



RESEARCH SERVICES

OFFICE OF POLICY ANALYSIS,
RESEARCH & INNOVATION

TECHNICAL SUMMARY

Technical Liaison:

Brian Gage, MnDOT
Brian.Gage@state.mn.us

Project Coordinator:

Alan Rindels, MnDOT
Alan.Rindels@state.mn.us

Principal Investigator:

David Levinson,
University of Minnesota

PROJECT COST:

\$100,000



The models developed in this study will help MnDOT determine how to prioritize its investments in transit and highway infrastructure to maximize accessibility.

Evaluating the Effects of Land Use and Transportation Infrastructure on Twin Cities Accessibility

What Was the Need?

A key goal of planning is accessibility, or the ability of travelers to reach their desired destination within a reasonable amount of time. Accessibility depends both on the efficiency of a city's transportation network and on its land use: the location of buildings for commercial, residential and other uses. Transportation and land use are interdependent, and understanding their relationship is important to planning transportation facilities and zoning.

Despite this interdependence, land use and transportation planning are typically conducted independently. The latter is often focused on improving congestion measures such as mobility and reliability without taking into account the effects on land use. Focusing on mobility may result in plans that favor the decentralization of populations from the inner city to the suburbs and may be automobile-centric, reducing options for people using other modes of transportation.

Since 2006 researchers at the University of Minnesota have been working with MnDOT and other Minnesota organizations on a line of research called [Access to Destinations](#) to remedy this problem and develop accessibility measures for use in transportation planning. A recent study under the umbrella of this effort uses accessibility as a performance measure to evaluate various combinations of land use and transportation plans for Minnesota's Twin Cities metropolitan area.

What Was Our Goal?

The objective of this study was to evaluate how accessibility in the Twin Cities region would be affected by various changes in land use (including population and employment trends) and the transportation network (due to proposed highway infrastructure improvements and public transit investments).

What Did We Do?

Researchers analyzed 60 different model runs combining six land use scenarios with 10 transportation network scenarios involving both highway and transit.

Land use scenarios involved different assumptions about the distribution in population and employment growth, specifically how centralized they are expected to be within the Interstate 494/694 Beltway. These also included a baseline scenario reflecting existing land use in 2010, and a 2030 scenario reflecting decentralized growth predicted by the Twin Cities Metropolitan Council.

Highway network scenarios made different assumptions about the use of high occupancy toll (HOT) lanes and congestion pricing. These also included a free-flow scenario assuming no congestion, a 2010 scenario reflecting existing conditions and a 2030 scenario reflecting mostly decentralized network improvements planned by the Metropolitan Council. Transit scenarios made different assumptions about the use of streetcars and rapid transit, and included 2010 and 2030 scenarios.

This project will help MnDOT prioritize its transportation infrastructure investments and land use strategies to maximize accessibility, producing the greatest benefit per taxpayer dollar for Minnesota travelers.

“The product developed by this project will be an excellent tool for analysis, communications and policy development, and will help promote multimodal transportation practices that accommodate the diverse needs of all communities.”

—**Brian Gage**,
MnDOT Access
Management Coordinator

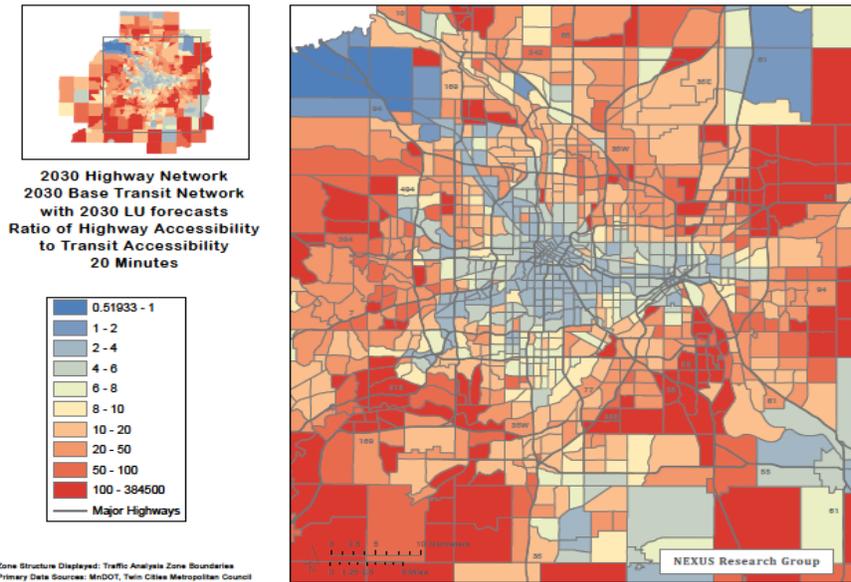
“Transportation and land use are interdependent, and understanding their relationship is critical to planning investments in transportation infrastructure.”

—**David Levinson**,
Associate Professor,
University of Minnesota
Department of Civil
Engineering

Produced by CTC & Associates for:

Minnesota Department
of Transportation Research Services
MS 330, First Floor
395 John Ireland Blvd.
St. Paul, MN 55155-1899
(651) 366-3780

www.research.dot.state.mn.us



Researchers compared the accessibility of destinations by transit and highway for a scenario reflecting planned improvements by the Twin Cities Metropolitan Council. Some destinations were just or nearly as accessible by transit as by highway (bluer areas), but others were far less accessible (redder areas).

For each scenario, researchers calculated travel time using computer models to simulate highway and transit networks. Then they calculated each scenario’s accessibility, defined as the sum of destinations reachable within a certain time threshold.

What Did We Learn?

Results showed that centralized growth in population and employment produced the highest accessibility, followed by centralized population and decentralized employment. Depending on the network configuration, fully centralized growth produced about 20 percent to 25 percent more accessibility than the forecast for 2030.

Of the highway scenarios, free-flowing highway networks had the highest accessibility, with 20 percent more accessibility than the forecast for 2030. The second most accessible were HOT lane scenarios, with congestion pricing not far behind.

Transit accessibility was about twice as high for the fully centralized as for the fully decentralized scenarios, illustrating that transit networks are significantly better at connecting people to jobs at higher densities. Similarly, transit scenarios that improved speeds in the central cities had more of an effect on systemwide accessibility than those that expanded service areas.

While the combination of centralized population and employment with a free-flowing highway network maximizes accessibility, it is likely not cost-effective or feasible with current technologies, and counters trends of increasingly decentralized population and employment. If these trends continue, an investment in congestion pricing or HOT lanes might be best. On the other hand, decentralized development renders the transit system ineffective and reduces the effectiveness of the highway system to connect people to jobs. A concentrated effort for higher densities and infill development in the central cities would most benefit accessibility.

What’s Next?

MnDOT will use the methods developed in this study to further examine the accessibility of more specific scenarios, allowing it to prioritize transportation network and land use strategies based on how much accessibility they provide per unit dollar.

This Technical Summary pertains to Report 2012-05, “Using Twin Cities Destinations and Their Accessibility as a Multimodal Planning Tool,” published February 2012. The full report can be accessed at www.dot.state.mn.us/research/TS/2012/201205.pdf. More information about the Access to Destinations effort can be found at www.cts.umn.edu/access-study.