Developing an Emission Modeling Framework that Incorporates Vehicle Fuel Types Within the Integrated Transport Land-Use and Energy (iTLE) Modeling System

Kashfia Nahrin Nokshi*
Graduate Research Assistant
Department of Civil and Resource Engineering
Dalhousie University
5410 Spring Garden Road, Halifax, NS, B3H4R2
Email: kashfia.nahrin@dal.ca

Muhammad Ahsanul Habib, Ph.D.
Professor, School of Planning, and;
Department of Civil and Resource Engineering
5410 Spring Garden Road, P.O. Box 15000
Dalhousie University, Halifax, NS, B3H4R2
Email: ahsan.habib@dal.ca

*Corresponding Author

Abstract:

To deal with the increasing impact of global emissions, the world is struggling to shift from conventional fuel use to renewable energy sources. This study developed an emission modeling framework within the Integrated Transport Land-use and Energy (iTLE) system, emphasizing the significance of considering fuel types in estimating emissions. Using the HaliTRAC 2022 survey data, a vehicle type choice model was developed within iTLE, and the model output provided information on the vehicle type for each household. This information was utilized to adjust the fraction of vehicles capable of using various fuels and technologies in each model year for the emission model, developed using the latest EPA's Motor Vehicle Emission Simulator (MOVES4.0). The vehicle choice model indicates a distribution of 83.2% gasoline, 14.7% diesel, and only 2.1% electric vehicles in 2022. The use of gasoline vehicles decreases in future years, while diesel vehicles show a slight increase in usage. The emission model developed on this basis reveals a slight increase in total emissions in 2023, followed by a notable decrease of 3.89% in 2027 and 10.37% in 2030. This reduction is attributed to the growing adoption of electric vehicles (EVs). In Halifax, where people mostly use gasoline vehicles and aren't too keen on switching to electric ones, this research shows how adopting electric vehicles can significantly cut down on emissions. Considering the Zero Emission Vehicle (ZEV) target sale scenario, the research indicates a potential reduction of 5.51% in 2027 and 12.37% in 2030, with 2022 as the baseline. The framework proposed in this study effectively address the existing gap by assessing emission variability across different fuel types.

Submission Category: *Clean Tech Innovation*

Research Review: My research is focused on the reduction of Greenhouse Gas emission caused by the transportation system of Nova Scotia. I am working on the development of an advanced emission model using data from the HaliTRAC 2022 survey. This model demonstrates emission generated from vehicles based on their fuel type, developed within the innovative Integrated Transport Land-use and Energy (iTLE) framework. Additionally, I am estimating the emissions stemming from public transit, considering multiple variables, including speed, ridership, and fuel composition. This initiative aims to uncover the relationship between these variables, offering insights into how transitioning to electric fleets and increasing ridership can enhance sustainability in public transit. Beyond emissions research, I have explored market segments for EV choice in Halifax.