

## ABSTRACT

Klatko, Trevor J., M.S.C.E., Purdue University, December 2015. Development of Statewide Framework for Vehicle Miles Traveled (VMT) Estimation. Major Professor: Dr. Samuel Labi.

Vehicle Miles Traveled (VMT) is a critical performance measure that is used extensively in highway transportation management for financial analysis, resource allocation, impact assessments, and reporting to oversight agencies. As highway revenue from fuel taxes continues to plummet and user-based taxes such as VMT fees become increasingly attractive, consistent and reliable VMT estimates have become critical for highway funding evaluation and administration. At the present time, there are several methods for VMT estimation that typically yield estimates that are inconsistent or inaccurate. This thesis presents alternative techniques for VMT estimation in the state of Indiana at the project, regional, and network levels for confirming or estimating the levels and distribution of vehicular travel at the present time as well as at any specified future time. The present research also developed a benchmark method for VMT estimation and shows how the estimates from the other different methods can be calibrated to mitigate the inconsistencies in VMT estimation across the different methods. The early tasks of the research, which included a literature review and survey of VMT-data stakeholders, helped streamline the research effort, categorize the different techniques for VMT estimation and identify their limitations, and identified the preferred outputs of any platform for VMT estimation.

The core outcome of this thesis is a comprehensive framework for estimating the VMT contributed by each vehicle class for the state's entire road network. This framework is a segment-level estimation of VMT using the segment length, traffic volume, and distance and was conducted for the primary highway systems: state routes (interstates and US and state roads) and local routes (city streets and county roads). Local route VMTs were studied in-depth because of their historical underrepresentation in VMT studies, the low accuracy of past estimating methods, and the local road's significant share of the total road inventory. For the state road VMT estimation, a comprehensive database was developed which facilitates extensive aggregations of VMT by geographical scope, route, functional class, and vehicle class. For the local-route VMT estimation, a sample of counties of different spatial locations and degrees of urbanization were used. Analytical techniques and tools, including cluster analysis, geographic information systems (GIS), and spatial interpolation techniques were used to expand the VMT estimates from the local road sample to the population of all counties in the state.

The results indicate that there is significant variation in the results from the various VMT estimation methods. The technique developed in this research for reconciling these different VMT estimates was validated using the estimate from the benchmark method (segment-level) as a basis. The implementation platform developed in this research was designed to produce outcomes that address the VMT data needs of the intended end users and stakeholders and could be enhanced in the future as and when data become available. The deliverables from this research are expected to have far reaching impacts on the various functional areas of highway management and administration, the evaluation of VMT fee as an alternative or complement to the fuel tax for highway revenue, and the generation of required reports to the federal oversight agencies.