Fast Forward

IMPACTS REPORT 2020

CENTER FOR
TRANSPORTATION STUDIES
UNIVERSITY OF MINNESOTA

By the Numbers

CTS IS THE HUB FOR TRANSPORTATION RESEARCH, EDUCATION, AND ENGAGEMENT AT THE UNIVERSITY OF MINNESOTA.

Life this year seems to be standing still—and at the same time, speeding forward. While we pause our normal activities, disruption is forcing an accelerated pace of change. At CTS, we adapted quickly to address the issues of the day while continuing our work in many other areas. Highlights are in this report. And, more than ever, we thank our supporters and send wishes for health and wellness.

—Laurie McGinnis, CTS Director

FY20 Revenues: $12.7M

- Federal 23%
- State of Minnesota 38%
- Regional/Local 14%
- University of Minnesota 10%
- Other 15%

Research

- **3** patents/licenses applied for; 2 granted
- **25** new products/practices applied
- **87** faculty and staff with projects
- **118** active research projects
- **3,000** citations (approx.) of peer-reviewed publications

Engagement

- **63** committees, councils, and other stakeholder groups convened
- **209** media stories referencing U transportation research and outreach
- **2,678** participants at events
- **23,532** subscribers of publications and social media

Education

- **87** U students participating in research projects
- **877** K-12 students participating in CTS experiential learning activities
- **4,993** participants in customized training and technical assistance programs

Read the annual impacts report online for links to these stories and much more:
cts.umn.edu/2020annualreport

A Wellspring of Knowledge

Crash risk for pedestrians and cyclists higher in less-affluent neighborhoods

The crash risk for pedestrians and bicyclists is higher in Minneapolis neighborhoods that have lower household incomes and higher populations of minorities.

For their analysis, U of M researchers determined crash numbers and frequencies for pedestrian and bicycle crashes in Minneapolis between 2005 and 2017. They then developed new models of pedestrian and bicycle crash risk and used them to predict crashes at all of the city's intersections and mid-blocks. Next, they used statistical tests to assess how equitably the estimated crash risk is distributed in the city.

They found that people in Minneapolis who live in lower-income neighborhoods in which more than half the population is minority face higher crash risk than those individuals who live in more affluent, majority-white neighborhoods, especially at intersections.

The team then developed new indices of crash risk and showed how they could complement or augment rankings currently used by the city to prioritize street improvement projects.

Principal investigator: Greg Lindsey, Humphrey School of Public Affairs. Co-investigator: Jason Cao, Humphrey School. Sponsor: Roadway Safety Institute.

Transitway investment leads to higher regional GDP, job growth, and accessibility

Transitway investment adds considerable economic value to metropolitan regions, including the Twin Cities area, and increases access to the places people need to reach to prepare for, get, and keep a good job. Transitways also provide more equitable access for people of color and residents of areas with concentrated poverty.

Transitway investment does not, however, measurably change a region's median household income or income inequality. While a whole region may see growth from transitway investment, researchers found no direct impact on how income is distributed. Without proper planning, investment in low-income minority neighborhoods—often at risk for gentrification—may not benefit disadvantaged population groups.

Principal investigator: Yingling Fan, Humphrey School of Public Affairs. Co-investigator: Andrew Guthrie, University of Memphis. Sponsor: Transitway Impacts Research Program.

Tool helps local agencies prepare for connected and automated vehicles

Experts predict the implementation of connected and automated vehicles (CAVs) will soon be widespread. To help prepare for this change, researchers developed a reference tool that local transportation agencies can use to anticipate the infrastructure needs for CAVs and plan for infrastructure upgrades and maintenance activities.

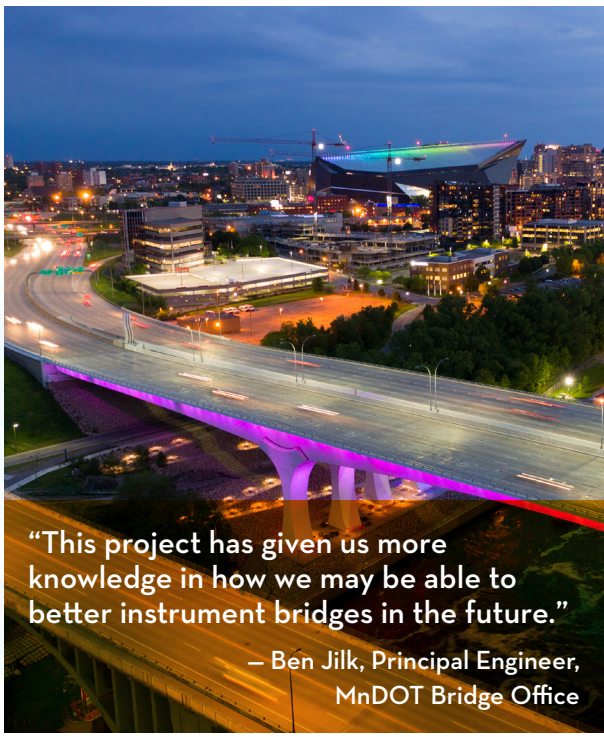
Transportation planners often anticipate decades of service from infrastructure such as traffic signal control technology and signage, so the decisions they make today must reflect the needs of CAV technologies. Researchers created a matrix of infrastructure applications—with cost projections—to accompany the detailed descriptions in their report.

Principal investigator: John Hourdos, Minnesota Traffic Observatory. Sponsor: Minnesota Local Road Research Board.

Monitoring system provides decade of data from I-35W bridge

On August 1, 2007, the I-35W Saint Anthony Falls Bridge collapsed in Minneapolis. Its replacement was instrumented with more than 500 sensors to record the new structure's behavior and evaluate the effectiveness of different monitoring strategies. A 10-year review of the bridge's monitoring system is available from U of M researchers.

The continuous operation of the I-35W bridge monitoring system makes it one of the longest-lived in the country. The report provides insight regarding the relative strengths of the instrumentation systems and potential considerations for future system deployments. One key finding is that seasonal and daily temperature variations have a big impact on the bridge's behavior—so the instrumentation needed to measure temperature and its impacts is the most important technology for long-term monitoring.



Principal investigator: Lauren Linderman, Civil, Environmental, and Geo- Engineering (CEGE). Co-investigators: Carol Shield (CEGE) and Brock Hedegaard (U of M Duluth). Sponsor: MnDOT.

Local cyclists who tested the alert system said it gave them "peace of mind" to know that potential bad behaviors by drivers near them would be recorded on video.

Researchers develop alert system to protect cyclists from cars

A research team is developing a smart bicycle with an attached alert system that sounds a horn when cars get too close to the cyclist. The team is collaborating with cycling manufacturer Quality Bicycle Products to test the technology.

The system uses sensor technology created for automated vehicles. It comprises three sensors that monitor the trajectories of nearby vehicles, speakers, and a black-box camera that records video when the cyclist is in danger. A key goal is to minimize the cost of the system.

Researchers worked with local cyclists in 2019 to test the alert system. Although further testing was postponed because of the pandemic, the team aims to have a marketable product in coming years.

Principal investigator: Rajesh Rajamani, Mechanical Engineering (ME). Co-investigator: Max Donath (ME). Sponsor: National Science Foundation; prototype funded by the Roadway Safety Institute.

Researchers rate job accessibility for five Twin Cities transitway scenarios

Transitway service is expanding across the Minneapolis–Saint Paul metro area. In an analysis for the Metropolitan Council, Accessibility Observatory researchers evaluated job accessibility for five transitway scenarios.

The team first compared the network as of May 2019 to the funded baseline. The funded baseline adds the C Line along Penn Avenue, the Orange Line along I-35W to Lakeville, and the Green Line extension to Eden Prairie.

They then compared the funded baseline accessibility results to those of three proposed lines: The B Line along Lake Street, the D Line along Emerson/Fremont and Chicago Avenues, and the E Line along Hennepin and France Avenues. The transitways were evaluated in isolation and in a scenario combining all three.

The results show that all five scenarios improve accessibility across the region and especially increase accessibility for workers living near transit stops.

Principal investigator: Andrew Owen, Accessibility Observatory. Sponsor: Metropolitan Council as part of the National Accessibility Evaluation, a multi-year effort led by MnDOT.

"When we add fast, frequent BRT service to these important local routes, we can shorten wait times and travel times. This analysis shows that these improvements cascade through the bus system to improve connections in areas not immediately adjoining the transitways in question."

– Eric Lind, Manager of Research & Analytics – Strategic Initiatives, Metro Transit

A Pivot to COVID-19

Webinar paints a picture of COVID-19 impacts

CTS convened a special webinar in June to shed light on the pandemic's effects on transportation. U of M researchers and professionals from state and Twin Cities agencies presented findings and weighed in on the issues. Shashi Shekhar (Computer Science and Engineering) reported on mobility changes he calculated using smartphone data, and Alireza Khani shared early results from his study of virus transmission (below).

Simulation calculates the risks of bus travel

Building on his previous research into pandemic transmission, Alireza Khani (Civil, Environmental, and Geo- Engineering, CEGE) developed a mathematical simulation that can analyze the relative risk of traveling on buses. Using multiple data sources, Khani calculates how long riders tend to stay on a bus and how many people they might encounter. This allows him to gauge the relative COVID-19 risk of a given route at a given time of day. The ongoing work, which includes collaboration with Metro Transit, is sponsored by the Office of the Vice President for Research COVID-19 Rapid Response Grants and CEGE.

Other COVID-19 research

Several other researchers have pivoted to study the pandemic. Topics include the benefits and equity of telecommuting; impacts on roadway and transit funding; social isolation, especially of older adults; medical supply chains; modeling the spread of the virus in transportation networks; and social distancing and adherence. CTS will share results from this research as it becomes available, and the pandemic's impacts will be an ongoing source of transportation data and research questions.

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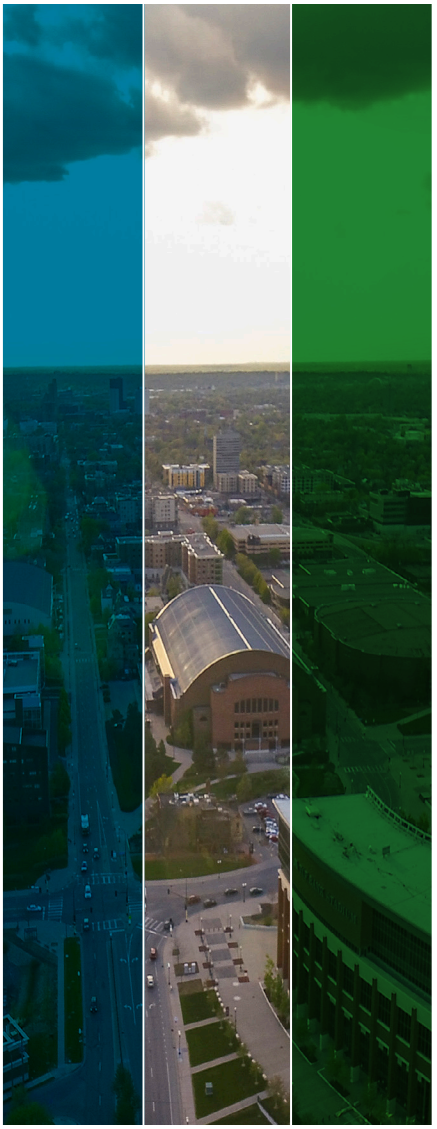

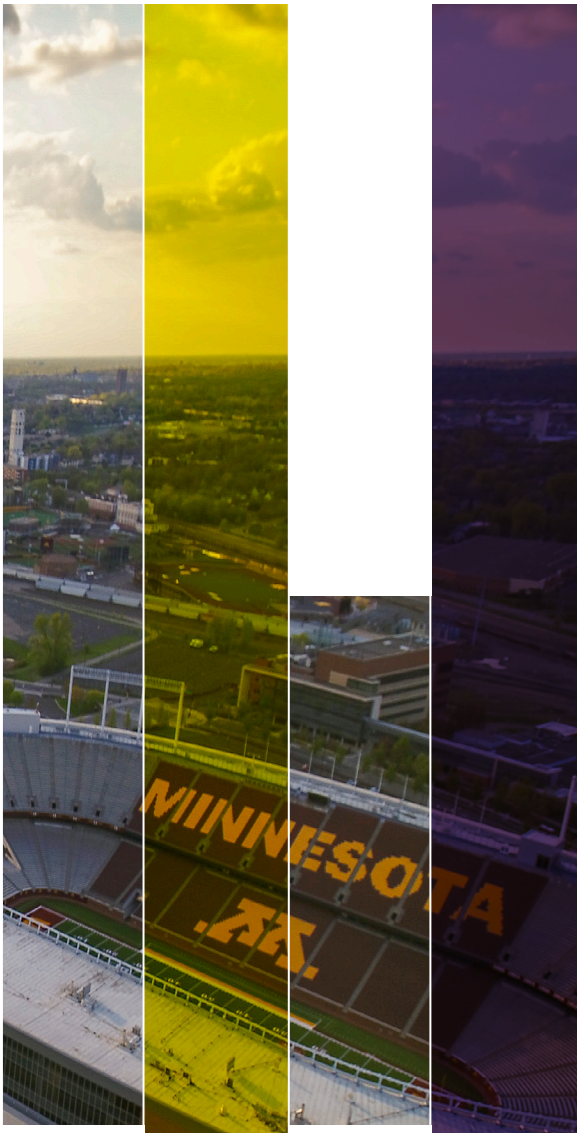

Our mission:

CTS IS A CATALYST FOR TRANSPORTATION INNOVATION THROUGH RESEARCH, EDUCATION, AND ENGAGEMENT.

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