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Federal-aid Program Overview

Transportation Planning

Modeling and Analysis Fundamentals

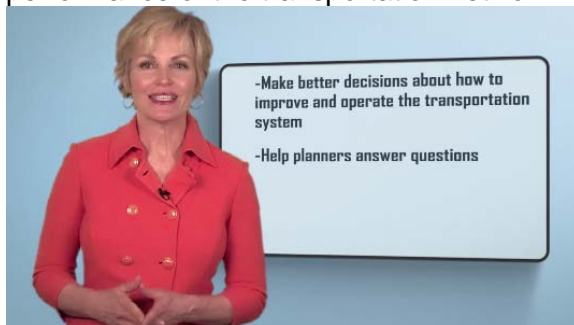
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Modeling and analysis tools provide valuable information to improve transportation decisionmaking



When we build transportation projects, how do we know the project is going to improve the system? Or what is the right type or size of a transportation project?

Modeling and analysis is a step in the transportation planning process that provides objective information about the performance of the transportation network.



Transportation planners use modeling and analysis to make better decisions about how to improve and operate the transportation system. Models help planners answer questions about how a transportation system may operate in the future as an area grows, or as new investments are made in the system.

These planning-related questions may include the total volume of trucks and passenger vehicles on the transportation system, the location of bottlenecks, and the average time travelers spend sitting in traffic. Ultimately, modeling and analysis can help planners describe transportation

system performance and suggest the best alternatives for decisionmakers to consider in funding decisions.



Models may be used to evaluate transportation alternatives that improve roadway efficiency by using different toll rates for high-occupancy-vehicle (HOV) lanes at rush hour, decrease congested intersections through signalization improvements, reduce vehicle use in congested areas by encouraging carpooling and other forms of ride-sharing, provide improved park-and-ride services from fringe areas to the central business district, improve internal transit management efficiency by developing information systems, and encourage individual decisions that can help optimize system performance.

Models use information about households, employment, and transportation networks to predict travel preferences over time as conditions change. For example, some travelers may decide to choose an

alternative route, change the time they leave for work, or switch from a private vehicle to transit to avoid congestion. Models help predict the range of likely traveler responses to changes in the transportation system.

Planners select the most appropriate tool based on the information requirements and the stage of the planning process. The three primary categories of tools are: sketch-level, travel demand, and microanalysis.



Sketch-level tools can be applied quickly and at relatively low cost, to answer basic questions and get an estimate of the total demand under different conditions. These tools are useful to quickly examine several alternatives.



Travel demand models help planners evaluate alternatives in greater detail than sketch tools and often span regions or states. For example, planners use travel demand models in mid- to long-range planning to predict the number of vehicles that will use a new HOV lane, or the routes that travelers may avoid when using the new, less congested HOV lane.



Microanalysis tools are the most detailed of the modeling and analysis tools. Planners and other transportation professionals use microanalysis to provide a detailed account of short-term impacts during construction and the general operation of roadways. These models are useful for identifying conflict points between vehicles as lanes merge or the effectiveness of signalized intersections. For example, microanalysis tools can reveal the improved travel speed that may result from efficient traffic signal coordination.



To illustrate these points, let's consider the fictional City of Brightdale, where travelers experience frequent traffic jams on the freeway as they enter town. Residents complain that traffic queues on the freeway off-ramp stretch back onto the freeway mainline.



Brightdale staff assessed many proposed alternatives and prepared a plan that outlined several layers of analysis. First, planners used a sketch-planning tool to evaluate the high-level impacts of adding a lane, improving bus service and adding housing to existing retail development to encourage shorter trips. The sketch tool gave a rough estimate of miles traveled by cars and the average trip distance. Planners used the sketch tool information to eliminate the least effective alternatives.

Planners then applied a regional demand model to look at the remaining alternatives in greater detail. Common measures produced by regional models included traffic volumes during the most congested times of the day and travel times to work and non-work locations.



After identifying the preferred alternative, project staff used microanalysis tools to fine-tune the project design to ensure that the solutions achieved operational and safety measures, such as reducing crash rates or decreasing congestion during peak travel periods.



Planners communicated the impacts of the preferred alternative based on modeling and analysis. The preferred alternative is a blended strategy of ramp metering and improved traffic signal coordination at key freeway access and egress points.

Modeling and analysis helps make data-driven decisions that meet your community's transportation needs. Modeling tools help evaluate alternatives, prioritize projects, improve design, and allocate limited funds to the most effective projects.



For more information about modeling and analysis, contact your State department of transportation, metropolitan planning organization, or the FHWA division office in your State.

Additional Resources

- Link to FHWA's Traffic Analysis Tools Program
<http://www.ops.fhwa.dot.gov/trafficanalysis/tools/index.htm>
- 23 CFR Part 450 is the regulation that requires FHWA planning assistance and denotes standards of practice
http://www.ecfr.gov/cgi-bin/text-idx?SID=e187b6b4137fb932aa538ff2ae606243&tpl=/ecfrbrowse/Title23/23cfr450_main_02.tpl
- TRB's National Cooperative Highway Research Program (NCHRP) Report 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design describes methods, data sources, and procedures for producing travel forecasts for highway project-level analyses.
<http://www.trb.org/Main/Blurbs/170900.aspx>
- Interim guidance on the application of travel and land use forecasting for use in environmental (NEPA) studies
http://environment.fhwa.dot.gov/projdev/travel_landUse.asp
- Certification checklist for travel forecasting methods
<http://www.fhwa.dot.gov/planning/certcheck.cfm>
- Access portal to FHWA's Travel Model Improvement Program (TMIP)
<http://www.fhwa.dot.gov/planning/tmip/>
- Electronic version of 40CFR Part 93 - determining conformity of Federal actions to State or Federal implementation plans
http://www.ecfr.gov/cgi-bin/text-idx?SID=b7cc2d159608c0190532eca3260e8bad&tpl=/ecfrbrowse/Title40/40cfr93_main_02.tpl
- Link to travel forecasting resource Web site
http://tfresource.org/Travel_Forecasting_Resource
- Link to TRB's Online Travel Survey Manual
<http://www.travelsurveymanual.org/>

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This Companion Resource is the script content for the video production of the same name.