



Transportation Planning and Analysis Tools

Selecting the Right Tools to Optimize Outcomes

ADVANCING PLANNING FOR OPERATIONS • TECHNICAL BRIEF



Transportation planners have a challenging job. They must balance competing priorities and needs against an anticipated but not necessarily known future. Planners must answer complex questions such as:

- Will congestion decrease if we invest in a particular strategy?
- What will be the environmental impacts of a new traffic signal timing plan?
- What should our new performance target be for travel time reliability?
- How might travel patterns change and where will we see the worst congestion in the future?

The use of analysis tools in planning for operations supports decisionmaking by answering all of these questions and more. Planning for operations is a joint effort between transportation planners and operators to integrate transportation systems management and operations (TSMO) strategies into the transportation planning process in order to improve transportation system safety, efficiency, and reliability. A fundamental aspect of achieving this goal is using the right analysis tools to predict the most beneficial outcomes.

Analysis tools and methods give transportation practitioners the ability to assess strategies independently or in conjunction with other transportation investments, facilitating the evaluation of different alternatives so that the right mix can be selected and the optimal results can be realized. Analysis tools also provide planners with fact-based information that can be used to communicate the analytical results of these kinds of comparisons with elected officials, other decisionmakers, and the public, helping them make better and more informed decisions about transportation investments.

Analysis Tools that Support Planning for Operations

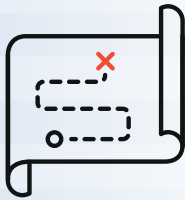
There is not a single analytical tool that can do everything or solve every problem. Using an overly sophisticated tool may result in a poor use of resources. Conversely, using a tool that is too basic may produce results that are insufficiently accurate or reliable. These are the five classes of analysis tools or methods in use today:

ARCHIVED OPERATIONS DATA



Is used for documenting baseline operational conditions, monitoring and evaluating system performance, and identifying and reporting performance issues/needs, among others. It includes data collected and stored to support the monitoring and management of the transportation system.

REGIONAL TRAVEL DEMAND MODELS



Are widely used for estimating changes in mode choice and traffic patterns or volumes due to changes in development levels, demographics, and the transportation system itself. These tools are best for screening and evaluating corridor- and region-wide strategies like congestion pricing, assessing mode choice and travel pattern/volume impacts, and providing travel forecast inputs to models and tools that can analyze operations strategies, to name a few.

SKETCH PLANNING TOOLS



Provide quick order of magnitude estimates with minimal input data in support of preliminary screening assessments. They are most appropriate to use early in the planning process, while planners are still screening a large number of potential TSMO strategies to get a general idea of whether a strategy would be worth investigating further. They are useful in evaluating policy-based and region-wide TSMO strategies and generating potential impacts of implementing particular TSMO projects.

ANALYTIC/DETERMINISTIC METHODS



Help planners analyze the performance of isolated or small-scale transportation facilities, the impacts of strategies under different demand conditions, and a range of traffic control strategies. They allow planners to predict capacity, density, speed, delay, and queuing on transportation facilities.

SIMULATION TOOLS



Use a variety of formulas and algorithms to simulate travel behavior. They can be used to evaluate a range of improvements and strategies at isolated locations, on corridors, or area-wide. With enough data and resources, they may also be applied regionally.

A number of new methodologies have been developed and are being enhanced to better assess the changeable nature of transportation operations, including:

ACTIVITY-BASED MODELS

Typically focus on individual person-trips, representing how individuals travel across the entire day. They provide higher accuracy on travel patterns, more performance measures, and allow analysis of more policy issues. This type of analysis produces detailed performance metrics, such as how travel benefits (or disbenefits) accrue to different populations, measures used to support regional planning, regional air quality, transit, and transportation demand management forecasting. At present, research versions of “truck tour” models are being developed that may help planners develop forecasts by vehicle type.

DYNAMIC TRAFFIC ASSIGNMENT

Are emerging as a practical tool for numerous planning and operations applications, and may also be incorporated into macroscopic, mesoscopic, and microscopic simulation models. This tool is useful in a number of planning for operations functions, including simulating the impact of incidents, evaluating operational strategies that are likely to induce a temporal or spatial pattern shift of traffic, and estimating travel behavior from various demand/supply changes and interactions.

MULTI-SCENARIO METHODS

Are used to assess impacts under varying conditions, including non-typical days (non-recurring events). Different analysis scenarios can be developed to represent varying demand levels or non-recurring conditions. Tools in this family allow planners to test the impacts of an improvement or strategy under a variety of potential conditions and help them refine project scope or design to optimize benefits.

VISUALIZATION METHODS

Help planners present transportation performance data and information in a visual format; e.g., annotated maps, graphs, photos, illustrations, and videos, for example. Visualization may involve video or photos capturing actual field conditions, mock-ups of proposed projects, or animations based on operational models. These methods are most useful in communicating transportation needs to leaders who must prioritize budgets and to the public so that they understand the investment options and implications of each.

Whichever method or tool you decide to use, it should be consistent with your goals and objectives and match with budget and resource requirements. Analysis tools are important components in linking planning and operations, and promoting optimal transportation system performance through operational strategies. Linking the two fields, using appropriate tools, methods, and performance measures can answer transportation planners’ questions and help them convey understandable information both to decisionmakers as well as the public.

The key to success is matching the methods or tools to planning objectives, budget, and resource requirements. To help you select the right option based on your needs, the Federal Highway Administration has developed a set of resources for transportation planning and operational professionals, that can be found at: <https://ops.fhwa.dot.gov/trafficanalysisistools>.



Source: Thinkstock

Applying Analysis Tools in Planning for Operations

<https://www.plan4operations.dot.gov/casestudies/analysis.htm>

Applying Archived Operations Data in Transportation Planning: A Primer

<https://ops.fhwa.dot.gov/publications/fhwahop16082/index.htm>

FHWA Traffic Analysis Tools Resources

<https://ops.fhwa.dot.gov/trafficanalysisitools/>

For more information, please contact:

Jim Hunt
FHWA Office of Operations
Jim.Hunt@dot.gov
(717) 221-4422

Ralph Volpe
FHWA Resource Center
Ralph.Volpe@dot.gov
(404) 562-3637

Federal Highway Administration
Office of Operations
1200 New Jersey Avenue, SE
Washington, DC 20590

<https://ops.fhwa.dot.gov>



U.S. Department of Transportation
Federal Highway Administration

FHWA-HOP-17-049

December 2017