We all benefit.

IMPACTS REPORT 2019

CENTER FOR
TRANSPORTATION STUDIES
UNIVERSITY OF MINNESOTA

By the Numbers

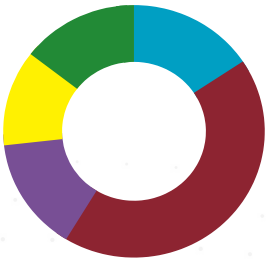
CTS IS THE HUB FOR TRANSPORTATION RESEARCH, EDUCATION, AND ENGAGEMENT AT THE UNIVERSITY OF MINNESOTA.

Everyone benefits from transportation...which means everyone benefits from transportation research. The University of Minnesota provides a wellspring of ideas to make transportation better, and it prepares the workforce to put those ideas to work. This report shows you highlights from FY19. And as always, our deepest thanks to our supporters.

—Laurie McGinnis, CTS director

Revenues: $15,490,000

- Federal 16%
- State of Minnesota 43%
- Regional/Local 15%
- University of Minnesota 12%
- Other 14%



Research

5 patents/licenses applied for; 3 granted
16 proposals secured by interdisciplinary research teams
22 new products or practices developed
104 peer-reviewed publications
172 active projects

Engagement

63 committees, councils, and other stakeholder groups convened
191 media stories referencing U transportation research and outreach
4,063 participants at events

Education

23 U students in CTS-facilitated internships
36 Ph.D. and master's graduates
497 K-12 students in CTS activities
5,936 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/2019annualreport

New & Notable

AN INTERDISCIPLINARY U OF M TEAM RECEIVED A $1.75 MILLION GRANT FROM THE NATIONAL SCIENCE FOUNDATION FOR A THREE-YEAR STUDY OF AUTOMATED SHARED VEHICLES. THE STUDY WILL FOCUS ON LEVERAGING THESE VEHICLES TO RETHINK AND REDESIGN TRANSPORTATION SERVICES AND ENABLE SMART, CONNECTED COMMUNITIES WHERE EVERYONE BENEFITS.

RESEARCHERS DEVELOPED AND SHARED NEW KNOWLEDGE TO HELP REDUCE TRANSPORTATION DISPARITIES AS PART OF MNDOT'S ADVANCING TRANSPORTATION EQUITY INITIATIVE. ACCORDING TO THE FINDINGS, EFFORTS TO IMPROVE TRANSPORTATION EQUITY NEED TO FOCUS ON SOCIETAL INEQUITIES—SUCH AS RACIAL SEGREGATION—AS WELL AS THE TRANSPORTATION BARRIERS THAT AFFECT SPECIFIC COMMUNITIES AND POPULATION GROUPS.

CTS SECURED A ONE-YEAR GRANT FROM THE MCKNIGHT FOUNDATION TO SUPPORT THE TWIN CITIES SHARED MOBILITY COLLABORATIVE. CTS WILL PROVIDE ORGANIZATIONAL, COMMUNICATIONS, AND PUBLIC ENGAGEMENT SUPPORT TO ADVANCE THE COLLABORATIVE'S LEADERSHIP ON THIS EMERGING TRANSPORTATION INITIATIVE IN THE TWIN CITIES REGION.

New Knowledge — Broad Value

"The increased fuel efficiency from this research may help delivery firms control costs, which benefits their customers, too."
— Mike Muldoon, telematics technical lead, Workhorse Group, Inc.

Increased fuel efficiency — lower delivery costs

A research team is developing and deploying technology that will improve the fuel efficiency of package delivery vehicles.

Large delivery companies such as UPS use analytics to assign routes to minimize fuel consumption. Current UPS routing algorithms use historical data and do not interact directly with vehicles on the road.

The U of M team is integrating new technology into UPS electric powertrain vehicles to allow them to make adjustments in real time. The upgrades will connect vehicles to the "cloud" to feed route analytics. They will also enable the powertrains to respond to changing conditions such as weather and traffic. The project may improve fuel economy by more than 20 percent over the baseline electric vehicle now in the UPS fleet.

Lead researcher: Will Northrop, Mechanical Engineering. Co-investigator: Shashi Shekhar, Computer Science and Engineering. Sponsor: US Department of Energy.

Safer drivers — safer pedestrians

Researchers in the University's HumanFIRST Laboratory collaborated with city and state officials on a project aimed at reminding drivers to watch out for pedestrians. The team looked at several ways to improve Saint Paul's existing pedestrian safety campaign, including low-cost engineering changes.

At eight test sites treated during the study, the researchers installed feedback signs that displayed the weekly percentage of drivers who stopped for pedestrians. Other signs reminded drivers that it's Minnesota law to stop for pedestrians in crosswalks. The average compliance rate of drivers jumped from approximately 32 percent to as high as 78 percent.

Lead researcher: Nichole Morris, HumanFIRST Laboratory, Mechanical Engineering. Co-investigators: Curtis Craig, Mechanical Engineering, and Ron Van Houten, Psychology–Human Factors, Western Michigan University. Sponsor: MnDOT.

"The awareness of pedestrian safety grew to a new level."
— Commander Jeremy Ellison, Saint Paul Police Department

Community engagement — informed decisions

The motor vehicle crash fatality rate is higher for American Indians and Alaska Natives than for any other ethnic or racial group. Researchers sought to better understand and identify potential ways to reduce this high rate in tribal lands.

In their work, researchers collaborated with American Indian communities to learn the top roadway safety concerns and priorities. They also identified successes and limitations of existing efforts. One major finding: Pedestrian safety is a critical, distinctive, and under-recognized priority.

Researchers also assessed pedestrian safety at four reservations and monitored pedestrian traffic and highway crossings at 10 locations. They then developed recommendations for safety countermeasures such as crosswalks.

Lead researchers: Kathy Quick and Greg Lindsey, Humphrey School of Public Affairs. Sponsors: CTS, Roadway Safety Institute.

"We used the research findings to secure state funding for a new crosswalk and pedestrian-activated signal."
– Mike Moilanen, director of planning and project management, Mille Lacs Band of Ojibwe

Practical culvert designs — healthier streams

Researchers developed a comprehensive culvert design guide to help preserve stream connectivity and promote the safe passage of fish and other aquatic organisms. The designs integrate environmental health with goals for public safety and infrastructure resilience and longevity.

Because of the variety of ecological regions in the state, the range of culvert geometries, and other factors, no single solution can work for culverts statewide. The new guide fills this information void.

Lead researcher: Matt Hernick, St. Anthony Falls Laboratory. Co-investigator: John Nieber, Bioproducts and Biosystems Engineering. Sponsors: MnDOT, Minnesota Local Road Research Board.

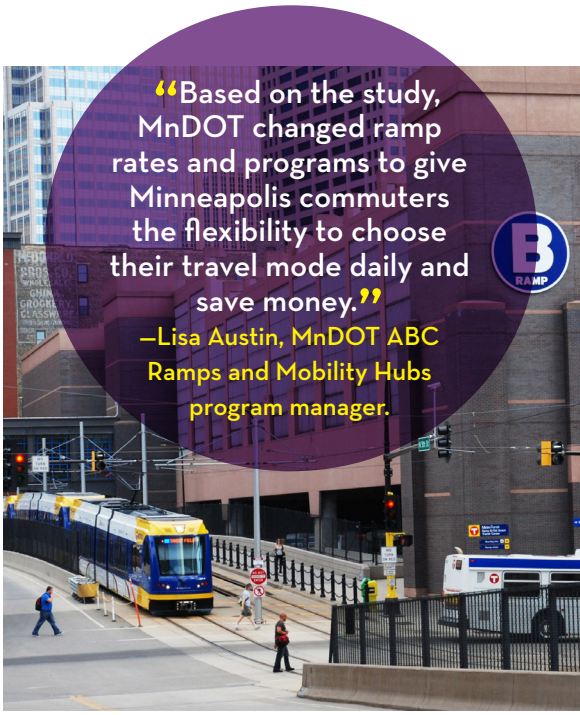
"This design guide offers a practical, Minnesota-based perspective on how to design culverts."
–Nicole Bartelt, MnDOT Bridge Office

Commuting choices — less congestion

The ABC Parking Ramps in Minneapolis were designed to ease congestion by encouraging carpooling and transit use. Now, however, they are increasingly used by solo drivers and surrounded by congested streets. A U of M team analyzed the issues and made recommendations to policymakers for the short and long term.

Options included a discounted daily rate for occasional carpoolers and flexible contracts with both ramp access and transit options. The researchers also advised adding more drop-off and pick-up areas for ridesharing and more charging stations for electric vehicles.

Lead researcher: Frank Douma, Humphrey School of Public Affairs. Co-investigators: Yingling Fan, Jason Cao, and Adeel Lari, Humphrey School. Sponsor: MnDOT.



"Based on the study, MnDOT changed ramp rates and programs to give Minneapolis commuters the flexibility to choose their travel mode daily and save money."

—Lisa Austin, MnDOT ABC Ramps and Mobility Hubs program manager.

New experiences — promising career paths

More than 100 students from five high schools got an up-close, hands-on look at transportation construction jobs during MnDOT Construction Career Day at the State Fairgrounds. The new event raised awareness of career opportunities within the transportation industry. Students rotated in small groups through nine demonstration stations focused on highway heavy construction. Representatives from several MnDOT offices, contracting and consulting firms, and trade unions offered insight, encouragement, and practical advice.

Sponsor: MnDOT Office of Civil Rights.

"This has been an extremely valuable event to me personally. Not every kid is going to be able to get out here and see this, and that's honestly, I think, why a lot of kids just don't really get the jobs that they want."

— Cole, a Roosevelt High School student interested in carpentry

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Vice President, Cargill Transportation & Logistics

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Photography: iStock; Shutterstock; University of Minnesota; UPS

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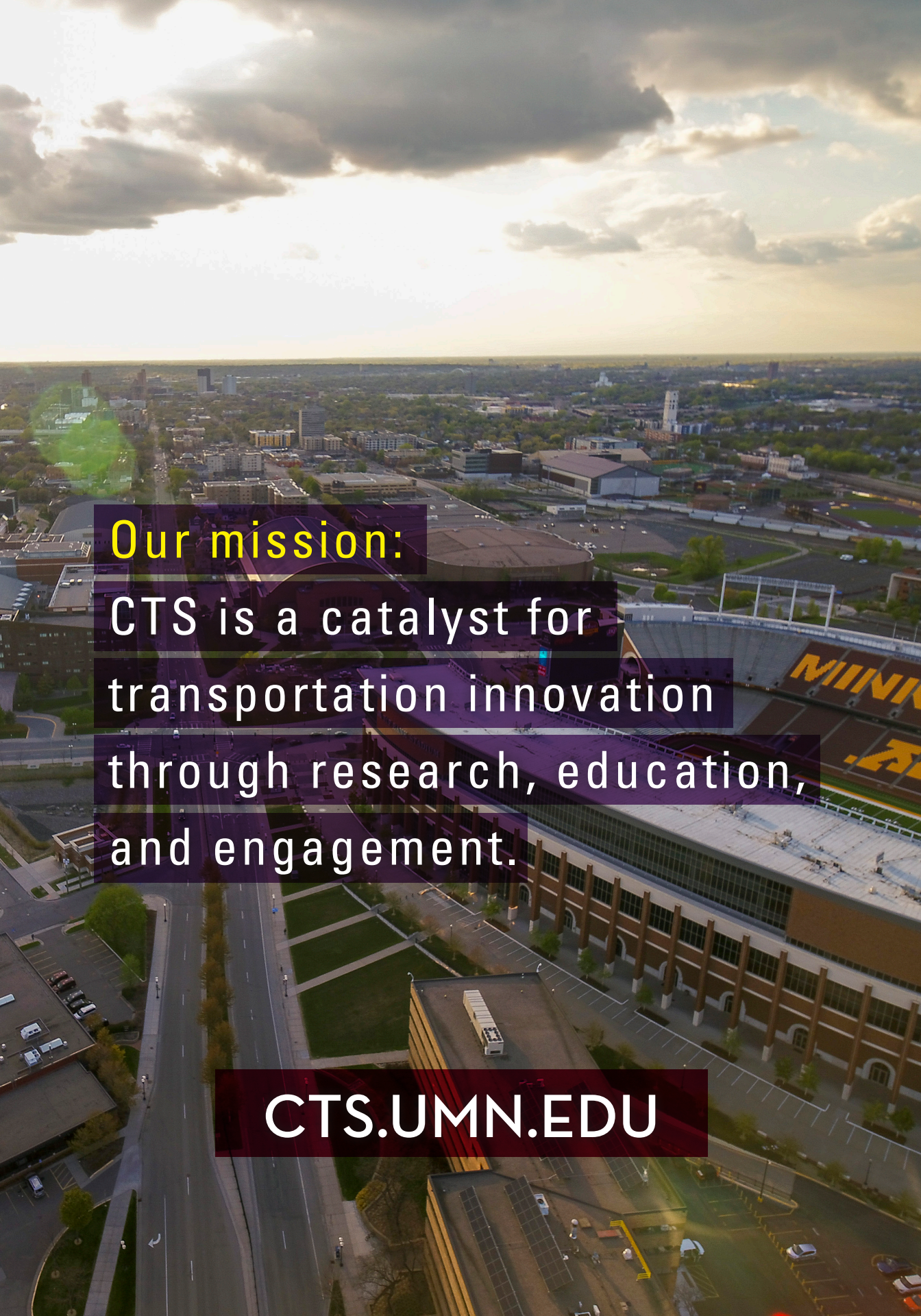

Our mission:

CTS is a catalyst for transportation innovation through research, education, and engagement.

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