Logistics companies

Application guideline

Carbon Added Accounting

Make the CO_2e footprint of products and services demonstrably reliable

Connekt

Topsector Logistiek

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1 Logistics companies

This guideline describes the application of Carbon Added Accounting for logistics companies based on the principle:

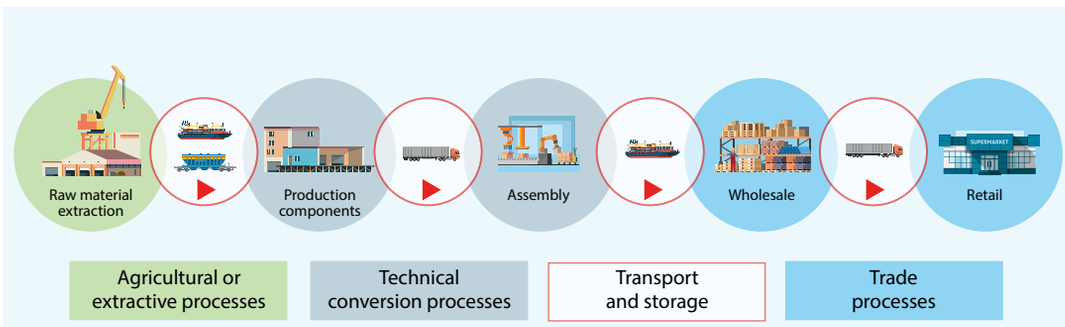
CO_2e input + CO_2e added = CO_2e output

The allocation of CO_2e of logistics activities to cargo is elaborated in detail with regard to carbon footprinting at www.carbonfootprinting.org. This guideline puts this information in the larger context of Carbon Added Accounting and is elaborated on the basis of two basic logistics activities: transport and storage.

2 Role in the value chain

Carbon Added Accounting considers, among other things, value chains, such as chains with physical goods flows, which, for example, start with agricultural or extractive processes of whose products continue through storage and transport to successively a semi-manufacture producer, an end-manufacturing producer, wholesale and retail) to finally reach the consumer. Various organisational typologies have been drawn up for each of these processes from the accountancy perspective as a tool for the administrative organisation and internal control (AO/IC) on the flows of money and goods.

Organisational typologies in a chain of physical goods flows



However, these typologies are not only applicable for differences in financial management and audits, but they are also suitable as an aid for CO_2e calculations.

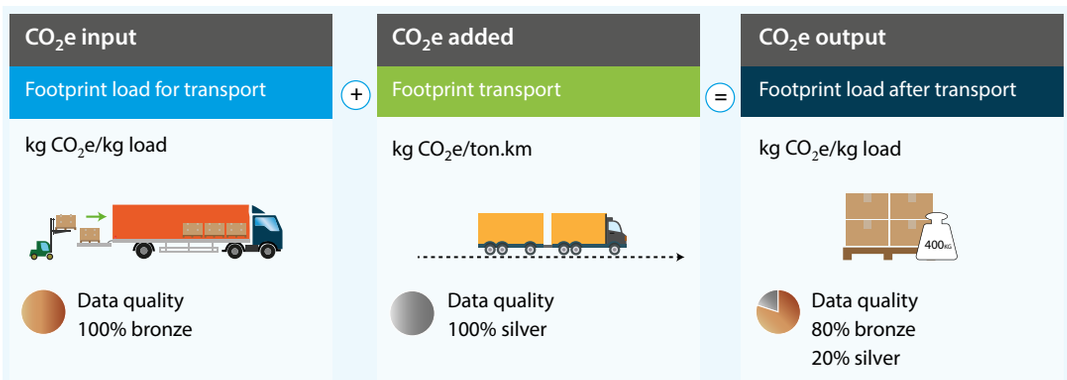
3 Transport

ISO14083, the international standard for Carbon Footprinting in logistics, identifies five transport modalities, namely transport by road, rail, water, air and pipelines. Any form of transport requires energy to transport goods from A to B. The Carbon Added Accounting basic principle, being CO_2e input + CO_2e added = CO_2e output, works for all these five modalities. An example for road transport is worked out below.

Determining CO_2e input

In transport, the CO_2e input is the CO_2e value of the shipment at the time of departure. It is also important to check the data quality of the CO_2e values.

The CO_2e output of transported pallets (including data quality)

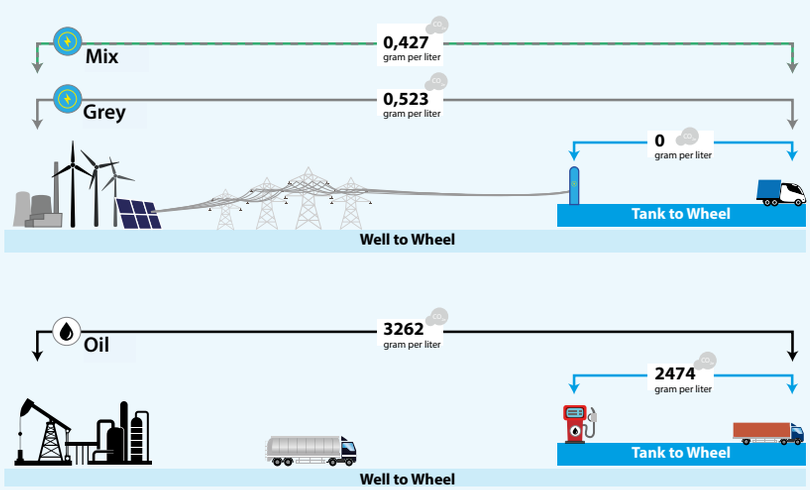


Calculating CO_2e added

CO_2e added refers to the emissions released during the energy consumption of freight transport. This may be the combustion of fuel, but also the (previous) emissions of consumed electricity. Ideally, this information is available at trip level, resulting in high data quality.

This energy consumption is relatively easy to convert into CO_2e emissions. The CO_2e emissions are calculated based on the amount and type of energy consumed. The website www.co2emissiefactoren.nl lists the Dutch emission factors for each form of energy consumption per unit. Two figures are always available, namely a Tank-to-Wheel (TTW) figure and a Well-to-Wheel (WTW) figure. The TTW figure only shows the emissions while driving, while the WTW figure shows the emissions of the entire production chain. The total CO_2e added is always based on a WTW figure.

WTW and TTW figures N.B. ISO14083 prescribes that both values must be calculated and reported separately

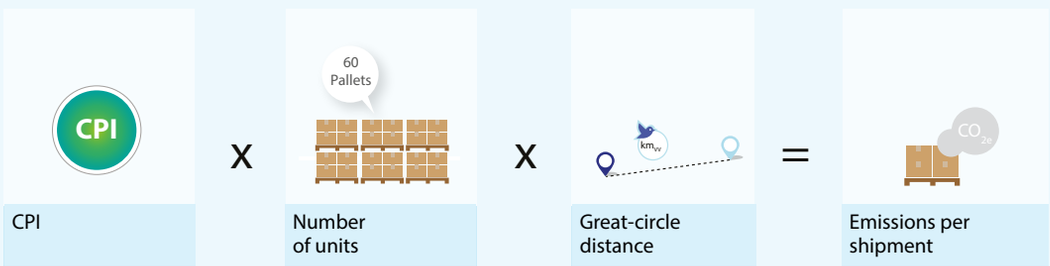


If less detailed data is available, calculations can also be made with averages over several trips, several vehicles or longer periods. Naturally, this will affect data quality. See the Data Quality Guideline or www.carbonfootprinting.org.

CO_2e output: allocation of CO_2e input and CO_2e added

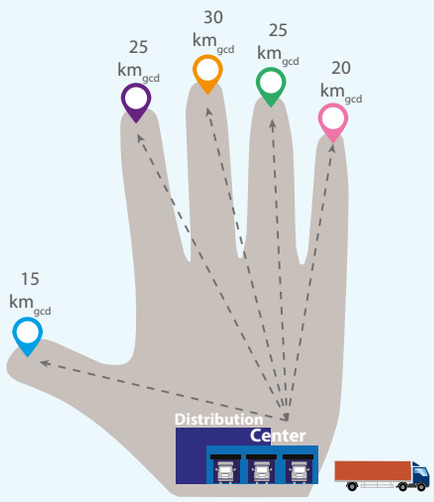
Allocating CO_2e to cargo to calculate the CO_2e output in the logistics sector is done via the COFRET Presentation Indicator (CPI). The unit of the CPI is CO_2e emissions per unit per km_{vv} (N.B. 'km_{vv}' is the displacement distance.) The CPI is set up in such a way that a logical distribution of CO_2e emissions is made over the various shipments in the same truck trip. All emissions from the trip are divided over the kilometres driven per amount of cargo. The unit of this is usually expressed in weight ($CO_2e/t.m_{vv}$) but can also be volume, number of pallets or number of packages. To this end, the CPI of the total trip is calculated first, which is then used to allocate the emissions to individual cargo over the distance transported.

Calculation for emissions per shipment with a CPI: simple calculation of the Great-circle distance by converting locations to geo-coordinates (latitude, longitude)



The formula is: CPI x number of units x Great-circle distance = CO_2e emissions for that shipment.

The example below shows how the CPI can be calculated in the case of a distribution trip with five shipments with a different quantity of pallets over different distances.



Round trip: basis

A distribution trip to transport 34 pallets to 5 locations.

Details

Total driven	**180**	km
Diesel	**51.43**	liters
Consumption	**3,5**	km/l
Total emissions	**170.74**	kg CO_{2e}
Cargo	**34**	pallets

Allocation calculation

x = / 780 x 170.74

Location	Cargo (pallets)	Distance (km_{gcd})	Pallets x km (pallet.km_{gcd})	Allocation (%)	CO_{2e} emissions (kilos)	CO_{2e} emissions per pallet (kilo)	CO_{2e} emissions (kilos)
Thumb	6	15	90	11.54	19.70	3.28	19.70
Index finger	6	25	150	19.23	32.84	5.47	32.84
Middle finger	6	30	180	23.08	39.40	6.57	39.40
Ring finger	8	25	200	25.64	43.78	5.47	43.78
Little finger	8	20	160	20.51	35.02	4.38	35.02
Total	**34**	**180**	**780**	**100 %**	**170.74**		**170.74**

x CPI 0.218 =

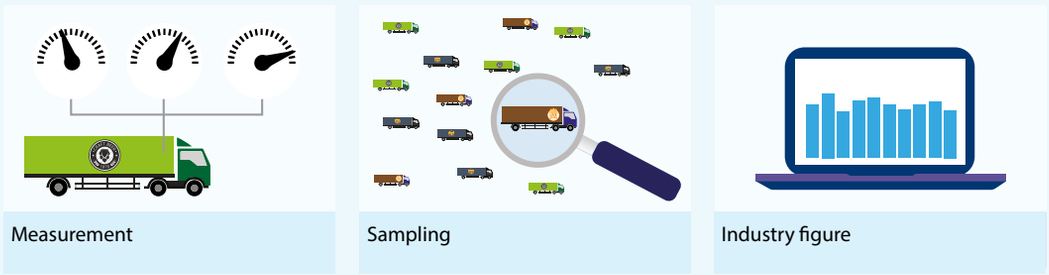
CPI & KPI

CPI = 170.74 kg CO_{2e} / 780 pallet.km_{gcd} = **0.218 kg CO_{2e} per pallet.km_{gcd}**

KPI = 170.74 kg CO_{2e} / 34 pallets = **5.0 kg CO_{2e} per pallet**

The chosen unit in the above example is 'pallets'. However, the Carbon Added Accounting method is based on weight, which means the emissions of the shipment will have to be converted into emissions per kg in the last step. If no detailed information is available to calculate the CPI at trip level, one can opt for information from samples or industry figures, which naturally leads to a lower data quality.

Different levels of data quality



Measurement | Sampling | Industry figure

If fuel information and/or a CPI cannot be retrieved, it is possible to arrive at a first rough estimate using general key figures. There are several sources that can provide $CO_2e/_{t.km}$ (e.g. co2emissiefactoren.nl).

4 Storage

ISO14083 describes, in addition to the CO_2e allocation to transportation activities, including how the CO_2e emissions from storage should be allocated to cargo.

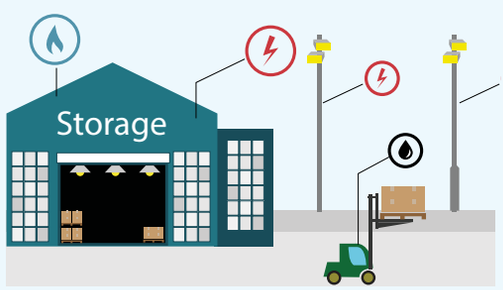
Determining CO_2e input

CO_2e input is the CO_2e footprint of the shipment at the time of arrival at the storage or transfer point. If goods are removed from their load carrier (read: packaging) in order to divide them into other units, for example, it is recommended to also map out the flow of packaging material. After all, new packaging material is also CO_2e input.

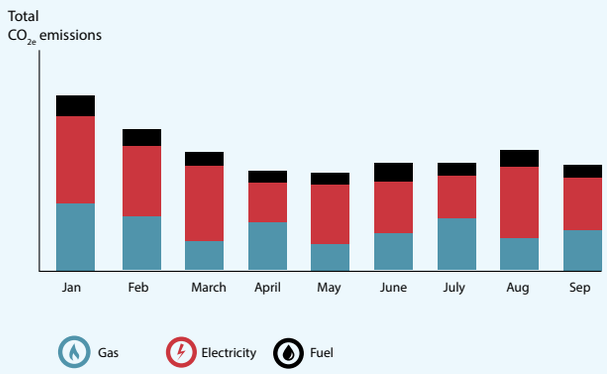
The goods are often removed from their load carrier in order to divide them into other units (break bulk, distribution centres). Special warehouses are used for conditioned storage.

Calculating CO_2e added

CO_2e added is the CO_2e that is added during the storage and transhipment process. This is normally the energy consumption of the buildings (e.g. gas, electricity) and the energy consumption of the means of transport (e.g. forklifts).



The CO_2e emissions of a storage facility (warehouse, cold store, distribution centre, etc.) primarily consist of the energy and fuel used for storage. This concerns everything that is directly needed for this, such as energy (gas, electricity) for buildings, and the fuel or electricity for (mobile) equipment such as forklifts.

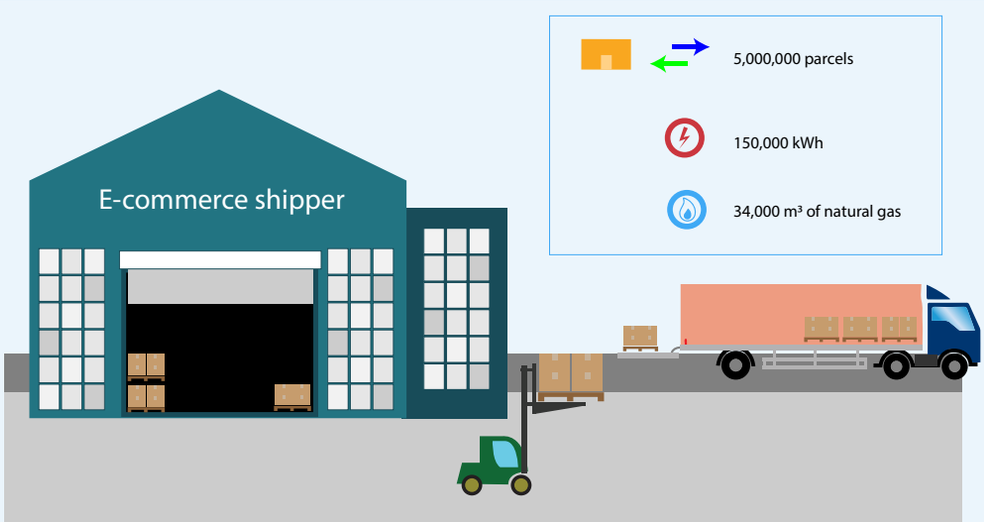


All that energy and fuel are measured and converted into CO_2e emissions. Most companies can determine this per year based on the bills of energy companies and fuel suppliers. More and more often, this consumption is also measured monthly or weekly and per unit, as it provides more insight.

Allocation of CO_2e input and CO_2e added

CO_2e output

There is no detailed guideline for allocating the CO_2e emissions from storage and transshipment processes. However, in practice the following method is well accepted and defensible: the allocation of CO_2e to the load based on the outgoing quantity, in the same period of energy consumption. A simple example of this is given below.



An e-commerce shipper with a 10,000-m^2 warehouse ships 5,000,000 packages in the month of March.

In March, 150,000 kWh of electricity was consumed and 34,000 m^3 natural gas.

The total emissions of the warehouse are:
150,000 kWh x 0.427 gram per kWh = 71,250 kg CO_2e
34,000 m^3 x 2.085 gram per m^3 gas = 64,260 kg CO_2e

Total 135,510 kg CO_2e = 27.1 grams of CO_2e per package.

(Source emission factors: www.co2emissiefactoren.nl)

5 Correlation checks

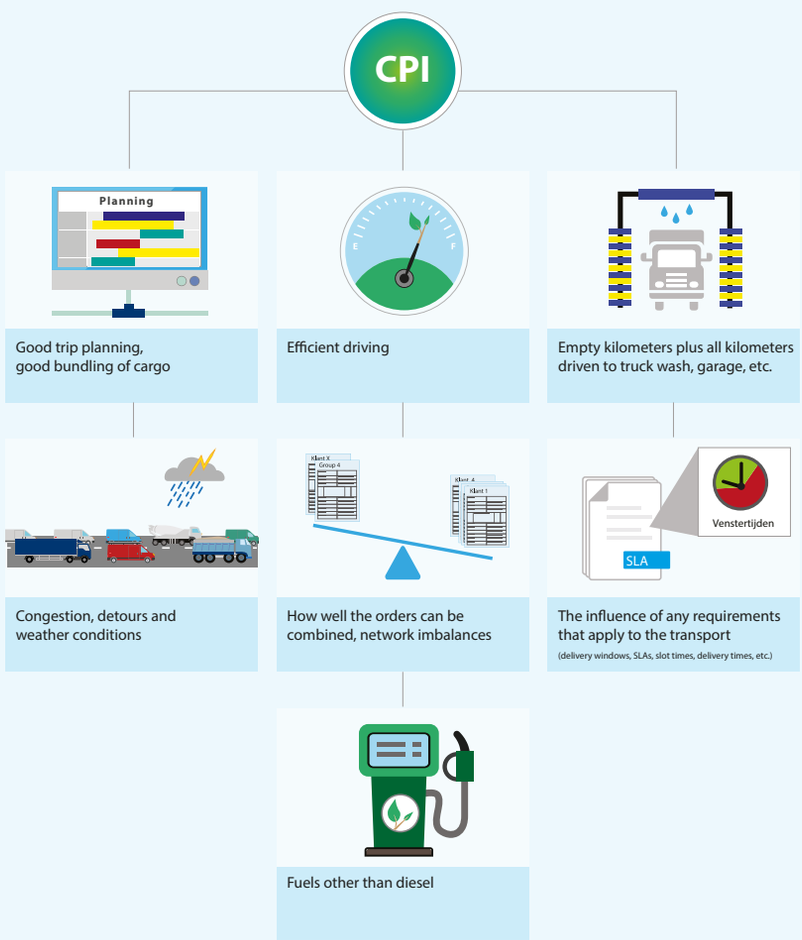
Partly from an accountant's perspective, the data must be correct (read: the data is accurate), complete (read: all data is available) and timely (read: the data relates to the intended reporting period). To this end, correlation checks can be made that compare the storage and transhipment performance, for example, with sales invoices and payments by customers and energy consumption with energy bills, bank payments and meter readings (e.g. gas, electricity, forklift use) per building. If the data differences in the correlation checks are small, the data quality is usually high. Any data differences in the correlation checks must be explained and and, where necessary, supplemented by modelling, which then leads to data completeness and thus lower data quality.

6 Insight

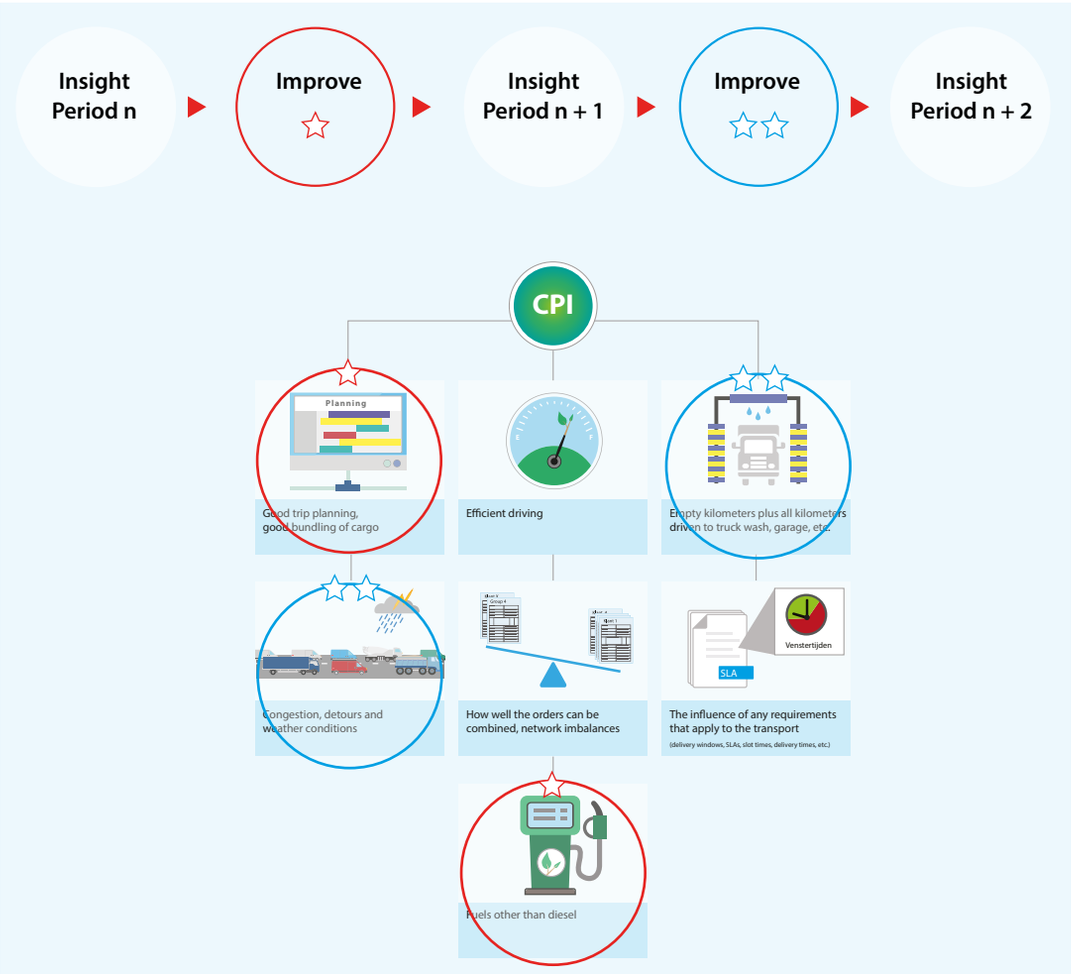
The use of the CPI leads to valuable insights for logistics companies. The CPI shows how energy or CO_2e-effective the storage and transshipment of goods are organised. Experience shows that this is a good indicator of an organisation's financial performance. The CPI combines many influencing factors in one indicator, namely:

- Good planning of trips, good bundling;
- Economical driving;
- Driving empty plus all kilometres to the car wash, garage, etc.;
- Traffic jams, detours and weather influences;
- How well the jobs fit together, imbalance in the network;
- The influence of requirements imposed on the transport (window times, SLAs, slot times, delivery times etc.);
- Fuels other than diesel.

Factors that influence the CPI indicator



An important aspect in this CO_2e allocation is that both the data quality and the GreenHouse Gas (GHG) protocol scope are traceable in the calculations so the end products do not only contain the calculated CO_2e values, but also the breakdown of these according to both data quality level (Bronze, Silver, Gold and Gold+) and GHG scope (I, II and III) which shows the context of the CO_2e values (see: Data quality application guideline).



Insight into the CPI and underlying information gives companies valuable insights to continuously improve their processes and financial performance and thus reduce CO_2e emissions.

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