Project Summary

Texas Department of Transportation

0-6235: Sketch Planning Techniques to Assess Regional Air Quality Impacts of Congestion Mitigation Strategies

Background

A quick-response project-planning tool can be extremely valuable in anticipating—and comparing—the air quality, emissions, congestion, safety, and other impacts of large-scale network improvements and policy implementations. While capacity additions to existing transportation systems may facilitate new and longer trips, thereby increasing total vehicle-miles traveled (VMT) in a region, these miles tend to occur at preferred times of day, to more attractive destinations, and/or at lower cost. The travel time and cost savings, as well as added choice benefits for personal and commercial travelers, can be sizable, along with crash reductions and other benefits. In an era of constrained budgets and high expectations, procedures and tools are needed to permit early evaluation of transportation-project proposals, to facilitate project prioritization, and enhance communication with all stakeholders.

What the Researchers Did

The research team first surveyed existing methods and software programs for evaluating the impacts of transport projects. They determined that more holistic tools were needed to identify the magnitude of multiple project impacts and account for traffic diversion and other behavioral responses in realistically complex networks. The team then developed a user-friendly interface with state-of-the-art code to estimate trip tables from link counts and closely mimic full-network demand estimation results across origin-destination pairs, modes, times of day, and all links in abstracted or sub-networks (of ten to hundreds of links—depending on user aspirations).

For example the team spent many hours running MOBILE6.2 to develop an extensive table of emissions rates (by temperature, season, vehicle type and age, roadway type, speed, and so forth) and developed crash-rate equations as a function of link and intersection geometries (with defaults for users who do not wish to describe their networks in detail).

The toolkit's output structure allows users to quickly review a range of key project impacts, including benefit-cost ratios, internal rates of return, and net present values estimated over projects' design lives.

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Project Completed: 8-31-10

Two major case study sites in Austin were examined to test the toolkit's capabilities. The first focused on a 5.2-mile stretch of US 290 between US 183 and State Highway 130. The second looked at strategies to limit travel demand on an eight-lane 4.9-mile stretch of Interstate Highway 35 between US 183 and 15th Street. Various scenarios were considered in the case studies, including land count changes, upgraded facilities, and tolling.

What They Found

This research project resulted in a very powerful yet user-friendly toolkit that provides a host of new and increasingly critical outputs and costs for project planning and policymaking. In this way, toolkit users obtain a preliminary estimate of system-wide project impacts, often before conducting a more detailed analysis of demand patterns using a full-network demand model.

What This Means

A tool now exists to provide early forecasting of project impacts on air quality, emissions, traffic, user benefits, system reliability, crash counts, and lifetime costs. Planning and modeling staff at public agencies in the transportation arena may use such tools to help identify and prioritize projects. In this way, agency staff and leaders can better meet transportation demands and allocate budgets.

The toolkit's modular design and open architecture enable adaptation and enhancement. TxDOT research project 0-6487 (which seeks to similarly evaluate operational strategies, like speed harmonization and ramp metering) and a likely implementation project should result in further enhancement of the toolkit.

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