

## Modeling the Impact of Traffic Congestion on Urban Freight Costs and Emissions

### Abstract

Congestion is a common phenomenon in all medium to large cities of the world, and Portland is no exception. The City of Portland's Bureau of Transportation indicates that the growth in truck movement and traffic congestion is rapidly increasing on Portland's street system. Freight traffic may grow even faster than passenger traffic. Between 2000 and 2020 the number of medium and heavy truck trips is expected to nearly double (COPOT, 2005).

The economic vitality and sustainability of an urban area is highly dependent on transportation services. Supply chains and urban area economic activity cannot thrive without the efficient movement of goods and accessibility to services. However, a direct negative impact of commercial vehicle miles traveled (CVMT) are increased emissions, air pollution, traffic congestion, and noise levels. Increases in CVMT affect the livability and sustainability of urban areas. Furthermore, congestion significantly increases emissions and air pollution rates on a per mile basis.

Commercial movements are responsible for a significant and growing share of transportation related energy usage and emissions. Yet, compared with the movement of people, the movement of freight is mostly neglected in policy development and transportation planning (Gilbert and Perl, 2007). This is mostly caused by the lack of suitable tools and data. Freight planning tools and models are still relatively crude when compared to passenger planning tools and models (Hensher and Figliozi, 2007).

Existing models do not capture the relationships between congestion, vehicle routing, and emission. The research outlined below aims to study and model congestion, commercial vehicle routing, operational costs, and emissions. The results of this research will be valuable for planners, policy makers, and private fleet operators.

### How this Proposed Grant Activity Meets the Statement of Purpose

This proposed grant activity meets several goals identified in the *Statement of Purpose* for Faculty Enhancement Grants:

- The principal investigator is an Assistant Professor who has been employed at PSU since fall 2007. This is his second application for a PSU grant. This research proposal builds upon the tools and results obtained in the previous Faculty Enhancement Grant 2008-2009.
- The previous Faculty Enhancement Grant 2008-2009 was used to develop a fast, robust, and efficient vehicle routing algorithms that is suitable for congested networks. The algorithm developed is suitable to model congestion because it can accommodate substantial variations in travel times during peak morning and evening hours (Figliozi, 2009a) Additional outcomes from the previous grant includes:
  - Research results were presented at two highly recognized national conferences: (a) the annual meeting of the Institute for Operations Research and Management Science (INFORMS), and (b) the annual meeting of the Transportation Research Board (TRB) of the National Academy of Sciences.
  - A paper has been published in the Transportation Research Board annual meeting conference proceedings (Figliozi, 2009a)