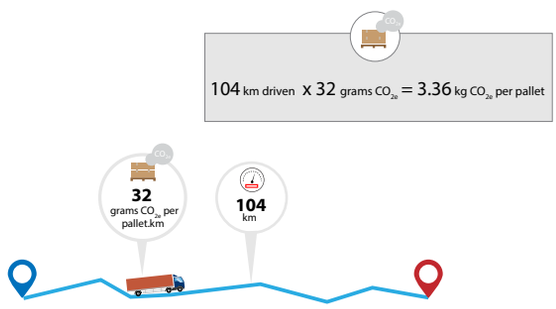


Fuel invoices can serve as a source of information as a fallback option. This applies in the case of inland vessels with no fuel gauge, for example.

Extrapolating



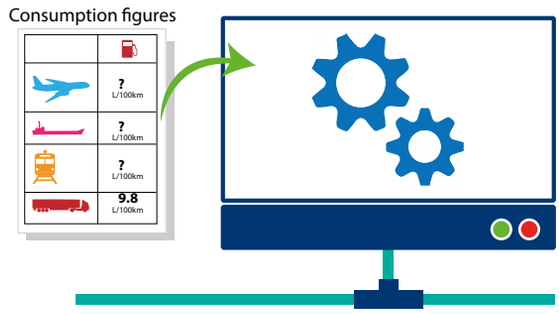
It is possible to extrapolate how much fuel has been consumed from the number of kilometers driven or sailed, based on standard consumption figures per type of vehicle/vessel. These consumption figures must then be specified for the calculation.



A transporter that allocates CO_{2e} itself in accordance with these guidelines can have an indicator calculated automatically (emissions per unit.km). Please note: in such a case it is mandatory to use the transportation distance (km_{gcd}) for the allocation and the indicator must be an average for all trips over a longer period. It is a representative average rather than a snapshot.

If the transporter passes on this average indicator to its customers, they can combine it with their transport orders and therefore also allocate CO_{2e} to each transport order. This works as follows: the transport order indicates the number of units, the origin and the destination. The transportation distance can be calculated directly from the origin and destination. By multiplying the transportation distance and the number of units by the indicator (CO_{2e} emissions per unit.km_{gcd}), it is possible to calculate the allocated emissions per order.

Estimating



Sophisticated forecasting systems[1] can estimate very effectively the amount of fuel that will be consumed on the basis of planned transport. It is possible to estimate how much fuel has been consumed using the planned number of kilometers, based on standard consumption figures per type of vehicle/vessel. These consumption figures must then be specified for the calculation.

1 such as EcotransIT

Emission intensity factors

Another way of approximating emissions or fuel is to use 'emission intensity factors', which are often expressed in emissions per ton.km. The figures can be found in STREAM studies or the GLEC standard. They can only be used for large, aggregated cargo flows and not individual trips. Why they do not work for individual trips is clear from the example. The STREAM/www.co2emissiefactoren.nl intensity figure is applied to a trip made by a delivery van. The calculated emissions are then converted back to diesel. This shows that the consumption figures are unrealistic.

Example calculation 1

Delivery van: factor 1.153 kg CO_{2e}
- cargo 1,500 kg = 1.5 tons
- transports this 50 km
- and returns empty = 100 km in total

Convert these CO_{2e} back to diesel

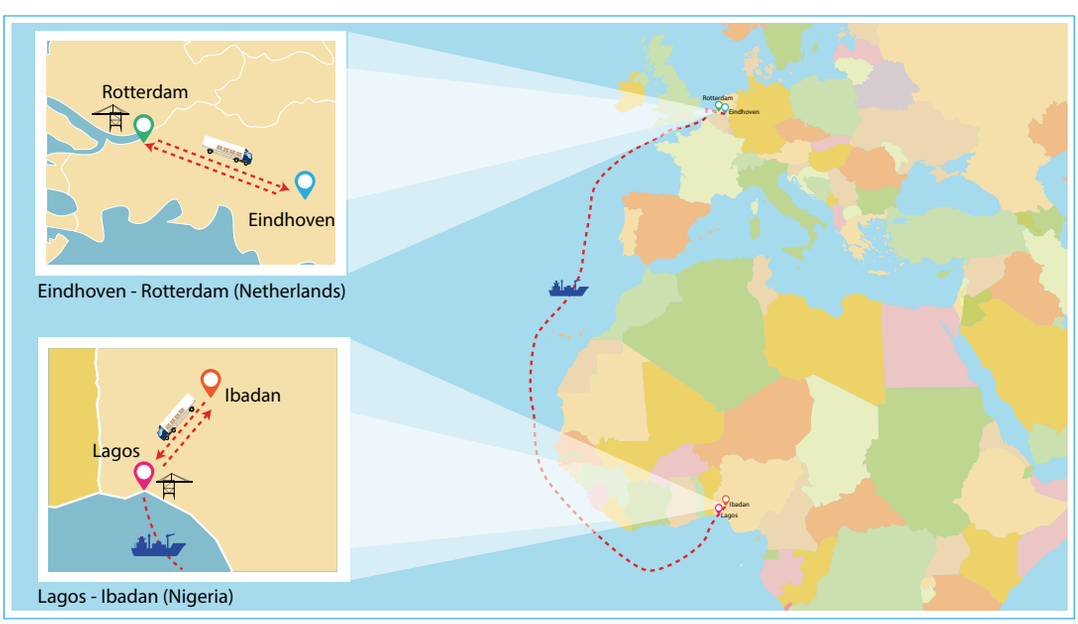
Diesel WTW 3.23 kg CO_{2e} / liter
86.47 kg CO_{2e} = 26.8 liters of diesel, over 100 km
= **1 per 3.73**

Example calculation 2

Delivery van: factor 1.153 kg CO_{2e}
- cargo 500 kg = 0.5 tons
- transports this 50 km
- and returns empty = 100 km in total

Convert these CO_{2e} back to diesel

Diesel WTW 3.23 kg CO_{2e} / liter
28.8 kg CO_{2e} = 26.8 liters of diesel, over 100 km
= **1 per 11.2**



Route	km_{gcd}	Consumption or emissions	Number	Kilometers	Liters of diesel	per 40 ft container	Total
Eindhoven - Port of Rotterdam	**112**	**90** Measured fuel consumption per container incl. empty kilometers	**40** trips		**3,600**	**290.7** kg CO_{2e} per container	**11,628** kg CO_{2e}
Port of Rotterdam transshipment		**8** Measured emissions per transshipment 40 ft container	**40** x transshipment			**8** kg CO_{2e} per container	**320** kg CO_{2e}
Port of Rotterdam - Port of Lagos	**5,065**	**77** Standard value for container shipping* CO_{2e}/TEU_{km} (sailed)	**40** x 2 TEU	**7,708** estimated km sailed		**1,187** kg CO_{2e} / container	**47,481** kg CO_{2e}
Lagos transshipment		**12** Standard value for emissions per transshipment 40 ft container	**40** x transshipment			**12** kg CO_{2e} per container	**480** kg CO_{2e}
Lagos - Ibadan	**108**	**42** Standard value for truck (liters/100 km)	**40** trips	**260** estimated km driven	**4,368**	**353** kg CO_{2e} per container	**14,109** kg CO_{2e}

Cargo
40 ft container **25 tons per container** **40 containers** **1,000 tons total**

Measured Indicator Estimated

1,850 kg CO_{2e} per container

74,018 total kg CO_{2e} of which 62,070 on basis of indicators

74 kg CO_{2e} per ton of which 62 kg CO_{2e} on basis of indicators

For the emission factor for diesel the figure indicated at www.co2emissiefactoren.nl is used

* *The standard value for container shipping to Lagos is trade-lane-dependent.*

In practice, especially in long international supply chains, all variants may be used at the same time. The basis applied for each fuel or CO_{2e} figure needs to be specified.

As, in the case of Lagos, freight largely travels in one direction, ships transport less cargo per round trip, which means the standard value for the Lagos trade lane is almost twice as high as for Rotterdam-Shanghai. A figure of 47 grams of CO_{2e}/TEU.k_m is indicated for the latter trade lane.

Carbon Footprint guidelines

0. Measuring, calculating, allocating and reducing

1. Allocating

2. Cargo

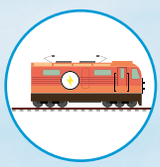
3. Origin and destination

4. Fuel

5. Inland shipping - containers

6. Inland shipping - bulk

7. Freight transport by rail



8. Air freight

9. Maritime and short sea shipping

10. Transshipment

11. Storage

12. Parcel transport and post

13. General road transport

14. Perishable and temperature controlled

15. Outsourced transport

16. Repositioning and empty kilometers

17. (Inter)national supply chains

18. Benchmarking

19. Intermediaries and platforms

20. Auditors and accountants

21. Data quality

22. The relationship between social goals and corporate goals

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