Access to jobs by transit increases in many U.S. metros

Access to jobs by transit increased in the Twin Cities area and many other U.S. metros, according to a new report from the University’s Accessibility Observatory. The annually updated research ranks 49 of the 50 largest (by population) metropolitan areas in the United States for connecting workers with jobs via transit.

Although the rankings of the top 10 metro areas for job accessibility by transit changed only slightly from the previous year, new data comparing changes within each of the 49 largest U.S. metros revealed interesting insights.

New tool to help Metro Transit schedule drivers, optimize workforce planning

A U of M team has completed a project aimed at helping Metro Transit schedule and manage its bus operator workforce. Led by Qie He, an assistant professor in the Department of Industrial and Systems Engineering (ISyE), the project was part of a multi-year partnership between the University and the Twin Cities transit agency.

Metro Transit’s extensive network of bus service employs more than 1,500 bus operators at five garages. Every day, operations staff must manage this workforce, adjusting for both planned and unexpected events.
The City of Ramsey is a rapidly growing exurb of Minneapolis, and its main thoroughfare, Highway 10, is experiencing chronic congestion as a result. The Highway 10 corridor is slated for significant upgrades in the next 20 years to convert it to a limited-access highway. As part of the U of M’s Resilient Communities Project (RCP), a team of graduate students developed ideas for a more substantial process of communication between city staff and those most affected by current conditions along the corridor and future improvements.

The city was RCP’s community partner for the 2017–2018 school year. RCP, housed within the Center for Urban and Regional Affairs, seeks to connect students’ innovation, ingenuity, and fresh perspectives with local government agencies to learn about their needs, conduct research, and develop solutions, says RCP director Mike Greco.

Through RCP, students in a fall-semester course offered by the Humphrey School of Public Affairs (PA 5253: Planning and Participation Processes) identified strategies to productively engage with the main groups of stakeholders concerned about the future of Highway 10: business owners, residents, and commuters.

The instructor for the course was Dan Milz, a visiting assistant professor of environmental planning and civic engagement. The student team consisted of Ashley Hartle, T.J. Hofer, Joe Polacek, Alyssa Schmeling, Alicia Valenti, and Michael Wade. Their project report—The Road to Prosperity: Engaging Ramsey for a Better Highway 10—was prepared in collaboration with Tim Gladhill, community development director for the City of Ramsey.

The team recommended that to engage all stakeholder groups effectively, each group should have its own engagement strategies. Example strategies include a business-owner advisory committee, surveys to residents and commuters, and an interactive mapping event for residents.

A second report related to the Highway 10 project was completed in a capstone course at the Humphrey School this spring, also taught by Milz. This group picked up the work from fall semester and conducted a charrette-style workshop with community stakeholders. One of the students from the fall semester course, T.J. Hofer, was a member of the capstone team, along with Myles Campbell and Natela Jordan.

The Highway 10 corridor study was one of 21 projects that were part of this year’s RCP partnership with Ramsey. More than 50 student teams from 16 academic departments participated.

The collaboration provided the city and its residents with case studies, data analysis, concept plans, designs, and policy recommendations to build resilience in Ramsey, Greco says. It also offered more than 275 students the opportunity to tackle real projects as part of their coursework, working directly with Ramsey city staff, residents, and business owners.

At an end-of-year event, Ramsey’s acting mayor, John LeTourneau, thanked RCP for partnering with the city, promising that “The data and the information that the students and everyone else have brought forward is going to be applied in many different ways” as Ramsey strives to remain resilient in the face of rapid growth.

Two counties selected for 2018–2019

RCP community partners for the 2018–2019 academic year will be Ramsey County and Scott County. In the coming months, staff will define the scope and purpose of individual projects before matching them with courses offered at the University in fall 2018 and spring 2019.

Ramsey County’s proposal identified up to 18 potential projects, such as removing transportation barriers to employment and exploring innovative stormwater management practices. Scott County’s proposal identified 14 potential projects, including planning for autonomous vehicles. “This is a wonderful opportunity for Scott County to have access to the resources and cutting-edge research the University of Minnesota can share,” says Scott County board chair Tom Wolf.
In June, CTS hosted the annual summer meeting of the Council of University Transportation Centers (CUTC). More than 130 attendees from college and university centers and institutes focused on transportation research, education, and outreach gathered in Minneapolis for the event.

In the opening keynote, Carissa Slotterback, associate dean of the Humphrey School of Public Affairs, discussed the importance of collaborative engagement in transportation research. She also described how university transportation centers can serve as the models for this engagement on their campuses. Overall, Slotterback said, this involves moving from a push-out to a pull-in approach.

According to Slotterback, transportation research has both an imperative and competitive advantage when it comes to collaboration and engagement. First, the field is naturally multidisciplinary, ranging from engineering to public health to urban planning, and multidisciplinary work requires collaboration. Transportation is also multisector, with distributed authority and resources across all levels of government. “If we had a single authority, it would be much easier to do our work,” Slotterback said. “Since [we don’t], we have to think about being engaged across the distributed system.”

Transportation’s lack of diversity is another important reason for collaborative engagement. “We know we’re not representative,” Slotterback said. “Bringing in additional perspectives is critical to ensuring that our research is responsive to the needs of our communities.”

In addition, although transportation is a technical-solutions-oriented field, it is evolving. This includes increasing connections to a broader range of social, economic, environmental, and political concerns. “As the field becomes more complex and we realize the limitations of our technical solutions, it requires us to be more collaborative and engaged,” Slotterback said. “That’s essential for producing high-quality work and applying solutions that are contextual and relevant.”

Finally, transportation is personal, and everyone experiences it. “We are all experts,” Slotterback said. “We all experience transportation every day, and it touches everyone’s life. As researchers, we should be thinking about how to tap into that expertise and value it.”

Slotterback then outlined some characteristics of collaborative and engaged research, including ideas for how to put each of them into practice.

- **Power is redistributed.** Expertise is valued, acknowledged, and brought to the table, no matter where it comes from—including academics, practitioners, and communities. Ask potential collaborators what would make the interaction most valuable for them.

- **All play a role in setting the agenda.** Codefine the research question, gain context from your partners, and continuously redefine the agenda.

- **Work together on research.** Practitioners can be more than just advisors; they can be active members of the research team, along with academics. Make use of crowdsourced data as well as student workers, especially for quick turnarounds.

- **Little things show value and respect at events.** Consider who is on the agenda and how much time they get. Be thoughtful about room and seating arrangements and take advantage of opportunities to curate conversations.

- **Use your power to engage those not represented.** Look across and outside your university, including at small nonprofits working in diverse communities. Identify emerging leaders, big thinkers, and future superstars who aren’t usually invited to the table.

- **Sustain engagement.** Offer opportunities for ongoing engagement: cocreate rather than just update. Connect new faculty to external partners and engage younger practitioners and students. Use your power and platform to sustain relationships with underrepresented organizations. “Our field is changing. Our communities are changing. Our universities are changing,” Slotterback said. “Our research is needed. Don’t underestimate your power and your ability to do good.”

**Interested in engaging with CTS?**

Sign up to become a friend of one of our four research councils or our education and engagement council. For more information, visit [cts.umn.edu/councils](cts.umn.edu/councils).
Mussel spat rope can help small fish species navigate through culverts

In a recent U of M study, researchers showed how low-cost mussel spat rope can help small fish species navigate through culverts by reducing current velocity and providing protected areas for fish to shelter and rest. Mussel spat rope is a “fuzzy” polyethylene rope with 2- to 3-inch fibers commonly used for mussel aquaculture, says research associate Jessica Kozarek.

Maintaining fish passage for Minnesota’s high-quality fish population is a concern for fish and wildlife organizations and for the Minnesota Department of Transportation (MnDOT), which must maintain culverts and construct new channels that do not create fish barriers. “Minnesota is a headwater state, and we have a responsibility to keep our fish population healthy,” says Petra DeWall, bridge waterway engineer with MnDOT’s Bridge Office.

MnDOT funded research by the U’s St. Anthony Falls Laboratory (SAFL) to investigate mussel spat rope as a possible low-cost, low-maintenance method for Minnesota’s culverts. Led by Kozarek, a SAFL team conducted experiments in the laboratory and in the field. Key observations from these investigations:

- Mussel spat rope created small corridors (about 6 inches) of reduced velocity and turbulence along its length, which was sufficient to aid the passage of small fish. Sediment collected in, between, and beneath the ropes—an important finding, given that culvert floor sedimentation may assist fish passage.
- The rope displayed wear over two years in the field, raising a concern about plastic microparticle release into streams. Sediment covered some ropes over time, suggesting a need for maintenance in some culverts.
- In the laboratory flume, test fish swam near and between doubled rope lengths, apparently taking advantage of the reduced current near and beneath the ropes. While there was variation among species, most fish that swam upstream through the simulated box culvert ended their passage on the rope side, evidence that the rope provided cover and refuge from the current. (Only a few fish were observed at the field installations.)

“Overall, we believe that mussel spat rope is an inexpensive method that could be installed quickly in problem culverts, providing fish passage when other alternatives are infeasible,” Kozarek says.

MnDOT’s DeWall concurs: “Mussel spat rope will be one more effective tool in the toolbox of methods we have to assist fish passage through culverts.”

The final report includes guidance for installing the rope. The method will also be included in an upcoming guide for designing culverts that allow aquatic organism passage.

Save the date: CTS Research Conference

Mark your calendar for the annual CTS Transportation Research Conference, scheduled for November 1, 2018, at the Graduate Minneapolis (formerly The Commons Hotel) on the U of M campus in Minneapolis.

The conference convenes researchers and practitioners to highlight new learning, emerging ideas, and the latest innovations in transportation. Attendees will learn about research findings, implementation efforts, and engagement activities related to a variety of transportation topics.

Program information and registration will be available in late summer on the CTS website.
Researchers evaluate affordable bridge repair method

U of M researchers recently wrapped up an evaluation of a cost-effective technique for repairing damaged ends of reinforced concrete bridge girders. Although these girders can bear heavy loads well for decades, girder ends located under bridge expansion joints sometimes show distress. These joints consist of flexible seals that are needed for thermal expansion but are also prone to tears from roadway objects and material buildup. Water and salt leaking through these tears can cause corrosion and deterioration at the girder ends.

Funded by the Minnesota Department of Transportation (MnDOT), this project involved bringing bridge girders from the Trunk Highway 169 Nine Mile Creek Bridge near Edina and Minnetonka into the U’s Theodore V. Galambos Structural Engineering Laboratory for testing. Some of the girders had been repaired in 2013 using a novel method that involved removing deteriorated concrete, placing steel reinforcement cages around the damaged girder ends, and encasing the girder ends with concrete. “Repairs were done in the field by an experienced contractor, in a colder environment and season, in a swamp,” says Paul Pilarski, metro north regional bridge construction engineer with MnDOT’s Bridge Office. While some of these field conditions could have adversely affected the results of the repair, the repaired girder ends appeared to be in good condition when the bridge was scheduled for replacement in 2017.

To verify the strength of the repairs, MnDOT selected two pairs of girders, each containing a girder that had been repaired and one that was in good condition. All four girders were brought to the U of M, where a team led by civil, environmental, and geo-engineering professor Carol Shield began its evaluation.

The research team’s goal was to determine whether the repairs had restored the damaged girders to their original shear strength. If so, MnDOT would be able to use this method—in which damaged girder ends can be repaired for $5,000 to $10,000 without causing traffic interruptions—on other bridges. The alternative involves constructing a new girder, closing traffic, removing the bridge deck over the damaged girder as well as the girder itself, and recasting the bridge deck and barrier. This replacement method costs hundreds of thousands of dollars and can require more than a month of bridge lane closures.

To test the girders, researchers began by casting a new, high-strength concrete deck for each of the four girders to recreate their field configuration. Each one was then loaded by a hydraulic ram pushing down on the girder. The researchers applied a load in 25,000-pound increments to almost 500,000 pounds on each girder. They traced cracks with colored markers on the girder ends, recording details about condition at each step of the way.

Findings indicated that the repaired girder ends were at least as strong as the unrepaired girders. “This innovative method works remarkably well,” Shield says. “The amount of damage the crew repaired was pretty extensive. In the end, the strength of the repaired damaged girders was slightly more than the strength of the undamaged girders.”

“The fact that we tested good girders alongside repaired girders gives us a high level of confidence in this method,” Pilarski says.

Based on these study findings, MnDOT plans to continue using this repair method in similar conditions to the Nine Mile Creek Bridge. The agency will also continue to refine the repair method based on best industry practices.

BRIDGE GIRDER ENDS can be repaired for $5,000 TO $10,000 using the new method.

Catalyst Year in Review

During the past year, these were our most-read stories online:

#1: As funding gap grows, how do we pay for transportation infrastructure?
#2: In-vehicle warnings show promise for improving work-zone safety
#3: New warning systems aim to reduce rear-end crashes on Minnesota freeways

If you missed them, the stories are available online in the Catalyst archive.
metros over one year helped researchers identify the places with the greatest increases in access to jobs by transit. Kansas City improved more than 17 percent. San Francisco, which ranks 2nd for job accessibility by transit, improved nearly 9 percent. In all, 42 of the 49 largest metros showed increases in job accessibility by transit.

“Based on this analysis, Minneapolis–Saint Paul ranks 13th nationally in access to jobs by transit, unchanged from last year’s rankings. Between 2016 and 2017, the transit job accessibility experienced by the average Twin Cities worker increased by 7 percent—the 9th highest change in transit accessibility among the areas we analyzed,” says Andrew Owen, Observatory director.

“These results reflect many factors, including overall levels of transit service, total employment levels, and the density and geographic coordination of residential areas, workplaces, and transit corridors,” Owen explains. “Perhaps the most significant change in the Twin Cities’ transit system between January 2016 and January 2017 was the opening of service on the A Line [bus rapid transit]. Our analysis indicates that A Line service played an important role in driving the overall increase in transit accessibility, along with an increase in overall regional employment. Route and schedule changes throughout the transit network all contribute to accessibility changes as well, but it is difficult to isolate specific contributions.”

This year’s report—Access Across America: Transit 2017—presents detailed accessibility values for each of the 49 metropolitan areas, as well as detailed block-level color maps that illustrate the spatial patterns of accessibility within each area.

The new rankings are part of the Access Across America national pooled-fund study that began in 2013. The study is a multi-year effort led by the Minnesota Department of Transportation and supported by partners that include the Federal Highway Administration and 10 additional state DOTs.

The Transit 2017 report and other Access Across America research reports for auto, walking, and soon, biking, are available at access.umn.edu.

Top increases in job accessibility by transit
1. Kansas City (+17.36%)
2. Charlotte (+10.81%)
3. Austin (+9.76%)
4. Columbus (+8.99%)
5. San Francisco (+8.72%)
6. Orlando (+7.88%)
7. Las Vegas (+7.68%)
8. Phoenix (+7.31%)
9. Minneapolis (+7.01%)
10. Cincinnati (+6.78%)

Top 10 metro areas for job accessibility by transit
1. New York
2. San Francisco
3. Chicago
4. Washington, DC
5. Boston
6. Los Angeles
7. Philadelphia
8. Seattle
9. San Jose
10. Denver
unplanned absences. This open work can be assigned to a reserve operator (who is paid whether assigned work or not) or to a regular operator who is asked to work overtime. “Our project developed an analytics tool to help the agency minimize service disruption while also minimizing total costs,” he says.

During the study, ISyE students were immersed at Metro Transit: they worked in garages, met with dispatchers, and connected with workforce planning staff on a weekly basis. “The research team did a great job learning about our operations, the constraints that exist, and the day-to-day challenges we face,” says Donathan Brown, assistant director of bus operations administration for Metro Transit. “They then applied their analytical skills and gave us important insight into our operations.”

With the insight gained from these interactions, researchers created a machine-learning model that predicts how many drivers will be absent at a given point in the future. “This tool can predict absences of different types at the individual level, the garage level, and across the entire organization,” he explains. “This model helps Metro Transit get a better understanding of the factors that affect operator absences as well as provides a prediction of the distribution of daily absences.”

The output of this prediction tool then feeds into another tool the research team created—an optimization model—that recommends how many reserve operators are needed for the next day. The goal is to balance the number of reserves with the number of regular operators who are asked to work overtime.

A key finding from the project is that the current number of assigned reserve drivers is slightly more than is needed for the entire organization. “Operator shortage may occur at only some garages during certain times,” he says, “so one approach is to rebalance reserves more frequently across garages.”

One next step in the work is to cross-check and validate the models with recent data. The team also hopes to develop and evaluate tools that can be used on a daily basis by operations staff to guide decisions on operator assignments for the next day.

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The project was part of an external stakeholder engagement program launched in 2016 by the U of M’s Office of the Vice President for Research. Metro Transit cosponsored the project.

“In a tight, and still tightening, labor market, it is essential that we manage our workforce as efficiently as possible.”

— Brian Lamb, Metro Transit general manager
Access to jobs by transit increases in many U.S. metros.