# Navigating the Road to Trucking Decarbonization

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## Introduction

**Driving Factors**

- Road freight transportation accounts for over 7% of global $CO_2$ emissions.
- Transitioning the industry to alternative carriers will require significant investment and infrastructure build-out.

**Our Proposal**

- Develop a geospatial mapping tool that enables the regional identification and assessment of fleet decarbonization opportunities.
- Leveraging this mapping tool, implement a methodology to rigorously compare a range of factors that can impact fleet decarbonization decisions at the corridor level.

**Highlights**

- There are many ways to decarbonize trucking, how do we choose the 'best' one?

**Impact**

- Developed a methodology to systematically identify corridors of interest based upon freight flow and distance.
- Our methodology is applied to geospatial datasets to enable quantitative corridor comparison.

## Preliminary Results

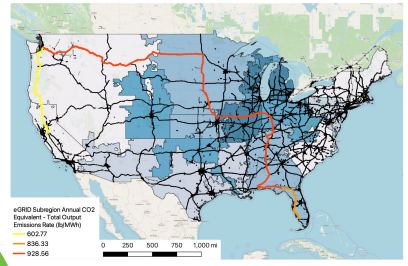

Fig 3. CO2 Emission Rates (lb/MWh)

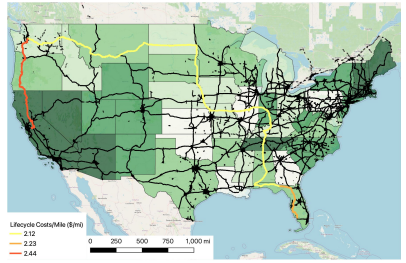

Fig 4. U.S. BET Lifecycle Costs/Mile ($/mi)

- We spotlight three corridors: one in the Western US, one in the Southeast US, and a Transcontinental route.
- Corridor end-points are defined according to Combined Statistical Areas.
- "Values of interest" have been averaged along corridors.

## Methods

1. **Literature Review:** Understand existing methods that identify and quantify fleet transition assessment factors.
2. **Data Gathering:** Collect relevant publicly available data.
3. **Model Development:** Synthesize data and leverage path planning algorithms to identify corridors of interest.
4. **Visualization:** Represent the resulting corridors geospatially.

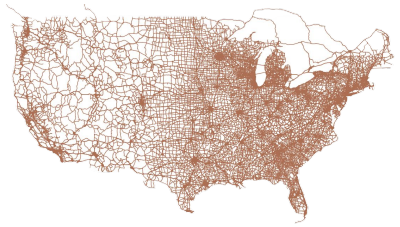

Fig 1. U.S. Road Network from FAF5

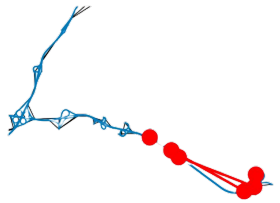

Fig 2. Corridor Identification Proof of Concept

## Findings & Future Work

**Findings**

- Based on $CO_2$ emissions, corridors in the Southeastern/ Midwestern US are ideal for fleet electrification.
- Vehicle lifecycle cost (for BETs) is higher in the Western/Southwestern US.

**Future work**

- Continue to expand the the range of data sources that input to the model for corridor level comparisons.
- Further refine how geospatial data along identified corridors is quantified to assess fleet transition opportunities.

**References**

***FAF5:*** Hwang, Ho-Ling, et al. "Freight Analysis Framework Version 5 (FAF5) Base Year 2017 Data Development Technical Report." 2021.
***eGRID:*** US EPA, "Emissions & generation resource integrated database (eGRID)."
***Green Trucking Analysis:*** Sader, K. M. "Battery Electric Long-Haul Trucking in the United States: A Comprehensive Costing and Emissions Analysis." ChemRxiv. 2023.

**Link to Extended Abstract:**
qrco.de/bewtjB

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