

# 2020–2022

## Progress Report



# A Valuable Resource in Unprecedented Times

Dear Friends:

To say that 2020–2022 has been unprecedented would be cliché, if it were not true. The TPEC Program also experienced unprecedented change—but, happily, our activities help us navigate these uncertain times and bring new opportunities for understanding.

While we retain our three focus areas—technology, industry clusters and freight, and finance—our work also was shaped by COVID-19. We adjusted our research to look at how these focus areas are adapting in extraordinary times.

The dramatic change to working remotely allowed us to dust off previous work into telecommuting and, more importantly, examine the impacts of that shift—noting how transportation policies may need further adjustment to ensure that our new commuting patterns will work for everyone.

Similarly, the way we supply our domestic manufacturing firms and ship their products has changed as well, in ways we are only beginning to understand. TPEC has been instrumental in initiating conversations illuminating these changes and the resulting opportunities to increase Minnesota’s global competitiveness.

Finally, all these changes—along with the continued maturation of electric vehicles—have implications for how we pay for our transportation system. TPEC’s Transportation Finance Database and resulting research are providing up-to-date information about how to adjust to these changes.

On an organizational note, Lee Munnich, the original director of the Humphrey School’s State and Local Policy Program and lead researcher on TPEC’s industry clusters and freight research, retired from the University of Minnesota. I am pleased to say Lee has joined the TPEC Advisory Board and will continue to offer insight on key issues.

In addition, TPEC welcomed Kyle Shelton, the new director of the Center for Transportation Studies, to our board. He succeeded Laurie McGinnis, who also retired.

Finally, the name of the “home” for TPEC changed as well, as the State and Local Policy Program merged with the Humphrey School’s Institute for Urban and Regional Infrastructure Finance.

We look forward to continued progress toward a “new normal,” and we thank you for your interest and support.

—Frank Douma, TPEC Director

## A Quick Look at TPEC

TPEC focuses on three overarching topics:



**Finance** – maintaining and enhancing a comprehensive transportation finance database for Minnesota and examining finance alternatives and sustainable revenue streams.



**Industry clusters and freight infrastructure** – improving knowledge of the state’s key industries and their supply chains and infrastructure needs.



**Technology** – examining policy issues involving new and emerging technologies such as automated vehicles and telecommuting.

# Technology

*Preparing for new and emerging technologies such as automated vehicles*

## Connected and Automated Vehicles: Equity and Accessibility

As momentum for connected and automated vehicles (CAVs) continues to build in Minnesota, TPEC researchers are working to understand how CAV technology could serve transportation-disadvantaged communities. CAVs offer the potential to provide greater mobility and equity for many people, but public engagement is essential to ensure all user needs are understood and addressed.

### Twin Cities East Metro

In recent work, TPEC researchers focused on communities in the east metro of the Twin Cities, particularly the east side, downtown, and Frogtown areas of St. Paul. Much of the equity-related research conducted in the Twin Cities area centers on Minneapolis, and there is a relative gap in knowledge about the transportation challenges of the east metro.

The research team used a combination of interviews and roundtable discussions to gather a range of stakeholders' perspectives on transportation challenges and CAV technologies. A few ideas stand out as tangible ways CAVs can solve issues:

- Supplementing rather than replacing transit—connecting underserved areas to the broader transit

system and providing first-mile/last-mile options.

- Improving accessibility—supporting multiple languages and meeting visual and audibility needs.
- Contributing to maintenance and delivery services—clearing sidewalks and bus stops with automated snowplows or delivering food and prescriptions.

A key concern for residents is safety, particularly as drivers become less common. Policies may be needed to ensure attendants and caregivers staff CAVs as necessary so those with higher service needs are not left driverless and without assistance.

The researchers concluded that CAVs alone cannot solve systemic inequities, but planners and policymakers can make decisions that avoid the same disparities of past planning decisions. A notable takeaway is that policy needs to take a stronger role in guiding private development to address equity issues as CAV technology develops.

The east metro research builds on earlier TPEC efforts that gathered input from local officials, stakeholders, and community members in Grand Rapids, St. Cloud, Mankato, and Fergus Falls.



## Future Work

Future CAV work by the TPEC team will include partnering on demonstration projects and pilot deployments in 2022 and beyond. These include:

- White Bear Lake: An AV test pilot project will serve low-income, senior, and adult day-care communities.
- Grand Rapids: AV shuttle service will supplement the existing transit service. The pilot will focus on creating more accessible mobility for those with transportation challenges.
- University of Minnesota CAV Ecosystem: This collaborative environment is advancing research, engagement, and workforce development to prepare for broadscale CAV deployment.

*“We are so excited to provide an opportunity that aims to increase the quality of life for our residents. Using autonomous vehicles, we can provide free accessible transportation during the evenings and on weekends. This service will be available along a 12-mile route within Grand Rapids.”*

—Myrna Peterson, Co-Founder, Mobility Mania

## Telecommuting in a COVID World: Impacts and Equity Challenges

Telecommuting became the norm for many people during the COVID-19 pandemic. TPEC researchers are studying telecommuting trends and the impacts on transportation, with a focus on the equity impacts.

Telecommuting is not equally available to everyone. Some jobs—such as those in retail, construction, and hotels—are impossible to do online. These jobs also tend to be the ones held by the 25 percent of the nation’s workforce with the lowest incomes. Telecommuting also varies by gender, race, and educational attainment.

A new normal could have long-term impacts on vehicle-miles traveled, congestion, transit use, finance, and emissions. According to TPEC researchers, strategies may be needed to overcome the impacts on women, minority communities, and those with low incomes. In addition, strategies may be needed to maintain transit services and sustain the pandemic-related environmental benefits achieved by working from home.

### eWorkPlace

eWorkPlace was a state-sponsored, multi-year initiative that helped Twin Cities-area businesses foster teleworking. Several of the resources that were available through eWorkPlace are now housed on the TPEC website:

- Telework toolkit for employers
- Telework benefits
- Employer and employee benefits
- Telework case studies and research
- Presentation materials

The initial goal of eWorkPlace was to promote telecommuting as a way to reduce greenhouse gas emissions and traffic congestion. The pandemic renewed interest in teleworking and made the findings from the initiative even more relevant.



# Industry Clusters and Freight Infrastructure

*Improving knowledge of the state's key industries and their supply chains and infrastructure needs*

## Medical Device Industry Hot Spots and Trucking Times

Minneapolis–Saint Paul International Airport (MSP) plays a vital role for the medical device industry supply chain—which means surface transportation linkages to MSP are also crucial.

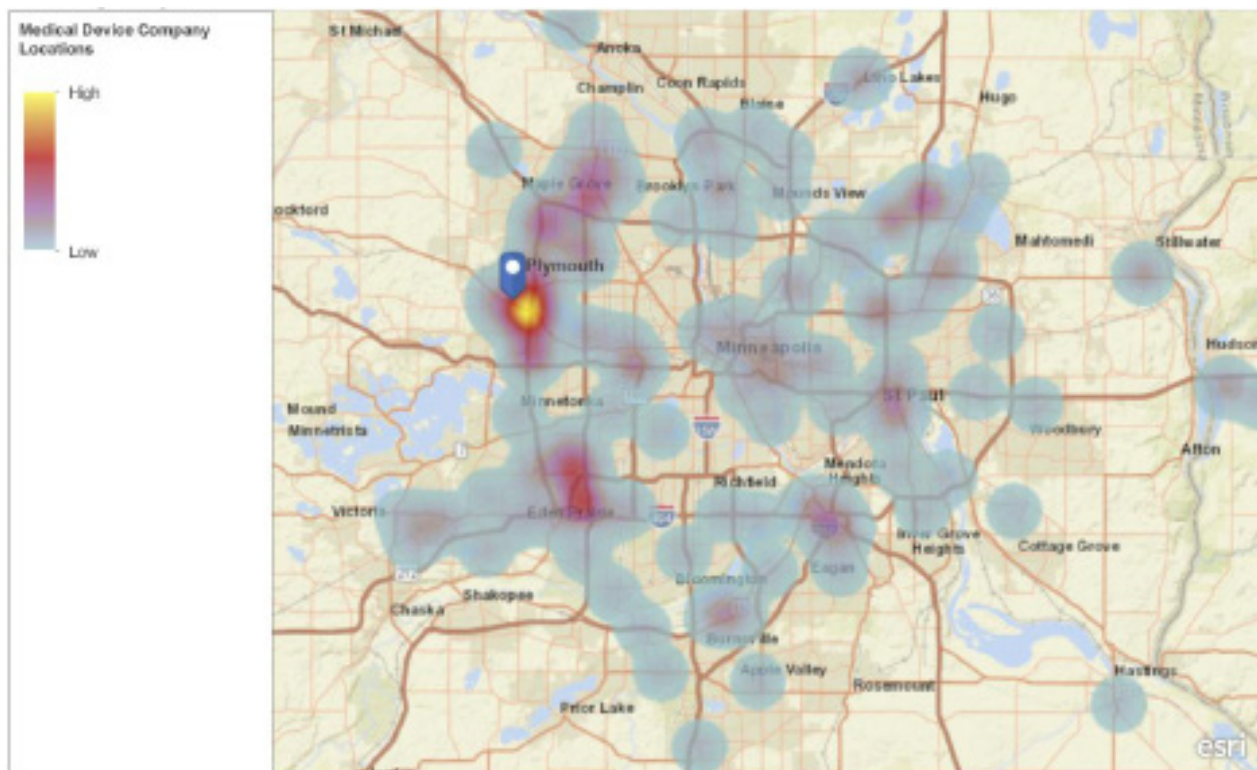
Using geographic information systems (GIS) analysis, TPEC researchers identified medical device industry “hot spots” in the Twin Cities metro and conducted a case study of one of them: the City of Plymouth. They then overlaid hot spots onto maps of major freight corridors and assessed trucking times to MSP for key companies.

Plymouth stands out as a significant hot spot for medical device companies and for production technology companies, which are key suppliers of medical device companies. Two other hot spots are Maplewood (home of 3M headquarters) and Fridley (home to Medtronic).

*“We have the largest industrial park in the state of Minnesota located right on I-494 that allows companies to easily move raw materials onto the interstate system, provides quick access to the airport, and lets employees get to work.”*

— Jeff Wosje, Mayor, City of Plymouth

Hot spots can be especially vulnerable to travel time delays on key freight corridors and can contribute to heavier traffic on them, the researchers say. By identifying hot spots, it may be easier to target transportation investments where they would be most useful for freight routes.



*Plymouth Hot Spot Map – Medical Device Companies, 2020*



## Ensuring Minnesota's Competitiveness: Pandemic-Influenced Infrastructure Priorities

The pandemic is having big impacts on supply chains. The TPEC Program convened state and national experts in an October 2021 forum to discuss the implications for Minnesota's infrastructure and economic competitiveness, with a focus on the state's medical device and health care industries.

In the forum's keynote, Jeff Davidman, Delta vice president of state and local government affairs, shared how the airline's growing cargo business delivered positive revenue during early COVID-related closures. Davidman expects cargo will have a bigger role in the company's future network decisions.

Other forum presenters discussed air cargo needs at MSP; Minnesota's "brand" as a global authority in medicine; the state's freight plan, including infrastructure for electric trucks; and the "bioinnovation" economy—the medical device industry combined with the food and agriculture industries.

Overall, the forum provided two key takeaways:

- COVID-19 pointed out the importance—and weaknesses—of medical supply chains.
- Concerns about the availability of medical devices and other supplies could lead to increased onshoring and altered supply chains—and opportunities for Minnesota to capture some of this business.

A TPEC report incorporates highlights from the forum and recent TPEC research. The report also includes recommendations to address challenges and opportunities stemming from the pandemic.

## Supply Chains: Transportation and Consumer Considerations in the Age of COVID-19

Transportation and supply chains have become a central focus for Minnesota legislators and policymakers. In a January 2022 forum, the Center for Transportation Studies (CTS) and the TPEC Program convened experts to examine the businesses and supply chains that are key to Minnesota's economy, with attention to the ongoing impacts of the COVID-19 pandemic. The forum was organized in response to interest from Representative Frank Hornstein, chair of the Minnesota House Transportation Finance and Policy Committee.

"The [COVID] crisis has really shown how critical transportation infrastructure is in our lives. In the case of vaccine distribution and grocery stores, it was literally keeping people alive," Hornstein said. "Just like everything else in COVID, we saw some areas of weakness that need improvement, and [those are] really what we need to [address] as we move forward in transportation."

Forum participants included representatives from both the private and public sectors as well as the research community. Topics included network resiliency, port backups, the trucker shortage, and pending federal legislation.

In closing remarks, CTS director Kyle Shelton commented on the key themes that emerged throughout the discussion. "The through line is communication and coordination," he said. "Our state leaders can help keep the conversations going between our transporters, manufacturers, and producers."



# Finance

*Examining revenue streams and finance alternatives*



## Transportation Finance Database

The Minnesota Transportation Finance Database provides a comprehensive, objective source of transportation finance information. Created by TPEC researchers, the database serves as a solid foundation for understanding transportation finance issues in Minnesota and for promoting informed decision making.

The database is composed of annual data from various transportation funding sources—at the state, MnDOT district, and local levels—as well as transportation expenditure allocations.

In 2020–2022, TPEC researchers added five new datasets:

- Electric vehicles registered in Minnesota (county level)
- Revenues from local option transportation sales taxes and excise taxes (city level)
- Revenues from municipal vehicle excise taxes (county level)
- State highway and bridge quality (state level)
- Capitalized and maintenance costs (state level)

TPEC researchers also developed data visualization tools, reports and analyses, and other resources building upon the data files. This allows more people to access and easily understand the data.

## Transportation Funding Redistribution

TPEC researchers continued to study how federal and state transportation funding is redistributed in Minnesota. Unlike locally generated taxes, federal and state transportation funding may be collected in one area and redistributed to others.

The most recent study looked at the six-year period between 2015 and 2020. Researchers aggregated or allocated data to the county level for analysis and then presented the aggregated results at the district level for both roadways and transit.

The team found that local governments fund a huge proportion of the transportation infrastructure in Minnesota—primarily through the property taxes they collect—and this share has grown in recent years.

During 2015–2020, federal and state special revenues accounted for about 50.4 percent of total transportation funding in Minnesota, while local efforts accounted for about 49.6 percent. During 2010–2015, local efforts accounted for about 45.5 percent.

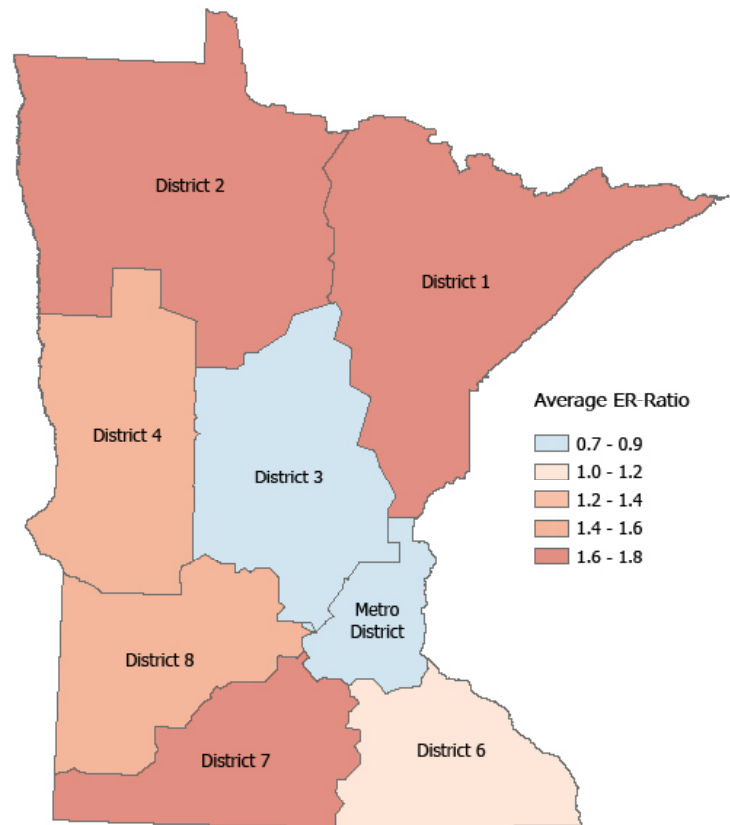
Researchers also found that in 2015–2020, the Twin Cities Metro District contributed more than it received. It contributed about 50 percent of federal and state

transportation revenues and received about 45 percent back in expenditures.

District 3 also received less than it contributed. All other districts received more than they contributed, probably due to much lower population density in these counties.

Finally, the researchers found a cost of 8.7 cents per vehicle-mile traveled in the state. This cost tends to be much higher in counties located in the north.

The team's transit analysis showed that about 55 percent of public transit expenditures in Minnesota came from federal and state special revenues. Fare revenue paid for about 13 percent, while other local efforts covered about 32 percent. Overall, Metro District counties received almost 90 percent of total public transit spending in Minnesota.



*Average expenditure to revenue ratio. If the ratio is higher than 1, it means the district receives more than it contributes.*

*“Being able to receive information from the University about electric and hybrid vehicles gave us the data we needed to respond to the Minnesota legislature, where timelines for providing the information can be quite short.”*

*—Eric Willette, Director of Tax Research, Minnesota Department of Revenue*



### **Related Research: Minnesota Distance-Based User Fee Demonstration**

TPEC researchers evaluated a MnDOT demonstration of distance-based user fees. The 12-month demonstration used existing technologies embedded within shared mobility fleet vehicles to automatically calculate the fees.

Researchers evaluated the demonstration based on its feasibility, efficiency, adequacy, and equity. Work included policy research, financial analysis, and outreach and education efforts. The research was made possible through a federal Surface Transportation System Funding Alternatives grant to MnDOT.

# Engagement

*Sharing knowledge with leaders and stakeholders*

## Legislative Hearings: Future of Post-COVID Transportation

The Minnesota House Transportation Finance and Policy Committee held two informational hearings in January 2021 on the future of transportation in a post-pandemic world. Three TPEC researchers presented during the January 19 hearing on the following topics:

- Telecommuting Impacts of COVID-19: "We need to understand the work-from-home future and try to fully meet the transportation needs of all our users." – Adeel Lari
- Connected and Automated Vehicles: "We should get this technology out in front of the public so that they can understand it's real and that it's going to be viable in ways they might not otherwise expect." – Frank Douma
- Emerging Issues in Transportation Finance: "Implementing a distanced-based user fee won't be like flipping a switch. We will have the gas tax for a long time." – Lee Munnich

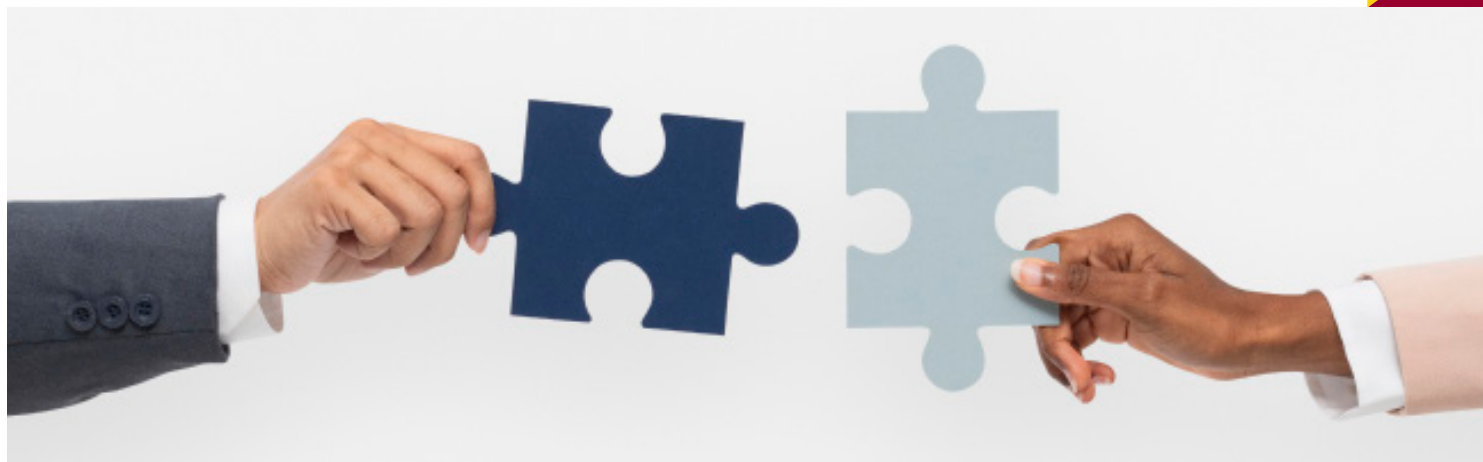
The presentations are available on the House archives site ([houseleg.state.mn.us](https://houseleg.state.mn.us)).

## Participation and Presentations

TPEC researchers lent their expertise through committee memberships and other activities. For example, Frank Douma was named co-chair of the Connectivity and Data Committee of Minnesota's CAV Innovation Alliance. The alliance was established by the Governor's Council on Connected and Automated Vehicles in May 2020 to coordinate statewide CAV-related efforts.

Selected presentations:

- "The Impacts of Vehicle Automation on Transport-Disadvantaged People," 2020 Transportation Research Board (TRB) Annual Meeting (poster).
- "Potential Implications of Connected and Automated Vehicles in Transportation-Disadvantaged Urban Areas," CTS Transportation Research Conference, November 2020.
- "Autonomous Vehicle Policies with Equity Implications: Patterns and Gaps," TRB Conference on Advancing Transportation Equity, September 2021 (poster).
- "Autonomous, Connected and Electrified Mobility Systems: Modeling, Control, and Deployment," CAEV's (and relations) in *Real Life: Ensuring Benefits to Society*, 24th IEEE International Conference on Intelligent Transportation Systems, September, 2021.
- "Remote Work and Transportation: Fad or Future?" CTS webinar, June 2021.



## An Educated Workforce

As part of their work, TPEC researchers guide and mentor graduate students—who then take their degrees and knowledge to the workforce.

Two students who worked closely with TPEC— Kimberly Napoline and Erika Shepard—received the 2021 John S. Adams Student Award from CTS. The award is presented to outstanding University of Minnesota students in the fields of policy and planning. This was the first time the award was given to a team.

Shepard completed a master's degree in urban and regional planning and is now working at the Wisconsin Department of Transportation as a multimodal planner. Napoline completed a dual degree: a master's in public policy and an MBA.

Their TPEC work focused on transportation supply chain policy issues for the medical technology industry cluster in Minnesota. Lee Munnich, retired TPEC researcher and Napoline's advisor, said that their efforts included producing a research paper that was presented at TRB, organizing the Medical Industry Cluster Forum, and arranging interviews with local industry to learn how the pandemic has affected their supply chains.

### Former graduate students:

- Kory Andersen
- William Boulay
- Joanne Cho
- Travis Fried
- Laura Haynssen
- Andrew Ingvalson
- Dan McNiel
- Joseph Mueller
- Ify Onyiah
- Spencer Peck
- Erika Shepard
- Letian Zheng

### Graduate students in 2022:

- Haiyue Jiang
- Kimberly Napoline
- Kribashini Narayana Moorthy
- Maya Sheikh
- Charlie Soh

## Selected Publications

*Local Contributions to State and Regional Transportation Facilities in Minnesota.* MnDOT, 2020.

Revenue Usages, Pricing Schemes, and Media Discussions for Taxing Ridesourcing Services. *Transportation Research Record*, 2020.

Preparing Transit in the Advent of Automated Vehicles: A Focus-Group Study in the Twin Cities. *Findings*, 2020.

*Medical Industry Cluster Forum Report.* TPEC, 2020.

The Impacts of Vehicle Automation on Transport-Disadvantaged People. *Transportation Research Interdisciplinary Perspectives*, 2021.

Assessment of Spatial Location and Air Transport Patterns of Minnesota's Medical Device Industry Cluster. *Journal of Strategic Innovation and Sustainability*, 2021.

Spatial Location and Air Transport Connections: The Case of Minnesota's Medical Device Industry Cluster. *Proceedings of the 54th Hawaii International Conference on System Sciences*, 2021.

*Sustaining Minnesota's Medical Device Industry Cluster: A Vital Role for Multimodal Transportation.* TPEC, 2022.

*Minnesota Transportation Funding Redistribution (2015-2020).* TPEC, 2022.

# People

## Researchers and Staff

TPEC welcomes public engagement and encourages you to contact us with your questions, comments, and research needs.

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## Advisory Board

The TPEC Advisory Board provides input and advice regarding program directions and activities. A key role of this group is to provide insight regarding priority needs for Minnesota and suggestions for how the program might meet them. Membership includes, but is not limited to, the current chairs and ranking members of the legislative transportation committees, other current and former elected officials, prominent research scholars, and high-level managers from both public and private transportation organizations.

## Technical Advisors

Technical guidance is provided by a select group of State of Minnesota and University of Minnesota staff whose work is closely related to the goals of the program. Organizations represented include MnDOT, Minnesota DEED, Metropolitan Council, and CTS. Members of this group, both individually and as a whole, provide advice regarding research approaches, development of outreach activities, and similar technical discussions. Members of this group are asked to serve, and make recommendations for others to serve, on technical advisory groups for specific research activities.

[tpec.umn.edu](http://tpec.umn.edu)

