

Research Results

Planning /
Policy /
Programming

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Project Title: Traffic Analysis and Simulation

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Traffic Analysis and Simulation, TPF-5 (176)

This pooled fund study brings transportation agencies together to improve how traffic analysis and simulation tools are used in planning and decision-making. As congestion grows and tools become more complex, agencies need clear guidance and shared best practices to ensure their analyses are accurate and consistent. The study identifies common challenges, develops practical solutions, and produces resources such as a multi-resolution modeling guidebook, case studies, and improved methods for data collection and model calibration. By creating a single trusted source of guidance and supporting nationwide knowledge-sharing, the project helps agencies make stronger, more defensible transportation investment decisions.

WHAT WAS THE NEED?

Traffic congestion is getting worse across the country, and transportation professionals are under pressure to find better, more efficient ways to manage our roads. To do this, agencies rely on traffic analysis and simulation tools that help them understand how different transportation solutions will perform. But as the solutions become more advanced, the tools also become more complicated, making it harder for agencies to use them effectively.

Many public agencies are now running into similar challenges—such as how to choose the right tools, how to interpret results, and how to use these tools to support good decision-making. Instead of each agency trying to solve these problems on its own, a Pooled Fund Study can bring agencies together to address these issues in a coordinated way.

The Traffic Analysis and Simulation Pooled Fund Study would create a shared forum where agencies can identify common challenges, learn from each other, and develop best practices for conducting, managing, and reviewing traffic analysis and simulation studies. The study would also help agencies share information and improve the overall practice of using these tools to support transportation planning and operations.



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WHAT WAS OUR GOAL?

The goal of this study is to help public agencies make better transportation decisions by strengthening the way traffic analysis and simulation tools are used. As these tools become more advanced and more central to major investment decisions, agencies need consistent, high-quality guidance to ensure the results they rely on are accurate and dependable.

This study will bring together regional, state, and local agencies—along with the Federal Highway Administration—to work collaboratively on the challenges they all face. Through this partnership, participants will identify the common issues that make traffic analysis difficult, explore practical ways to solve those challenges, and launch projects that directly address them. The study will also share guidance, recommendations, and lessons learned so agencies across the country can benefit from the work. By coordinating with other groups focused on traffic analysis and helping spread new tools and methods nationwide, the study aims to elevate the overall state-of-the-practice and support more informed and effective transportation investment.

WHAT DID WE DO?

As part of this pooled fund study, the research focused on advancing the practice of multi-resolution modeling so agencies can better understand and manage complex traffic conditions. The team produced a state-of-the-practice report that describes how these modeling techniques are currently used and where agencies face challenges. Building on this foundation, the researchers carried out a gap analysis to identify what practitioners still need to make these tools more effective. They then developed a comprehensive guidebook to help agencies apply multi-resolution modeling in real-world settings, supported by a series of case studies that show how the methods work in practice. The study also included a report on improving data collection and model calibration, ensuring that agencies have reliable, high-quality information to support their traffic analyses.

WHAT WAS THE OUTCOME?

Trajectory Investigation for Enhanced Calibration of Microsimulation Models: This report presents a new method for calibrating microsimulation models using detailed vehicle trajectory data. Researchers collected drone- and helicopter-based trajectories at four U.S. sites and compared traditional and trajectory-based calibration. Results show trajectory data improves model accuracy, offering transportation agencies better tools for model validation and decisionmaking.

Multiresolution Modeling for Traffic Analysis: State-of-Practice and Gap Analysis Report: This state-of-practice and gap analysis report provides a review of Multi-resolution Modeling (MRM) terminology, tools, and literature. It further reports the outcomes from a series of teleconferences with 19 agencies and companies with a vested interest in MRM. These discussions found increased interest in MRM as a means to make simulation results more defensible. However, the study found that there are still issues facing agencies that utilize or desire to utilize MRM as part of their modeling practices. These findings will provide an important point for future advancement in the research, development, and application of MRM in transportation engineering.

Multiresolution Modeling for Traffic Analysis: Guidebook: The guidebook summarizes Multi-resolution Modeling (MRM) terminology and definitions, provides a methodology for MRM analysis, and illustrates in three case studies the benefits of applying MRM. The proposed MRM methodology extends the seven-step methodology provided for simulation analysis in FHWA's Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software (Wunderlich, Vasudevan, and Wang 2019).

Multi-resolution Modeling (MRM) for Traffic Analysis: Case Studies Report: During the early stages of the project, stakeholders reported that the lack of available case studies presented a barrier to MRM adoption by transportation agencies. This case studies report provides a blueprint of the successful

pilot studies conducted during and within the MRM project. The report also provides lessons learned for agencies to overcome barriers to MRM adoption.

WHAT IS THE BENEFIT?

This study provides agencies with a single, reliable source for guidance on traffic simulation, helping ensure that analyses are consistent, transparent, and defensible. By creating shared standards and resources, the project also supports the transfer of new modeling practices and technologies both nationwide and within Caltrans. In addition, the study gives transportation agencies the tools and information they need to better oversee, review, and apply traffic analysis and simulation methods, strengthening the quality of the decisions they make about transportation investments.

LEARN MORE

Study Detail:

<https://pooledfund.org/Details/Study/403>

Transportation Pooled Fund Reports:

[Trajectory Investigation for Enhanced Calibration of Microsimulation Models](#)

[Multiresolution Modeling for Traffic Analysis: Guidebook](#)

[Multiresolution Modeling for Traffic Analysis: State-of-Practice and Gap Analysis Report](#)

[Multiresolution Modeling for Traffic Analysis: Case Studies Report](#)