Nurminen Logistics

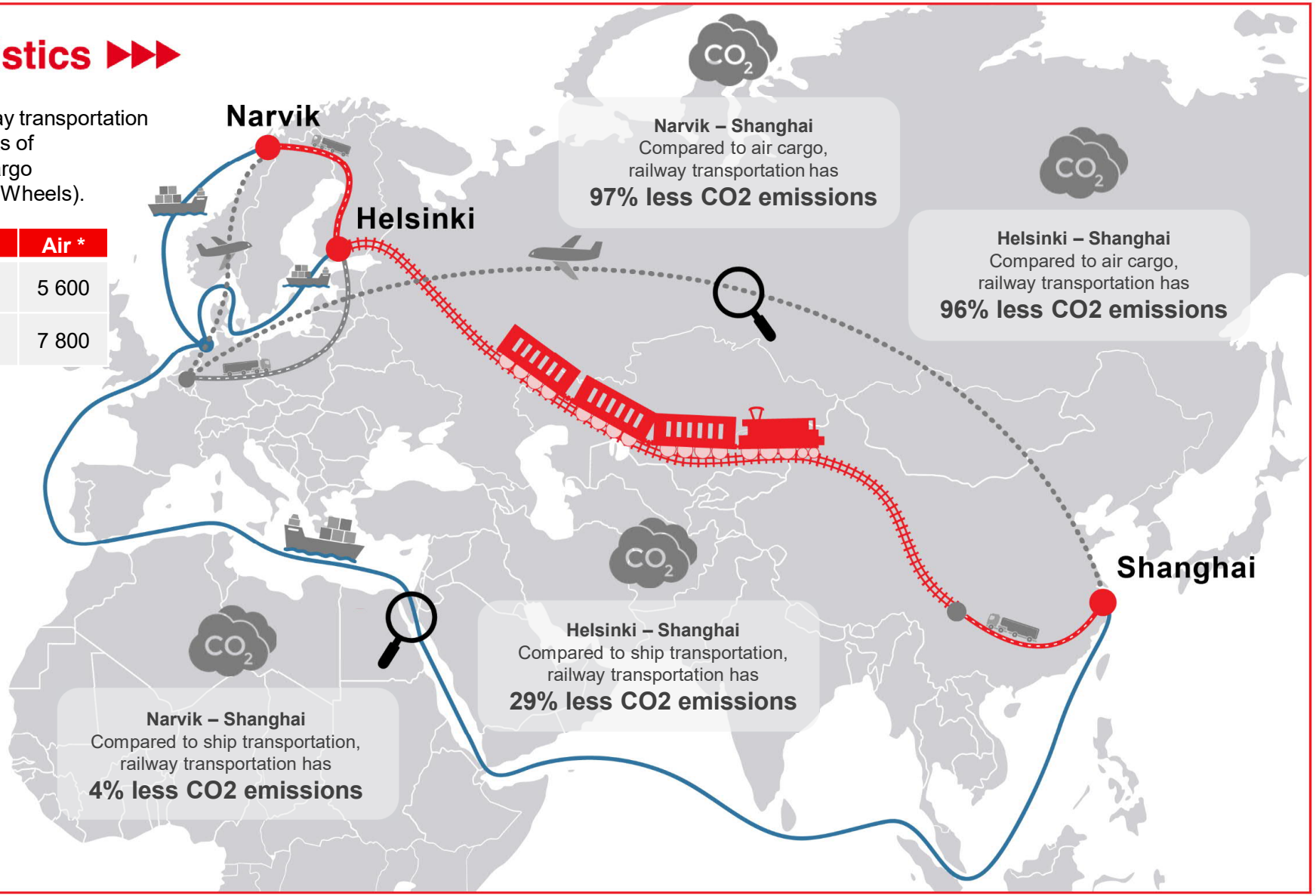
CARBON FOOTPRINT OF RAIL TRANSPORTATION

Gaia Consulting
17.12.2020

Nurminen Logistics

The carbon footprint of railway transportation compared to carbon footprints of ship transportation and air cargo for the same routes (Tank-to-Wheels).

kgCO2e/t	Railway	Ship	Air *
Helsinki – Shanghai	200	280	5 600
Narvik – Shanghai	270	280	7 800



The calculation is done according to the SFS-EN 16258 standard.

** Air cargo calculated without radiative forcing.*

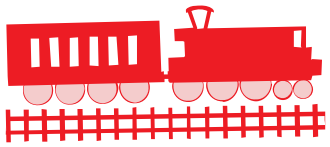
Carbon footprint of railway transportation of one ton of goods

- The carbon footprint of the railway transportation between Helsinki / Narvik and Shanghai was calculated for Nurminen Logistics by Gaia Consulting.
- The calculation is done according to the *SFS-EN 16258 Methodology for calculation and declaration of energy consumption and GHG emissions of transport services (freight and passengers)*. Both Tank-to-Wheels (TTW) and Well-to-Wheels (WTW) emissions are calculated according to the used standard.
  - Electricity consumption for electric trains was estimated based on VTT Lipasto database[1]. In Finland, only green electricity is used in railway transportation. For other countries, emission factors are taken from the IEA database[2]. Upstream emissions of electricity production as well as transmission and distribution losses (TTW) are calculated based on UK Government GHG Conversion Factors for Company Reporting (2020)[3].
  - For the diesel train the emission and consumption factors were from the standard SFS-EN 16258.
- The railway transportation was compared to ship transportation[4] and air cargo[5] for the same routes.
  - The ship transportation has 29% larger emissions for the route from Helsinki to Shanghai and 4% larger for the route from Narvik to Shanghai.
  - The air cargo has 96% larger emissions for the route from Helsinki to Shanghai and 97% larger for the route from Narvik to Shanghai.

Results	TTW	WTW	
Helsinki – Shanghai	197	265	kgCO2e/t
Narvik – Shanghai	268	367	kgCO2e/t

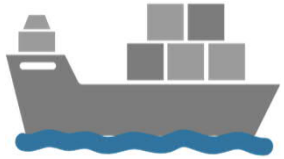
1) http://lipasto.vtt.fi/yksikkopaastot/indexe.htm
2) IEA, CO2 Emissions from Fuel Combustion
3) https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020
4) Container ship 8000+ TEU as an assumption
5) Without radiative forcing – real avoided emissions are thus higher than calculated

Comparison of different transportation modes per one ton of goods



The carbon footprint of the **railway transportation** from Helsinki to Shanghai equals to

- Flying from Helsinki to Prague (return flight, economy class), approx. 2700 km, or
- Driving a car from Helsinki to Tromsø (passenger car, average fuel), approx. 1320 km



The carbon footprint of the **ship transportation** from Helsinki to Shanghai equals to

- Flying from Helsinki to Geneva (return flight, economy class), approx. 3800 km, or
- Driving a car from Helsinki to Rovaniemi and back (passenger car, average fuel), approx. 1840 km

The carbon footprint of the **air cargo** from Helsinki to Shanghai equals to

- Flying from Helsinki to Shanghai and back five times (five return flights, economy class), approx. 76 000 km, or
- Driving a car from Helsinki to Vladivostok and back twice (passenger car, average fuel), approx. 37 000 km

Emission factors used in comparison: UK Government GHG Conversion Factors for Company Reporting (2020), international flight to/from non-UK, economy class, without radiative forcing (74 gCO2e/passenger-km) & VTT Lipasto (2016) Average passenger car in Finland (152 gCO2e/km)

OUR CLIENTS MAKE THE WORLD CLEANER AND SAFER.

gaia