

Shipping Happens - But Emissions Don't Have to

A Data Driven Approach to Decarbonising Logistics

Graduate



Florian von Arx

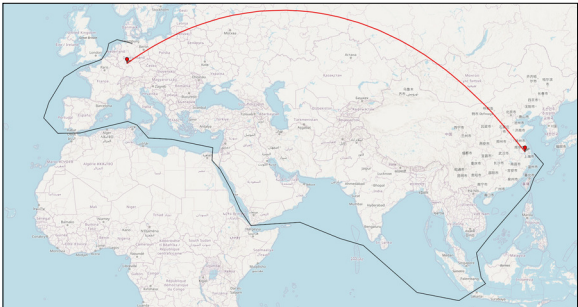
Introduction: The logistics sector significantly contributes to global greenhouse gas emissions, with Siemens inbound supply chain accounting for 8% of its total upstream emissions. To fulfill its net-zero commitments, the purchasing organisation of Siemens needs to find ways to operate emission free by no later than 2050. Despite the availability of lower-carbon transport options, decision-making often prioritises cost and delivery times over sustainability. This thesis addresses these challenges by systematically identifying emission hotspots within Siemens logistics operations and proposing actionable strategies to reduce emissions while ensuring operational feasibility.

Approach: A data-driven methodology was applied to analyse internal shipment data from Siemens, which consolidates transport-related information. Emission estimates were calculated based on the Global Logistics Emission Council framework, using transport activity (tonne-kilometres) and mode-specific emission intensity factors. The study focused on identifying high-emission suppliers, transport modes, and shipment lanes, followed by a statistical outlier analysis to pinpoint particularly impactful shipments. Practical decarbonization measures, including modal shifts and the use of alternative fuels such as Hydrotreated Vegetable Oil and Sustainable Aviation Fuels, were evaluated for feasibility and potential impact.

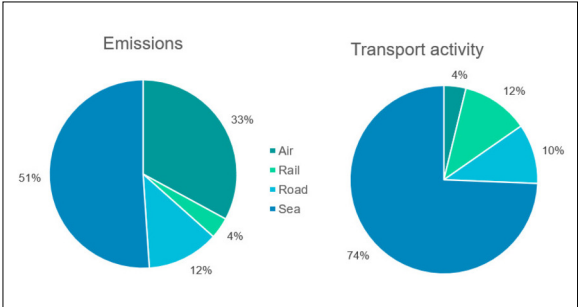
Result: The findings reveal that air freight and long-distance road transport are major contributors to emissions, despite comprising a small share of transport activity. Suppliers heavily reliant on high-emission transport modes, such as air freight, are identified as key targets for intervention. Targeted strategies, including mode shifts from air to sea and

road to rail, as well as integrating alternative fuels, demonstrated significant emission reduction potential. Implementing the identified measures would reduce the emission output of the analysed area by over 20%.

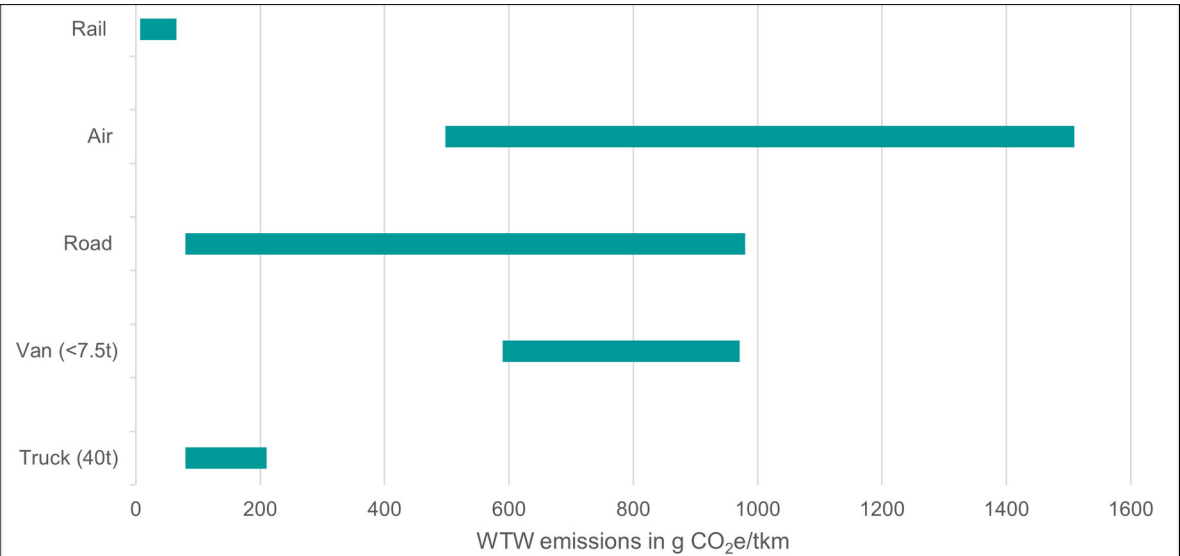
Route comparison of Air- and Seafreight transport lanes between Wuxi (China) and Frankfurt (Germany)
Own illustration, based on "www.gpsvisualizer.com"



Estimated emission output compared to transport activity across different modes
Own presentation



Examples of WTW emission intensity value ranges for different transport modes
Own illustration, data based on 2019 GLEC default factors



Advisor

Prof. Dr. Katharina Luban

Co-Examiner

Dr. Thomas Lorenzer, Basel, BS

Subject Area

Supply Chain Management

Project Partner

Siemens Schweiz AG, Zug