

GHG Methodology

GHG emission estimates are calculated according to the following formula:

$$\begin{aligned} \text{Tonnes of } CO_2e = & \{[(\text{Tonnes of freight}) \times (\text{Shipping distance})] \\ & \times (\text{Mode specific diesel consumption factor}) \\ & \times (\text{Mode specific emission factor})\} \\ & + \{[(\text{Tonnes of freight}) \times (\text{Transloading distance})] \\ & \times (\text{Heavy Truck diesel consumption factor}) \\ & \times (\text{Heavy Truck emission factor})\} \\ & + \{[(\text{Diesel consumed by rail operations}) \\ & \times (\text{Diesel production emission factor})] \\ & + [(\text{Diesel consumed by heavy truck operations}) \\ & \times (\text{Ultra low sulphur diesel production emission factor})]\} \end{aligned}$$

Please note, GHG emissions related to transloading operations and those related to the production of diesel fuel are calculated only if the user chooses to include these activities. Further, transloading operations are included only in the rail-shipping operations.

Glossary:

Emission Factor (EF): An emission factor is the average mass of a product of combustion emitted from a particular locomotive type for a specified amount of fuel consumed. The respective constituent emissions from a specific locomotive type are calculated based on data from test measurements, the operational duty cycle and engine specific fuel consumption. The EF units are grams, or kilograms, of a specific emission product per litre of diesel fuel consumed (g/L).

Emissions of Greenhouse Gases (GHG): The GHG constituents produced by the combustion of diesel fuel are listed below:

CO₂ (Carbon Dioxide): this gas is the largest by-product of combustion emitted from engines and is the principal greenhouse gas. It has a Global Warming Potential of 1.0. CO₂ and water vapour are normal by-products of the combustion of fossil fuels.

CH₄ (Methane): is a colourless, odourless and inflammable gas that is a bi-product of incomplete diesel combustion. It has a Global Warming Potential of 21 (relative to CO₂).

N₂O (Nitrous Oxide): this is a colourless gas produced during combustion that has a Global Warming Potential of 310 (relative to CO₂).

The sum of the constituent greenhouse gases expressed in terms of their equivalents to the Global Warming Potential of CO₂ is depicted as CO₂ equivalent (CO₂e). This is calculated by multiplying the volume of fuel consumed by the Emission Factor of each constituent then, in turn, multiplying the product by the respective Global Warming Potential, and summing them.

Class I Railway: A railway company with gross revenues of \$250,000,000 a year from Canadian rail service.

Short Line Railway: A railway that may originate or terminate freight traffic on its track, participate in division of revenue, and is usually less than 100 miles in length.

Transloading: The transfer of freight from one mode to another is known as transloading. In the case of the "RAC GHG Calculator" transloading operations refer to shipment of freight by heavy truck from point of origin to a transloading facility where it is loaded onto a railcar prior to rail shipment, as well as shipment by heavy truck from a transloading facility to the final destination subsequent to rail shipment.

Conversion Factors Related to Railway Operations

Imperial gallons to litres	4.5461
U.S. gallons to litres	3.7853
Litres to Imperial gallons	0.2200
Litres to U.S. gallons	0.2642
Miles to kilometres	1.6093
Kilometres to miles	0.6214
Metric tonnes to tons (short)	1.1023
Tons (short) to metric tonnes	0.9072
Revenue ton-miles to Revenue tonne-kilometres	1.4599
Revenue tonne-kilometres to Revenue ton-miles	0.6850

Sources:

Heavy truck and rail emission factors	Environment Canada (2007), <i>Canada's Greenhouse Gas Inventory 1990 - 2005</i> , Table A12-7
Heavy truck diesel consumption factor	Adapted from Natural Resources Canada (2000), <i>Fuel Efficiency Benchmarking in Canada's Trucking Industry</i>
Diesel production emission factors	Adapted from, GHGenius version 3.11
Rail fuel consumption factors	Derived from figures from the Railway Association of Canada internal database

Disclaimer:

Please be advised that the GHG emissions calculated with the Railway Association of Canada's Greenhouse Gas Calculator are intended to be used only as an estimate. It is recommended that shippers discuss the issue with their freight service providers prior to shipping.

Further, it should be noted that entering unusually low or high values in the input fields of the "RAC GHG Calculator" may result in inaccuracies.