

Methodology of carbon calculation

In this document the used methodology of the calculation of the carbon emission of different type of modalities is written. In the transport sector, there is no fixed methodology to calculate the emission. This is because it is hard to know exactly the released emission. There are several factors that influence the released emission e.g. weather, quality of maintenance of the vehicle, the type and weight of fuel contained in the vehicle and other factors which could not be determined subsequently.

To simplify the calculation, there are different report with average carbon emission factors. Those emission factors are mostly published in three different phases. The different between the measurements is briefly explained below:

- Well to Tank (WTT) – is the released emission from the production, processing and delivery of fuel.
- Tank to Wheel (TTW) – this is the emission that released during transport
- Well to Wheel (WTW) – this is the well to tank and the well to wheel phase together

Road transport

The released emission of road transport is calculated by using the emission factor published in STREAM Freight Transport. This report is written by CE Delft in collaboration with Delft University of Technology. The report provides representative average emission figures per mode of transport, which are suitable for global analyses where averages are sufficient.

The STREAM Freight Transport report distinguishes between three different goods/weight classes, based on the density of good. Different emission factors have been published for each of these classes. The different classes are:

- Light transport: equipment, furniture, mail, textiles, designed products (approximately 0.4kg/liter in cargo hold);
- Medium transport: food products, wood, paper, plastic, chemicals, metal products, cars, waste (approximately 0.5 – 1.2 kilogram/liter in cargo hold);
- Heavy transport: ores, minerals, coal, oil (typical for liquids and cargo >1.2 kilogram/liter)

To calculate the released emission of shipments, BGL used the emission factors of medium weight transport.

The emission factors are also shown per type of vehicles. BGL does not have their own trucks, so it is hard to know exactly which vehicle is used for transport. BGL used a shortlist of four types of trucks which are used in the calculation of the released emissions. The used type of vehicle in the calculation is based on the distance and shipment weight.

Type of vehicle	Distance	Weight of shipment
Large Van	< 30 kilometer	1.2t
Truck 10-20 tons	> 30 kilometer	<7.5t
Truck > 20 tons	> 30 kilometer	7.5t – 13t
LZV	> 30 kilometer	> 13t

The distance of a shipment will be calculated automatically by using an API. In some exceptions, we need to use route planners.

Besides the carbon emission, BGL can also calculate the released fine dust, Sulphur dioxide and nitrogen.

Sea freight

The released emission of sea freight shipments is comparable to trucking. To calculate the released emission it is important to know the dead weight tonnage(DWT) of the shipped vessel/container ship. This represents the max carried weight of the ship. The capacity can be found in platforms like Marinetraffic. The dead weight tonnage is needed to find the correct emission factor in the GLEC Framework. Also this report distinguishes in the WTT, TTW and WTW phases. The emission factors give an average of the released emission in grams per tonne-kilometer.

To calculate the released emission of a BGL shipment, the emission factor needs to be multiplied by the tonne-kilometer of a shipment. Tonne-kilometer represents the shipment weight in tonnes multiplied by the distance in kilometers. The shipped distance can be searched on Marinetraffic. This platform shows common used sea routes between two ports.

Air freight

To calculate the released emission by airfreight is more difficult. This modality is known as polluting a transport. The most airlines do not report the released CO₂ emission to their clients. BGL wants to calculate the released emission of a shipment as close to reality as possible. The most available calculation tools for airfreight shipments use a single emission factor for different airline types, however there are big differences in capacity and fuel usage.

BGL and Marinetrans developed an own tool to calculate the carbon emission. In this tool BGL makes a distinction between different type of aircrafts, also stopovers are included.

The first step is to calculate the released emission of the entire flight. For each flight Marinetrans needs to know the distance and type of aircraft. With these information the average fuel usage can be found at fuelplanner.com. At this webpage the fuel consumption can be found in kilograms. According to IATA, the average carbon emission per kilogram used fuel is 3.15kilogram. To know the average carbon emission for the entire flight, the total used fuel needs to be multiplied by 3.15.

The next step is to calculate the capacity of a flight. For different aircrafts Marinetrans created an overview of the number of passengers and the max weight in cargo. The tool of BGL and Marinetrans is based on EN 16258.

The final step is to calculate the share of the BGL shipment of the entire flight. The share of the BGL shipment can be multiplied by the total CO₂ of the entire flight to calculate the released emission of a single BGL flight.