

# **Identifying the Opportunities and Obstacles of Connected and Automated Vehicles in Rural Minnesota: Community Engagement in Greater Minnesota**

## **Introduction**

Connected and Automated Vehicle (CAV) technologies have advanced toward implementation stages and will eventually arrive on Minnesota roadways. The advent of CAV technology highlights the importance of facilitating policy conversations that will help plan for the uncertainties of these new modes of transportation. Rural communities in Minnesota experience distinct barriers to safe and affordable transit and have the potential to benefit greatly from the advancements of CAV technology. Automated vehicles present new ways of improving transportation safety, increasing accessibility for transportation disadvantaged populations and spurring economic growth. However, without policy intervention and intentional planning, CAV technologies have the undesired potential to perpetuate inequities in Greater Minnesota.

The staggered installation of the electrical grid, telephone lines and broadband internet in Greater Minnesota help to demonstrate the latent inequities that could arise from the implementation CAV technology. In 2019, one in five rural Minnesotan households still lacks access to high-speed wired internet service (Reinan, 2019). There is growing need for elected officials and city staff to initiate advanced planning regarding CAVs while these technologies continue to be developed and tested. Major automakers and tech startups are actively developing unique CAV models that can accommodate a variety of transportation requirements for communities both large and small. However, significant gaps remain in developing vehicle models and revenue streams that support CAV deployment in rural areas.

CAV technology has the potential to advance car sharing transit models, which can be problematic in a rural context. The advantage of a car sharing system is that the costs are spread across a broad base of users. A fleet model is financially viable, in part because users live within a reasonable distance of one another, cutting down the time and space between active trips. In rural areas, users are miles away, rather than blocks apart. Furthermore, rural areas lack the critical mass of people necessary to support the cost of implementation and maintenance. This means that rural areas will likely require the development of different driverless transit models that blend the functions of high speed and low speed public transit. Examining the challenges that rural transit operators currently face in Greater Minnesota can help to guide the development of policy that promotes rural driverless transit. As connected and automated vehicles become more prevalent on Minnesota roadways, the successful implementation of these new technologies depends upon how well CAVs service the specific needs of communities both equitably and economically. In all likelihood, policymakers and public officials will need to intervene to ensure that connected and automated vehicles can benefit all residents throughout Minnesota.

### **Planning for CAVs in Minnesota**

Connected and Automated vehicles offer the potential for safer, smarter and more efficient transportation systems. However, there remains an important need for continued innovation, research and policy development to ensure that CAV technologies improve safety and accessibility. In 2018, Governor Mark Dayton issued an executive order to organize the first CAV Advisory Council. The council was tasked with studying the implications of CAVs in Minnesota and to provide recommendations for changes in law and policy that would help to

ensure CAV adoption maximizes the benefits for all Minnестоans. The first CAV Advisory Council completed its recommendations in December of 2018 and [issued an executive report](#) summarizing their findings. Building upon this work, Governor Walz issued an executive order in the Spring of 2019 to establish a second Council on Connected and Automated Vehicles. This council will be tasked with proposing policies for safely testing and deploying connected and automated vehicles in Minnesota.

At the University of Minnesota, the Transportation Policy and Economic Competitiveness Program (TPEC) has been examining [equity issues and opportunities related to CAV technology](#) since 2014. The TPEC program focuses on conducting research, creating tools for policymakers, and engaging in outreach to better understand the relationship between transportation and economic development in Minnesota. In 2017, researchers Frank Douma, Adeel Lari and Kory Anderson [published an article in the Michigan State Law Review](#) that identified challenges and questions that need to be addressed in order for CAV technology to create a more equitable transportation system. This article identified ways in which CAVs can support transportation disadvantaged populations, identified the necessity for ADA compliant vehicle designs, discussed an array of implementation models and addressed the role that public policy can play in promoting equitable CAV adoption.

In the Spring of 2017, Douma and Lari helped to organize a Self Driving Vehicle (SDV) Task Force in order to identify how various SDV deployment strategies could improve mobility and access for transportation dependent Minnesotans. The task force was a strategic group of local government staff, University researchers and professors, policy experts, local port authority members, State DOT representatives, and social advocates from both the Twin Cities and

Greater Minnesota. This group developed a Matrix of Users designed to identify key transportation issues across Minnesota and examine how existing CAV deployment models could serve the diverse needs of Minnesota residents (See Appendix A). The Matrix of Users is a chart designed to cross-compare geography, barriers to participation, and CAV adoption models that could be implemented in Minnesota. The work of the Task Force highlighted the need for further outreach and engagement with communities in Greater Minnesota in order to better understand considerations for implementing CAVs in rural contexts. The work of the Task Force also demonstrated the importance of engaging with rural communities in order to hear from residents about the perceived opportunities and obstacles that may accompany these emerging technologies.

The Task Force was instrumental in helping TPEC focus its research, and promoted Douma and Lari to organize outreach events with communities in Greater Minnesota related to CAV technologies. The TPEC program has spent the last two years conducting community discussions with municipalities throughout the state to better understand how CAV technologies present opportunities to improve safety, accessibility, and equity in Greater Minnesota. The insights gained from these community discussions can help assist Minnesota lawmakers design future CAV policy that is responsive to the needs of residents.

### **Community Engagement in Greater Minnesota**

The TPEC program partnered with local officials and community organizations in Grand Rapids, St. Cloud, Mankato and Fergus Falls Minnesota to host CAV community discussions. The objectives for these engagement events were to share the work of the SDV Task Force, hear stakeholder's insights regarding opportunities and obstacles of CAV adoption in Greater

Minnesota, as well as to learn about current and forecasted transportation needs in these communities. These community discussions have demonstrated broad excitement about the potential for CAV technology to improve safety, quality of life and economic well-being in communities throughout Minnesota. There were also significant concerns expressed about how to equitably implement CAV technology in Greater Minnesota concurrently with the state's metropolitan areas as well reservations about how these vehicles will perform in Minnesota's harsh winter weather. Overall, these discussions highlighted the importance of considering the distinct needs of rural communities when planning for an approaching CAV transportation network.

The community discussions that TPEC hosted in Greater Minnesota highlighted a diverse array of perspectives regarding these emerging technologies, but also uncovered several key themes that were reiterated at each community engagement event. Stakeholders in Greater Minnesota routinely identified CAV's as an opportunity to improve safety, enable aging in place opportunities and improve accessibility for individuals who are transit dependent. Discussions with residents and local officials also highlighted the challenges of providing rural transit effectively and affordably. These community discussions also revealed the importance of hosting CAV demonstrations and providing ways for residents in Greater Minnesota to have firsthand experiences with these emerging technologies.

### **Key Themes from Greater Minnesota Community Discussions**

#### **Grand Rapids, Minnesota**

The first CAV community discussion took place in Grand Rapids, Minnesota in November of 2017. The TPEC program partnered with the [Blandin Foundation](#) and [Mobility](#)

[Mania](#), a non-profit organization dedicated to identifying and addressing accessibility issues, promoting accessibility awareness and improving accessibility access in Northern Minnesota and beyond. Myrna Peterson, the Co-director of Mobility Mania, was instrumental in organizing this community discussion and has been an important figure in promoting CAVs as a means for improving accessibility in Greater Minnesota. Myrna was the focus of an article in [MPR News](#) that covered the CAV community discussion in Grand Rapids. That article was picked up by the [Associated Press](#) and reprinted nationally. In addition to making national news, the Grand Rapids CAV community discussion was also highlighted in the [Grand Rapids Herald Review](#), which included several interviews with stakeholders who attended the event.

The CAV discussion in Grand Rapids identified improved safety and mobility as the two greatest benefits of connected and automated vehicles. Stakeholders also identified two potential deployment models for CAVs in Grand Rapids, either as a set route along one or two selected corridors in the city or as an after-hours (evenings and weekends) supplement to current transit services. The conversation highlighted the potential for CAVs to improve quality of life for an aging population in Itasca County. Additionally, stakeholders had a meaningful discussion about the impacts that driverless vehicles could have on transportation dependent populations. This conversation highlighted the important need to differentiate the role of a transit driver and that of a personal attendant. The conversation concluded with a shared interest and enthusiasm for bringing CAV technology to Grand Rapids for a demonstration as soon as the technology is available. Appendix B provides a link to meeting minutes and key questions addressed during the community conversation in Grand Rapids, Minnesota.

### **Mankato, Minnesota**

The second CAV community discussion was hosted by the [Region Nine Development Commission](#) and the [Center for Rural Policy and Development](#) in Mankato, Minnesota on April 11th, 2018. The discussion was focused around a series of multiple choice questions that were designed by the hosts to better understand attendees preferences about CAVs. Attendees used clickers to answer questions in real time, and the facilitator paused between responses to answer questions from the audience. Appendix C provides powerpoint slides with the multiple choice questions and attendees responses.

The discussion from this engagement event demonstrated an interest in understanding how CAV implementation could impact infrastructure investments and the freight industry. Attendees also recognized opportunities for CAVs to improve transportation safety. One attendee noted, “Some of the people in this room are working with MnDOT on its Zero Death initiative. In two years, in the United States, more people are killed in vehicular accidents than in the Vietnam War, yet somehow we consider this to be acceptable?” In addition to safety, the conversation centered on opportunities for improved accessibility and more equitable transit opportunities. Attendees discussed the difficulties of providing affordable rural transit, particularly in Blue Earth, Nicollet, and Le Sueur counties. There was discussion about the ways CAVs could improve the quality of life of transit riders, compared to the limited transit services (costs, availability, service area) offer by providers today. Concerns about CAV technology address during the discussion related to the costs of implementation, safety (Uber accident in Arizona), compatibility with Minnesota weather, and the loss of transportation as a leisure activity (i.e motorcycles and convertibles). Appendix D provides links to meeting minutes from the April 11th CAV Community Discussion with the Region 9 Development Commission as

well as an earlier presentation by Adeel Lari on January 10th, 2018.

### **St. Cloud, Minnesota**

The third CAV community discussion was hosted by the St. Cloud Planning Commission. Frank Douma and Adeel Lari presented on the current state of affairs of CAV technology as well as recent events related to CAVs in Minnesota (MnDOT's [Automated Shuttle Bus Pilot Project](#) and the [Governor's Council on CAVs](#)). The planning commission recognized that notable technological changes are quickly approaching and wanted to better understand how to plan for these changes. The discussion in St. Cloud had an economic focus and explored what implications CAVs may have on planning for infrastructure investments. There was an interest in understanding how CAV technology will influence planning for new facilities in the St. Cloud area.

### **Fergus Falls, Minnesota**

The fifth CAV community discussion was hosted by the [West Central Initiative](#) and took place on July 9th, 2018. The West Central Initiative is a community foundation and regional development district responsible for establishing regional economic strategies. Douma and Lari presented an overview of CAV technology to the West Central Initiative's Board of Directors and Economic Development Group. The presentation was preceded by a talk from the State Demographer which explained how Minnesota's older adult population will double between 2010 - 2030. There was significant discussion about the opportunities for CAVs to enable aging in place and maintain community vitality. The Board discussed how accessibility is an ongoing issue in the region and recognized the potential for CAVs to offer new ways to address these challenges. The Board was also interested in understanding the economic opportunities and key



regional benefits that CAV technologies offer. Additionally, the discussion identified concerns regarding job displacement and the importance of distinguishing the multiple roles that transit operators provide as both a driver and personal attendant.

### **Greater Minnesota CAV Workshop (Mankato, Minnesota)**

The final CAV community discussion that the TPEC program hosted in Greater Minnesota was a half day workshop in Mankato, Minnesota on November 11th, 2018. The workshop was an opportunity to bring together representatives from earlier CAV discussions in Grand Rapids, Fergus Falls, St. Cloud and Mankato to share findings from prior public engagement sessions. A goal of the workshop was to offer decision makers input, context, and insight from the community discussions to better inform current and future policy decisions. According to Adeel Lari, "The event was also an opportunity to tell a story about the transportation needs of residents in Greater Minnesota and a chance to highlight the opportunities and obstacles involved in assuring the benefits of CAV technologies help all Minnesotans." The workshop included a CAV presentation from Frank Douma and a guided discussion highlighting a number of themes that were heard during engagement events in Greater Minnesota. Appendix E provides a sample of the guided discussion questions, Appendix F provides a link to a full length video of the Greater Minnesota CAV Workshop, Appendix G shares a link to meeting minutes, key takeaways and list of workshop attendees, and Appendix H shows the powerpoint presentation from the workshop.

Attendees had a robust conversation regarding the opportunities and obstacles of implementing CAVs in Greater Minnesota. There was an appreciation amongst attendees for bringing these questions about CAV technology to Greater Minnesota, and emphasized the

distinct transportation challenges they face in rural areas. Discussing mobility issues, attendees identified opportunities for CAVs to improve equity and accessibility by supplementing existing rural transit and offering more affordable transportation options. Myrna Peterson, Co-director of Mobility Mania, emphasized the importance of sharing personal stories and providing context related to accessibility and the personal struggles residents in Greater Minnesota face to afford rides to weddings, a movie or a visit with family. There is an opportunity for future CAV related work in Greater Minnesota that appeals to emotion and tells a personal story about the impacts CAVs may have on the quality of life of individuals who are transportation dependent. The discussion also identified opportunities for CAVs to help improve opportunities for residents to age in place throughout rural Minnesota. Additionally, immigrant and refugee communities could really benefit if CAVs provide better access to health care, education and employment opportunities.

Attendees highlighted a particular interest in understanding what implications CAVs will have for the freight industry. The discussion identified potential opportunities to improve supply chains, address driver shortages, and help encourage businesses to consider locating in Greater Minnesota. The discussion also identified a shared mobility model, similar to Uber and Lyft, could be a viable business model for CAV implementation in many of the communities TPEC visited. There was significant interest in knowing when this technology will be coming to Minnesota. Workshop attendees noted that it will be important to get CAVs in front of the general public in order to show people that this technology is real and viable in their communities. Options identified during the discussion included a demonstrating a CAV shuttle during community parades or using CAVs as shuttles at the State Fair.

The workshop concluded with a discussion about additional stakeholder groups to engage with while planning for CAV adoption in Greater Minnesota. These stakeholders included tribal governments, bike and pedestrian advocacy groups, agricultural organizations, immigrant and refugee populations, regional development commissions, local news stations and newspaper editors, private sector companies (i.e. 3M, Polaris and others involved in CAV work), health care providers and law enforcement officials. See Appendix E, F, G, and H for additional resources from the Greater Minnesota CAV Workshop.

## **Conclusion**

Rural communities in Minnesota experience distinct barriers to safe and affordable transit and have the potential to benefit greatly from the advancements of CAV technology. Community engagement in Greater Minnesota revealed excitement about the opportunities CAV technology may offer for improving quality of life, accessibility, affordable and consistent transportation options and aging in place opportunities for rural residents. CAV technology has tremendous potential to make motor vehicle transportation safer by eliminating human error, and this advancement alone will likely be the catalyst for ubiquitous CAV adoption in the United States. In addition to safety, there are significant opportunities for policy to help ensure CAVs improve accessibility and quality of life for rural communities throughout the state. The community discussions that TPEC hosted demonstrated the importance of making this technology tangible to residents in Greater Minnesota in order to show that these technologies already exist and would be viable in communities throughout Minnesota.

## Summary of Opportunities and Obstacles Identified During CAV Community

### Engagement in Greater Minnesota.

#### Opportunities for Addressing

- Safety
- Aging in place
- Greater accessibility
- Shared mobility
- Concerns Regarding
  - Weather
  - Equitable Implementation
  - Security
  - Job displacement
  - Personal attendant vs. driver
  - Implementation models in rural areas
  - CAVs interacting with human drivers
  - Land use implications
  - Insurance
  - Emergency Response vehicles

### Helpful CAV Resources

- American Planning Association Report on Connected and Automated Vehicles [APA Report](#)
- The Minnesota Governor's Council on Connected and Automated Vehicles Executive Report [MN Gov. Council report](#)
- University of Minnesota Center for Transportation Studies Report from the Strategic Visioning Workshop for Automated Vehicles in Minnesota [CTS Strategic Visioning](#)
- U.S. Department of Transportation 'Preparing for the Future of Transportation: Automated Vehicles 3.0 Report' [NHTSA](#)

### Works Cited:

Reinan, J. (2019, March 11). Rural Minnesota in a broadband battle: 'We don't want people left behind'. Retrieved May 15, 2019, from

<http://www.startribune.com/broadband-moon-shot-has-rural-minnesotans-hopeful/506958222/>

## Appendix A: SDV Task Force Matrix of Users

User Groups	Geography							
	Central City		Suburban (No Centralized Core)		Isolated Small City (Core/Main street)		Rural (Scattered)	
	Application	Who Organizes?	Application	Who Organizes?	Application	Who Organizes?	Application	Who Organizes?
<b>Financial Barriers</b> (Ex. Affordability of transportation)	High/Low speed transit, <b>shared vehicle model</b>	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b>	For profit, subsidized by state/local	Low speed transit, <b>shared vehicle model</b>	County, regional with subsidy, non-profit	<b>Driverless Rural Transit</b> , Community car/collective ownership	Subsidized by state/local, non-profit
<b>Communication Barriers</b> (Ex. Written health promotion messages with barriers that prevent people with vision impairments from receiving the message, Auditory health messages may be inaccessible to people with hearing impairments)	High/Low speed transit, <b>shared vehicle model</b> , with features that accommodate visual and auditory impairments	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b> , with features that accommodate visual and auditory impairments	For profit, subsidized by state/local	Low speed transit, with features that accommodate visual and auditory impairments	County, regional with subsidy, non-profit	<b>Driverless Rural Transit</b> , Community car/collective ownership, Ownership, with features that accommodate visual and auditory impairments	Subsidized by state/local, non-profit
<b>Physical Barriers</b> (Ex. Steps and curbs that block a person with mobility impairment from entering a building or using a sidewalk)	High/Low speed transit, <b>shared vehicle model</b> , with ramp and drop-off/pick-up features that are aware of surrounding infrastructure accessibility	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b> , with ramp and drop-off/pick-up features that are aware of surrounding infrastructure accessibility	For profit, subsidized by state/local	Low speed transit, with ramp and drop-off/pick-up features that are aware of surrounding infrastructure accessibility	County, regional with subsidy, non-profit	<b>Driverless Rural Transit</b> , Ownership, Community car/collective ownership, with ramp and drop-off/pick-up features that are aware of surrounding infrastructure accessibility	Subsidized by state/local, non-profit
<b>Policy Barriers</b> (Ex. Denying reasonable accommodations to qualified individuals with disabilities, so they can perform the essential functions of the job for which they have applied or have been hired to perform)	High/Low speed transit, <b>shared vehicle model</b> , ADA compliance, the ability to travel anonymously	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b> , ADA compliance, the ability to travel anonymously	For profit, subsidized by state/local	Low speed transit, ADA compliance, the ability to travel anonymously	County, regional with subsidy, non-profit	<b>Driverless Rural Transit</b> , Ownership, Community car/collective ownership, ADA compliance, the ability to travel anonymously	Subsidized by state/local, non-profit
<b>Programmatic Barriers</b> (Ex. Inconvenient scheduling, Provider's attitudes, knowledge, and understanding of people with disabilities)	High/Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	For profit, subsidized by state/local	Low speed transit, vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	County, regional with subsidy, non-profit	<b>Driverless Rural Transit</b> , Ownership, Community car/collective ownership, vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable and expand services i.e after hours rides and more extensive services	Subsidized by state/local, non-profit
<b>Social Barriers</b> (Ex. People with disabilities are far less likely to be employed)	High/Low speed transit, <b>shared vehicle model</b>	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b>	For profit, subsidized by state/local	Low speed transit	County, regional with subsidy, non-profit	<b>Driverless Rural Transit</b> , Ownership, Community car/collective ownership	Subsidized by state/local, non-profit
<b>Transportation Barriers</b> (Ex. Lack of access to accessible or convenient transportation for people who are not able to drive because of vision or cognitive impairment)	High/Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	For profit, subsidized by state/local	Low speed transit, vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	County, regional with subsidy, non-profit	<b>Driverless Rural Transit</b> , Ownership, Community car/collective ownership, vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	Subsidized by state/local, non-profit
<b>Attitudinal Barriers</b> (Ex. People sometimes stereotype those with disabilities, assuming their quality of life is poor or that they are unhealthy because of their impairments)	High/Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	For profit, subsidized by state/local	Low speed transit	County, regional with subsidy, non-profit	<b>Driverless Rural Transit</b> , Ownership, Community car/collective ownership	Subsidized by state/local, non-profit

User Groups	Geography							
	Central City		Suburban (No Centralized Core)		Isolated Small City (Core/Main street)		Rural (Scattered)	
<b>Summarized Solution</b>	High/Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable, with features that accommodate visual and auditory impairments	Federal, State, region, municipality, private (vehicle developer)	Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable, the ability to travel anonymously, with ramp and drop-off/pick-up features that are aware of surrounding infrastructure accessibility, with features that accommodate visual and auditory impairments	For profit, subsidized by state/local	Low speed transit, vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable, the ability to travel anonymously, with ramp and drop-off/pick-up features that are aware of surrounding infrastructure accessibility, with features that accommodate visual and auditory impairments	County, regional with subsidy, non-profit	<b>Driverless Rural Transit</b> , Ownership, Community car/collective ownership, vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable, the ability to travel anonymously, with ramp and drop-off/pick-up features that are aware of surrounding infrastructure accessibility, with features that accommodate visual and auditory impairments	Subsidized by state/local, non-profit

[Link to Matrix of Users and Self Driving Vehicle Task Force Summary](#)

## Appendix B: Grand Rapids CAV Community Discussion Meeting Notes (November, 13<sup>th</sup> 2017)

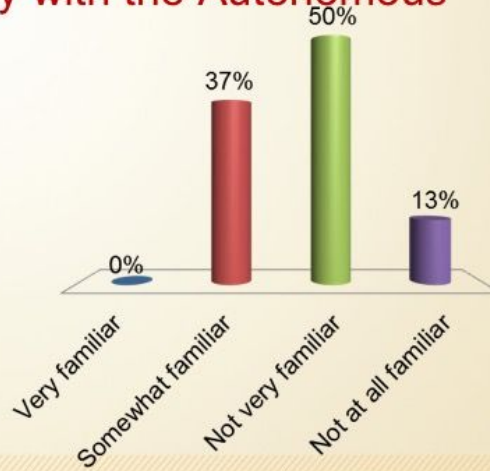
<https://docs.google.com/document/d/1R1WLFFXzr5xRUoAHvHMPf00HUfcBDGdXq64Qog0-EDE/edit?usp=sharing>

## Appendix C: Region 9 Development Commission - Multiple Choice Questions and Results (Monday, February 26th 2018)



## What is your familiarity with the Autonomous Vehicles?

- A. Very familiar
- B. Somewhat familiar
- C. Not very familiar
- D. Not at all familiar

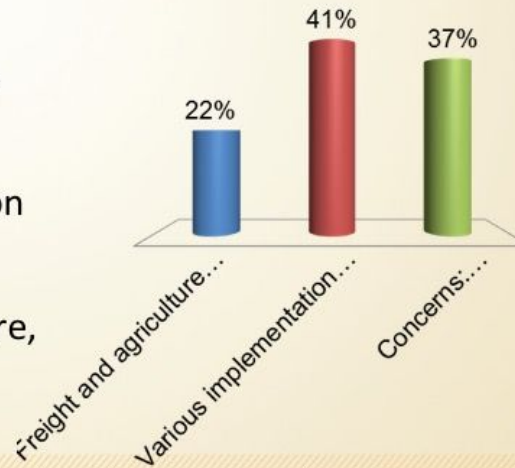




## How does Self-Driving Technology interest you?

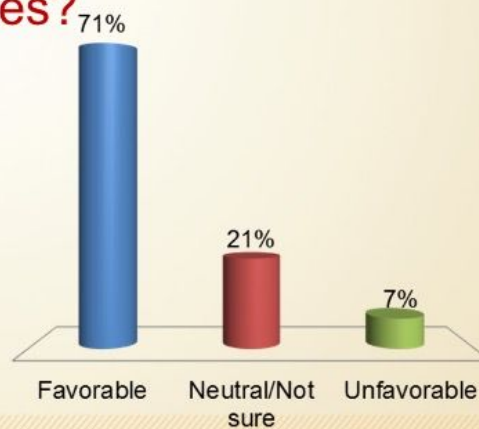
Demographic Data

- A. Freight and agriculture background
- B. Various implementation models
- C. Concerns: infrastructure, cost, or safety



## What is your opinion about Autonomous Vehicles?

- A. Favorable
- B. Neutral/Not sure
- C. Unfavorable

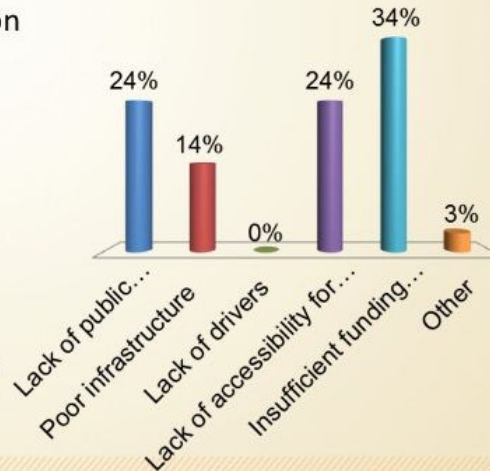


## What is your most pressing transportation problem in the region?



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- A. Lack of public transportation
- B. Poor infrastructure
- C. Lack of drivers
- D. Lack of accessibility for seniors and transit disadvantaged?
- E. Insufficient funding (transit and/or infrastructure)
- F. Other

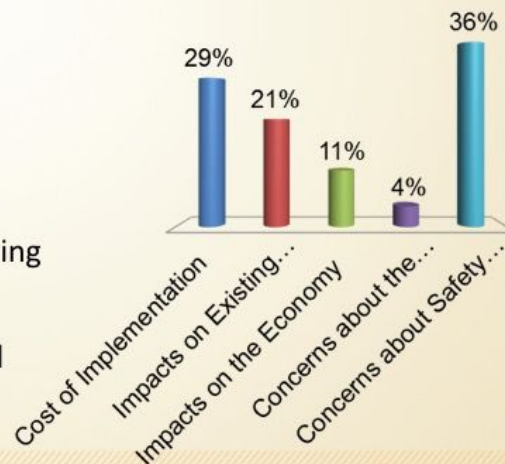


## What is your first concern about Autonomous Vehicles?



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- A. Cost of Implementation
- B. Impacts on Existing Infrastructure
- C. Impacts on the Economy
- D. Concerns about the Emerging Technology
- E. Concerns about Safety and Security Implications

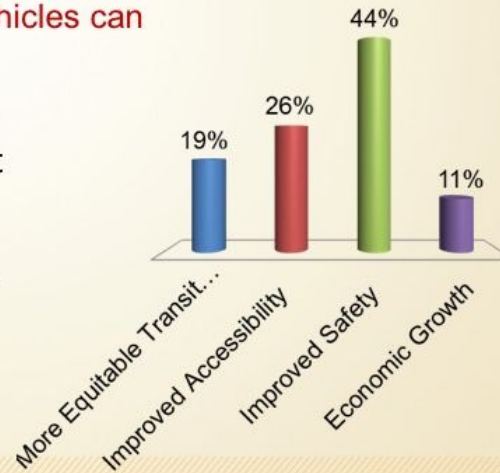






What do you see as the greatest benefit that Autonomous Vehicles can offer to your community?

- A. More Equitable Transit Opportunities
- B. Improved Accessibility
- C. Improved Safety
- D. Economic Growth



**Appendix D: Region 9 Development Commission Meeting Minutes  
(April 11th 2018)**

<https://docs.google.com/document/d/1lp-xoAdx8D2gC2GBcWkLkZQrOQO31ly4xcor5p0zrGE/edit?usp=sharing>

**Adeel Lari Presentation (January 10th, 2018)**

<https://docs.google.com/document/d/1nJnMwIqWD5NsWEQWFWExTLMv3YnJBs9FHm6cjXzQ9Pg/edit?usp=sharing>

**Appendix E: Greater Minnesota CAV Workshop - Guided Discussion  
(November 28th 2018)**

Discussion Guide

11/28/2018

Greater Minnesota - CAV Workshop

1. After our discussion this morning, what are the most important takeaways you have from our presentation?

2. What aspects of AV technology are you most interested in learning more about?
3. What stakeholder groups are affected by AV technology? Who are we missing?
4. What are the key benefits of AV technology and how would they support your constituents?
5. What do you consider to be the most important next step in preparing for AVs? What next questions do you have to move this work forward?
6. What policy challenges need to be addressed to achieve the key benefits of AVs?
7. What operational challenges need to be addressed to achieve key benefits of AVs?
  - a. What about transit opportunities, should this be a priority for AV implementation?
8. What political challenges need to be addressed to achieve the key benefits of AVs?
9. How do we tell the story of AVs in Greater Minnesota? How do we create momentum for that story?
10. Who are the key stakeholders that should be engaged in telling this story?
11. Who should hear our report summarizing TPEC's AV discussions in Greater Minnesota?  
And why?
12. Does this work seem to align with other activities in MN that are addressing AV technology? If yes, please share thoughts on how to coordinate with these activities. If

no, please share your thoughts about how we might better align with other activities in MN?

**Appendix F: Link to Video of the Greater Minnesota CAV Workshop  
November 28th 2018 (Full Video)**

[https://drive.google.com/open?id=1OT\\_-OF6EAQo4DZQIqFuRkcjIDaY](https://drive.google.com/open?id=1OT_-OF6EAQo4DZQIqFuRkcjIDaY)

**Appendix G: Key Takeaways of the Greater Minnesota CAV Workshop**

[https://docs.google.com/document/d/1\\_tSthc1XHUH\\_sWeXIVS0C2DiSku01fvygxO4z4C0Rdk/edit?usp=sharing](https://docs.google.com/document/d/1_tSthc1XHUH_sWeXIVS0C2DiSku01fvygxO4z4C0Rdk/edit?usp=sharing)

**Appendix H: Powerpoint Presentation Greater Minnesota CAV Workshop  
(November 28th 2018)**



Frank Douma, Adeel Lari, Daniel McNiel  
State and Local Policy Program



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UNIVERSITY OF MINNESOTA



## What is TPEC?

→ Transportation Policy and Economic Competitiveness Program (TPEC) is a research program within...

- The Humphrey School of Public Affairs
- The State and Local Policy Program
- The Center for Transportation Studies

→ TPEC Research focuses on...

- ◆ Finance
- ◆ Industry Clusters and Freight
- ◆ Technology





## What Does Our Work Look Like?

- TPEC aims to conduct research, create tools for policymakers, and engage in outreach to increase understanding of the relationships between transportation and economic development.

- Resources for policy makers include:

- Minnesota Transportation Finance database

- National Freight Economy Atlas

- SDV Task Force & Usability Matrix





## How Can Communities Effectively Prepare for SDV Technologies?

### Rural / Small Towns?

- Greater efficiency in low density?
- Last mile complement to existing service?
- Age in place?
- Exactly who benefits?





## SAFETY FIRST

### United States

40,100 traffic fatalities in USA in 2015

### Worldwide

1.25 Million Deaths in 2013

50+ million Injuries

65+ Million Deaths in 20<sup>th</sup> Century

Approximately WWII casualties

Economic Cost > \$500 Billion/year

**90% percent of accidents caused by driver's error**





## Recent Developments in Minnesota

- In 2017, MnDOT partnered with Easy Mile to test an automated shuttle bus in winter weather conditions at the MnROAD facility. Held public demonstrations around MN.
- March 5th, 2018 Gov. Mark Dayton signed Executive Order 18-04 to establish a Governor's advisory council on connected and automated vehicles.







## Recent Developments in MN Cont'd

- Gov. Council will be wrapping up their work and issuing a report soon.
- Polaris displayed its AV GEM Nov. 27th for Gov. Council
- In June, CTS hosted a Strategic Visioning Workshop for Automated Vehicles in MN. Summary report was recently published.

Advisory Council Subcommittees and Policy Areas





## Recent Developments Nationally

- USDOT released A.V 3.0 in October
- Uber Vehicle killed a cyclist in Tempe, Arizona (3/2018)
- **WAYMO (GOOGLE)**
  - Clear leader with more than 600 vehicles in demonstration
  - SDV has driven more than 6 million miles in 25 cities in California, Washington, Texas, Arizona etc.
  - Lowest rate of disengagement
  - Taxi demonstration in Phoenix suburb with plan to launch fully driverless commercial taxi service in Arizona later this year



## The SDV Task Force & The Usability Matrix

- Convened to examine potential impacts of SDV technology on “transportation disadvantaged” populations in MN
  - Strategic group of elected officials, policy experts, social advocates, MnDOT and more
  - Identified disparities in SDV technology and helped facilitate outreach in Greater Minnesota
- A tool developed by the SDV Task Force
  - A table to analyze current and needed SDV deployment models
  - SDV Task Force identified
    - A need for outreach with Greater Minnesota
    - What SDV models can serve rural and suburban transit needs?

# TPEC TRANSPORTATION POLICY AND ECONOMIC COMPETITIVENESS

<b>Home</b>	<b>Research ▾</b>	<b>Researchers</b>	<b>Publications</b>	<b>Events</b>	<b>About ▾</b>
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TPEC researchers have convened a task force to examine the potential impacts of self-driving vehicles on a wide variety of people who are "transportation disadvantaged." The task force will seek to identify strategies that ensure seniors, the disabled, and other disadvantaged communities fully enjoy the mobility offered by SDVs. It is made up of representatives from the Minnesota Department of Transportation, Metro Mobility, metro-area counties, non-profits, and organizations from Greater Minnesota.

## Completed research

- Self-Driving Vehicles Task Force Report and Matrix of Users (PDF), 2017
- Self-Driving Vehicles: Current Status of Autonomous Vehicle Development and Minnesota Policy Implications, *Minnesota Journal of Law, Science & Technology*, 2015
- Self-driving cars: As revolutionary in the 21st century for public health as vaccines were in the 20th, University of Minnesota School of Public Health Ignite! Symposium video, Feb. 2016
- Options for Automated Speed Enforcement Pilot Projects in Minnesota Work and School Zones, May 2014, Report no. CTS 14-06
- Understanding the Economic Effects of Flexibility through Three Employer Case Studies, February 2013, Report no. MnDOT 2013-07
- Investigating Deployment Potential for Automated Speed Enforcement in Minnesota (2012)
- Minnesota Field Test of Crash-Help (2012)
- Identifying Issues Related to Deployment of Automated Speed Enforcement - FY12 TechPlan (2011)
- ITS Data Needs: How Much Do We Really Need to Know? - FY11 TechPlan (2011)
- ITS and Locational Privacy: Suggestions for Peaceful Coexistence - FY10 TechPlan (2009)

User Groups	Geography							
	Central City		Suburban (No Centralized Core)		Isolated Small City (Core/Main street)		Rural (Scattered)	
	Application	Who Organizes?	Application	Who Organizes?	Application	Who Organizes?	Application	Who Organizes?
<b>Financial Barriers</b> (Ex. Affordability of transportation)	High/Low speed transit, <b>shared vehicle model</b>	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b>	For profit, subsidized by state/local	Low speed transit, <b>shared vehicle model</b>	County, regional with subsidy, non-profit	<b>Diverless Rural Transit</b> , Community car/collective ownership	Subsidized by state/local, non-profit
<b>Communication Barriers</b> (Ex. Written health promotion messages with barriers that prevent people with vision impairments from receiving the message. Auditory health messages may be inaccessible to people with hearing impairments).	High/Low speed transit, <b>shared vehicle model</b> , with features that accommodate visual and auditory impairments	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b> , with features that accommodate visual and auditory impairments	For profit, subsidized by state/local	Low speed transit, with features that accommodate visual and auditory impairments	County, regional with subsidy, non-profit	<b>Diverless Rural Transit</b> , Community car/collective ownership, Ownership, with features that accommodate visual and auditory impairments	Subsidized by state/local, non-profit
<b>Physical Barriers</b> (Ex. Steps and curbs that block a person with mobility impairment from entering a building or using a sidewalk).	High/Low speed transit, <b>shared vehicle model</b> , with ramp and drop-off/pick-up features that are aware of surrounding infrastructure accessibility	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b> , with ramp and drop-off/pick-up features that are aware of surrounding infrastructure accessibility	For profit, subsidized by state/local	Low speed transit, with ramp and drop-off/pick-up features that are aware of surrounding infrastructure accessibility	County, regional with subsidy, non-profit	<b>Diverless Rural Transit</b> , Ownership, Community car/collective ownership, with ramp and drop-off/pick-up features that are aware of surrounding infrastructure accessibility	Subsidized by state/local, non-profit
<b>Policy Barriers</b> (Ex. Denying reasonable accommodations to qualified individuals with disabilities, so they can perform the essential functions of the job for which they have applied or have been hired to perform).	High/Low speed transit, <b>shared vehicle model</b> , ADA compliance, the ability to travel anonymously	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b> , ADA compliance, the ability to travel anonymously	For profit, subsidized by state/local	Low speed transit, ADA compliance, the ability to travel anonymously	County, regional with subsidy, non-profit	<b>Diverless Rural Transit</b> , Ownership, Community car/collective ownership, ADA compliance, the ability to travel anonymously	Subsidized by state/local, non-profit
<b>Programmatic Barriers</b> (Ex. Inconvenient scheduling, Provider's attitudes, knowledge, and understanding of people with disabilities).	High/Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	For profit, subsidized by state/local	Low speed transit, vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	County, regional with subsidy, non-profit	<b>Diverless Rural Transit</b> , Ownership, Community car/collective ownership, vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable and expand services i.e after hours rides and more extensive services	Subsidized by state/local, non-profit
<b>Social Barriers</b> (Ex. People with disabilities are far less likely to be employed)	High/Low speed transit, <b>shared vehicle model</b>	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b>	For profit, subsidized by state/local	Low speed transit	County, regional with subsidy, non-profit	<b>Diverless Rural Transit</b> , Ownership, Community car/collective ownership	Subsidized by state/local, non-profit
<b>Transportation Barriers</b> (Ex. Lack of access to accessible or convenient transportation for people who are not able to drive because of vision or cognitive impairment)	High/Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	For profit, subsidized by state/local	Low speed transit, vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	County, regional with subsidy, non-profit	<b>Diverless Rural Transit</b> , Ownership, Community car/collective ownership, vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	Subsidized by state/local, non-profit
<b>Attitudinal Barriers</b> (Ex. People sometimes stereotype those with disabilities, assuming their quality of life is poor or that they are unhealthy because of their impairments)	High/Low speed transit, <b>shared vehicle model</b> , vehicle requirements that mandate ADA accessibility ensuring on demand services are equitable	Federal, State, region, municipality, for profit	Low speed transit, <b>shared vehicle model</b>	For profit, subsidized by state/local	Low speed transit	County, regional with subsidy, non-profit	<b>Diverless Rural Transit</b> , Ownership, Community car/collective ownership	Subsidized by state/local, non-profit



## Grand Rapids

- Safety and improved mobility are greatest benefits of AV technology offer Grand Rapids.
- Two potential deployment models
  - Set route along one or two selected corridors in the city
  - Or as an after-hours (evenings and weekends) supplement to current transit service
- Above all, shared interest and enthusiasm for bringing AV technology to Grand Rapids as soon as it's ready.





https://www.hhh.umn.edu/news/self-driving-vehicles-horizon-humphrey-school-works-ensure-theyre-accessible-all

News & Events • Self-Driving Vehicles on the Horizon; Humphrey School Works to Ensure They're Accessible to All

## HUMPHREY SCHOOL NEWS

URBAN  
PLANNING

# Self-Driving Vehicles on the Horizon; Humphrey School Works to Ensure They're Accessible to All

October 18, 2017—When Myrna Peterson wants to visit downtown Grand Rapids, Minnesota, from her home two miles outside the city limits, she uses the most convenient vehicle she has: her motorized wheelchair. Peterson, who has been in a wheelchair since she was seriously injured in a 1995 car accident, has few other options to get around town.

"I used to run marathons, and I can roll a 10-minute mile," Peterson says. "It's about five miles from one end of town to the other. My chair goes 11 to 12 miles on one charge, but some days I run out of juice."





## St. Cloud

- St. Cloud Planning Commission recognized that some big technological changes are quickly approaching and wanted to better understand how to plan for these changes.
- CAV discussion in St. Cloud had an economic focus. Explored the implications AVs may have on planning for new facilities and investment.



**ST.CLOUD**  
PLANNING  
COMMISSION





## Fergus Falls

- Recognized opportunities for AVs to advance aging in place. MN's older adult (65+) population will double between 2010 - 2030.
- Accessibility is an ongoing issue in the region and AVs offer new ways to address this challenge.
- Identified concerns about job displacement and the important roles that transit drivers provide as attendants.
- Interested in understanding economic opportunities and key benefits of AV technology.



## Mankato

- Interest in understanding
  - AV implementation and impacts on infrastructure investments.
  - Impacts AVs may have on the freight industry.
- Recognized opportunities for improved transportation safety.
- Also saw opportunities for improved accessibility and more equitable transit opportunities.
- Concerns about AV technology were related to costs, safety and security implications as well as compatibility with Minnesota winter.



Center for Rural Policy  
and Development

## What We've Heard



HUMPHREY SCHOOL  
OF PUBLIC AFFAIRS  
UNIVERSITY OF MINNESOTA

### Opportunities for Addressing

- Safety
- Aging in place
- Greater accessibility
- Shared mobility
- Energy
- Climate change

### Concerns Regarding

- Weather
- Security
- Job displacement
- Personal attendant
- Implementation models
- Interaction w/ human driver
- Land use
- Insurance
- Emergency Response

What are other key benefits and challenges relating to AV's in GR-MN?



# Thank you

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