DIVISION OF RESEARCH, INNOVATION & SYSTEM INFORMATION
Research Initial Scope of Work
SUBMITTAL FORM - FY 2022/23

I. Project Number: P1750

Project Title: Investigation of the Abilities and Limitations of Travel Demand Modeling in Informing Decision-Making

II. Task Number: 4173

Task Title: Investigation of the Abilities and Limitations of Travel Demand Modeling in Informing Decision-Making

III. Project Problem Statement:

Caltrans and other agencies rely on travel demand models (TDMs) to understand the outcomes that will result from proposed projects and plans, including effects on travel times and speeds, operations-related safety, equity (regarding both access to opportunity and harm from impacts), GHG emissions, air quality, noise, VMT, and health. Understanding these outcomes when choosing projects is a prerequisite to ensuring public benefit from taxpayer investment. However, a growing body of evidence suggests TDMs provide biased and erroneous answers to some of the types of questions frequently put to them. For example, Volker et al. (policy brief) shows that travel model assessments of induced VMT—which feed into the assessments just mentioned—deeply underestimate what empirical research shows (the five analyses examined show TDM induced VMT outputs of 0%, 0%, 8.85%, 13.73%, and 73.3%, respectively, compared to value shown in empirical research). Other studies have identified structural shortcomings in TDMs and show the implications to be important and problematic (e.g. Marshall, 2018). Problems with TDMs have also been noted in the press.

IV. Objective:

The first goal is to determine the suitability of TDMs for various types of assessments. For which types of assessments do TDMs provide reasonable and actionable data to inform decision-making? For which do they fail to do so? The study would also provide initial recommendations on developing guidance for TDMs use, for when to turn to alternative assessment tools that could better inform decision-making, and for what new tool development may be needed. The second goal is to determine the susceptibility of TDM analyses to bias introduced by the operator, to determine their usefulness in regulatory settings.

V. Task Description of Work and Expected Deliverables:

The purpose of this research inquiry is to delineate what we can reasonably use these models for, and what we can't. For example, under what circumstances do TDMs provide reasonably accurate induced travel assessments, or traffic volume outputs sufficiently accurate and precise for reasonable safety queueing analyses at ramps and turn lanes?

At a minimum, this research will address and provide the following deliverables:

1. This study will first list the types of analyses TDMs are called upon to undertake.
2. Second, it will list:
    a. The known fundamental constraints of the model to undertake each type of study (for an example see Marshall, 2018); and
    b. The known pathways for shifting the outcomes of each type of study via adjustments or manipulations of the model (such as changing assumptions on pricing or telecommuting or shifting of parameters within the model). To the extent possible, the study will cite where these adjustments or manipulations have been undertaken in actual practice, particularly (but not limited to) within California. Interviews with consultants, etc. can be used to supplement researcher knowledge.
3. A review of relevant academic and professional studies, reports, and manuals will come next. The researchers will provide a brief description of the relevance of each.
4. Models are often operated under pressure to demonstrate regulatory compliance (e.g., achieve SB 375 targets). Researchers will run a TDM multiple times with different sets of inputs and parameters that might be considered "reasonable", with the aim of characterizing the breadth or range of results a modeler would be able to return using the model.
5. Finally, in light of all of the above, the study will provide a reflection of the role of modeling in public policy, including regulatory compliance.

VI. Background:

Caltrans and other agencies rely on travel demand models (TDMs) to understand the outcomes that will result from proposed projects and plans, including effects on travel times and speeds, operations-related safety, equity (regarding both access to opportunity and harm from impacts), GHG emissions, air quality, noise, VMT, and health. Understanding these outcomes when choosing projects is a prerequisite to ensuring public benefit from taxpayer investment.

VII. Estimate of Duration:

12-15 months

VIII. Related Research and Reports:

1. Induced Vehicle Travel in the Environmental Review Process | National Center for Sustainable Transportation (ucdavis.edu)
2. Forecasting the impossible: The status quo of estimating traffic flows with static traffic assignment and the future of dynamic traffic assignment; ScienceDirect; 2018.
3. The Broken Algorithm That Poisoned American Transportation (vice.com)
4. 2018 PROGRESS REPORT: California's Sustainable Communities and Climate Protection Act; November 2018
5. Travel Forecasting Guidance: Survey of Practice; Caltrans Division of Research Innovation, and System Information P.I.; 2019.

IX. Deployment Potential:

This research effort aims to inform our choice between assessment tools (e.g. TDM, Induced Travel Calculator, Accessibility Tool, etc.), as well as shed light on needs for further tool development. It will also inform policymakers on the opportunities and limitations for relying on TDMs as regulatory tools.

In order to advance our Strategic Management Plan goals, we need to be able to predict the outcomes of our investments. Specifically, we need to be able to choose investments improve operational safety, climate, equity (reducing disparities in both impacts and access to opportunity), accessibility/connectivity, stewardship, and efficiency. The ability to understand the effects of our decisions is key to institutional excellence.