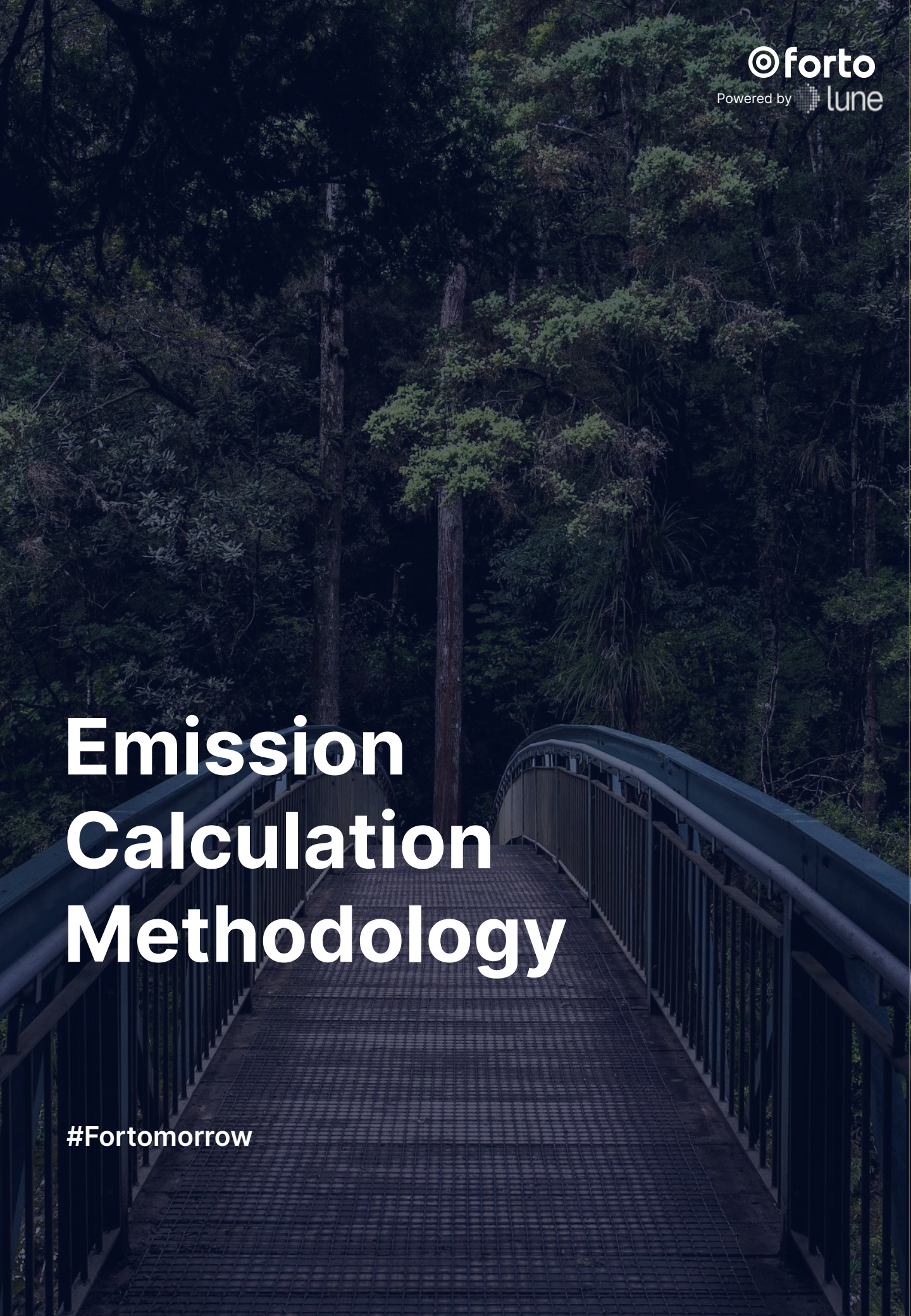

Emission Calculation Methodology

#Fortomorrow

1. Introduction

Based on this methodology, Forto calculates the CO2 equivalent (CO_2e) emissions from the logistic services they provide to their customers. All reported emissions reflect well-to-wake (wtw) emissions - meaning that emissions from the provision of the fuel (well-to-tank (wtt)) and the combustion of the fuel (tank-to-wake (ttw)) are taken into account. The emissions are calculated by our Global Logistics Emissions Council (GLEC) certified partner Lune. All calculations are in line with the GLEC Framework 2019 and DIN EN 16258. The methodology is also in accordance with the upcoming ISO 14083 standard. Emissions are calculated for the full transport chain of a shipment, including pre-, main-, on-carriage and transshipments. The calculation methodology varies depending on the mode of transport, which is outlined below. The output of the calculation is in metric tonnes of CO_2e.

2. Methodology

Calculating the emissions of a shipment consists of three main components: distance, weight or TEU, and emission factor.

Total CO_2e = distance (km) * weight or TEU * emission factor (ton-km)

2.1 Distance

The actual distance is used in the calculation whenever available, otherwise it is estimated in the following ways.

- Sea Freight
  A custom algorithm calculates the shortest feasible distance with an additional 15% to match the actual distance (recommended by the GLEC framework).
- Air Freight or Land Routes (rail and truck)
  The distance is estimated via Mapbox. Great Circle Distance is calculated for Air Freight, with an additional 95 km per airport in the journey. For and Routes shortest feasible distance is calculated with the coordinates of the addresses.

2.2 Weight/TEU

Depending on data availability, either vehicle specific emission factors, global or trade lane average emission factors are used. The emissions calculation with vehicle specific emissions factors consider the actual weight, and the emissions calculation with global or trade lane average emission factors consider the number of TEU of the shipment.

2.3 Emission factor

The emission factors vary depending on the transport mode and the data availability. A shipment can consist of multiple legs of different transport modes and different types of vehicles. Therefore the final emissions may be calculated with a combination of different emission factors, aiming to be as accurate as possible.

- Sea Freight
  The database EMSA THETIS-MRV provides vessel specific emissions data. This data has been processed by Lune to generate WTW emission factors. The database does not hold information for all vessels. When data is unavailable in the database the fall back solution is to apply an average emission factor from the GLEC framework.

- Inland Waterway
  Emission factors are derived from GHG emission factors for IWT [2018], which vary depending on the type of inland waterway vessel (motor, coupled convoy, pushed convoy etc.) and the size of the vessel.
- Air Freight
  Emission factors are derived from the IATA RP1678 methodology, which differ between cargo and passenger planes. If the plane type is unknown emission factors are an average of cargo and passenger planes. Emission factors also differ in specific flight distances which ranges from short, medium and long haul.
- Rail
  Emission factors differs between diesel and electric freight train. Diesel freight train emission factors are sourced from the GLEC framework. Electric freight train emission factors are country-specific and derived from EcoTransIT.
- Truck
  Emission factors come from the GLEC framework, which differ for different types of trucks, such as diesel van, gasoline van, 7.5t truck and others.

Powered by lune

References

Reference	Author	Year	Title
DIN EN 16258	Deutsches Institut für Normung	2013	Methode zur Berechnung und Deklaration des Energieverbrauchs und der Treibhaus-gasemissionen bei Transportdienstleistungen (Güter- und Personenverkehr)
EMAS Thetis MRV 2020	European Commission	2020	CO_2 Emission Report
GLEC 2019	Global Logistics Emissions Council	2019	Framework for Logistics Emissions Accounting and Reporting, version 2.0
IATA RP1678	International Air Transport Association(IATA)	2014	RECOMMENDED PRACTICE 1678
Mapbox	Mapbox	2022	Mapbox API
ISO 14083	International Organization for Standardization		Greenhouse gases — Quantification and reporting of greenhouse gas emissions arising from operations of transport chains
GHG emission factors for IWT	Global Logistics Emissions Council	2018	GHG emission factors for IWT
EcoTransIT	EcoTransIT World Initiative (EWI)	2020	Environmental Methodology and Data Update 2020

About Lune

Lune is a software company making it easy for logistics & freight businesses to measure and compensate their CO2 emissions. Lune's calculations are based on the leading international standard for logistics emissions calculations, the GLEC Framework, and are audited and accredited by Smart Freight Centre. By integrating their software solution, Forto can provide real-time data on the CO2 footprint and required transparency and resources to reduce it.

