AMPO National Framework for Regional Vehicle Connectivity and Automation Planning

Bill Keyrouze and Rachel Roper, AMPO

Tom Bamonte, North Central Texas Council of Governments

Eric Hill, MetroPlan Orlando

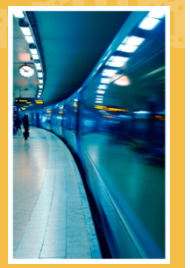
April 25, 2019
2:00-3:30pm Eastern time

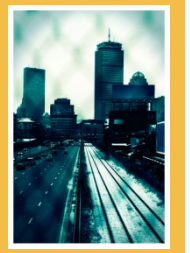
AMPO's Technical Working Groups

AMPO is a nonprofit, membership organization established in 1994 to serve the needs and interests of Metropolitan Planning Organizations (MPOs). We offer our member MPOs technical assistance and training, conferences and workshops, legislative and rulemaking updates, newsletters and communications, research, a forum for transportation policy development and coalition building, and a variety of other services.

AMPO facilitates several long-standing technical working groups focused on transportation planning topic areas that are required or of interest to MPOs.

- Air Quality
- **Vehicle Connectivity and Automation**
- Performance-based Planning & Programming
- Travel Modeling
- GIS
- Public Involvement





Vehicle Connectivity and Automation Working Group Background

Working Group Composition

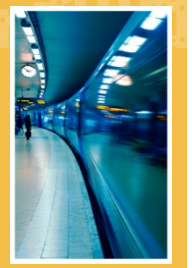
- 15-20 core members from diverse backgrounds, MPO-size, and geography

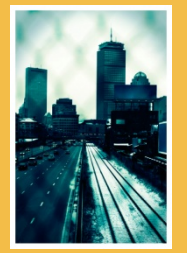
Working Group Objectives

- Build technical, institutional, and policy capacity
- Leverage the benefits of deployment
- Address knowledge gaps
- Support the U.S. DOT's efforts

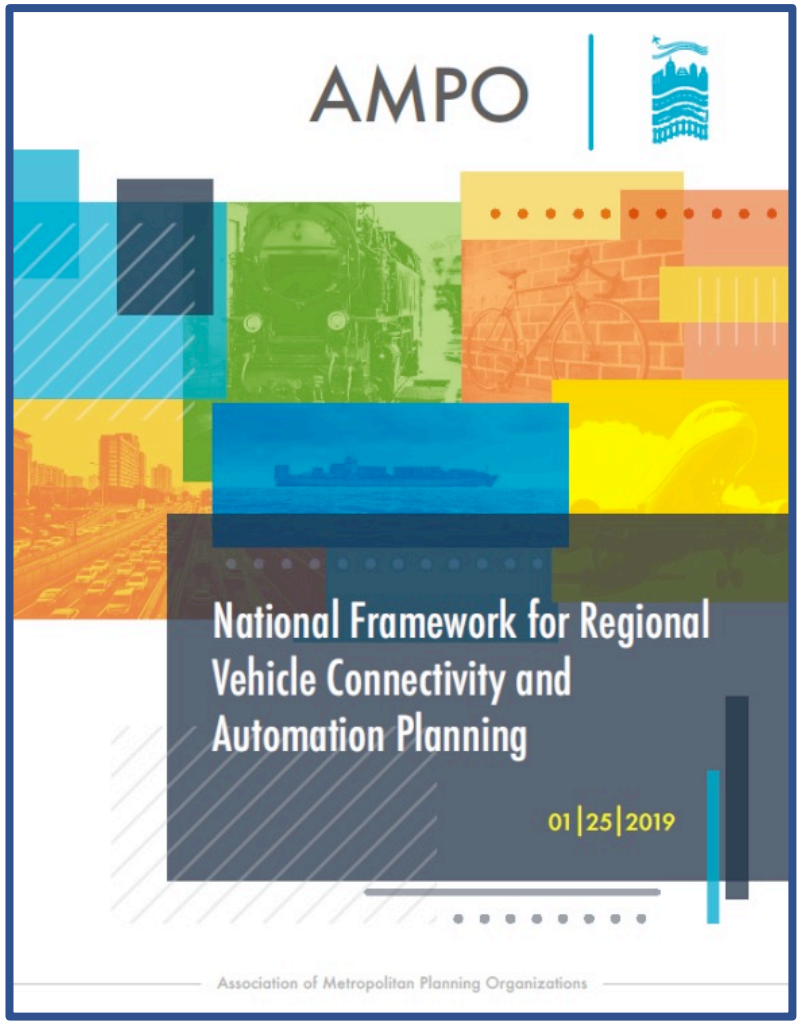
Working Group Activities and Products

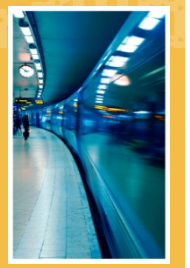
- Four meetings between 2017 – 2018 documented by a whitepaper
- National Framework for Regional Vehicle Connectivity and Automation Planning (Framework)
- Symposium in Denver, CO on November 14-15, 2018
  - Refine the Framework and identify next steps/items for potential further exploration

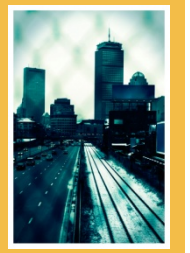




National Framework for Regional Vehicle Connectivity and Automation Planning





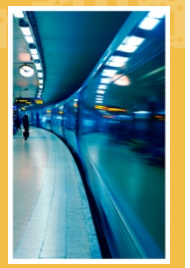


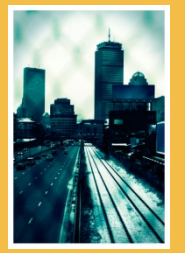
www.ampo.org

Purpose

Provide a framework and tool as MPOs:

- Incorporate vehicle connectivity and automation into their metropolitan transportation planning process and work to guide its deployment to help meet regional transportation needs and goals.
- Explore the potential impacts of vehicle connectivity and automation and their implications for the transportation system, its users, and the concept of mobility

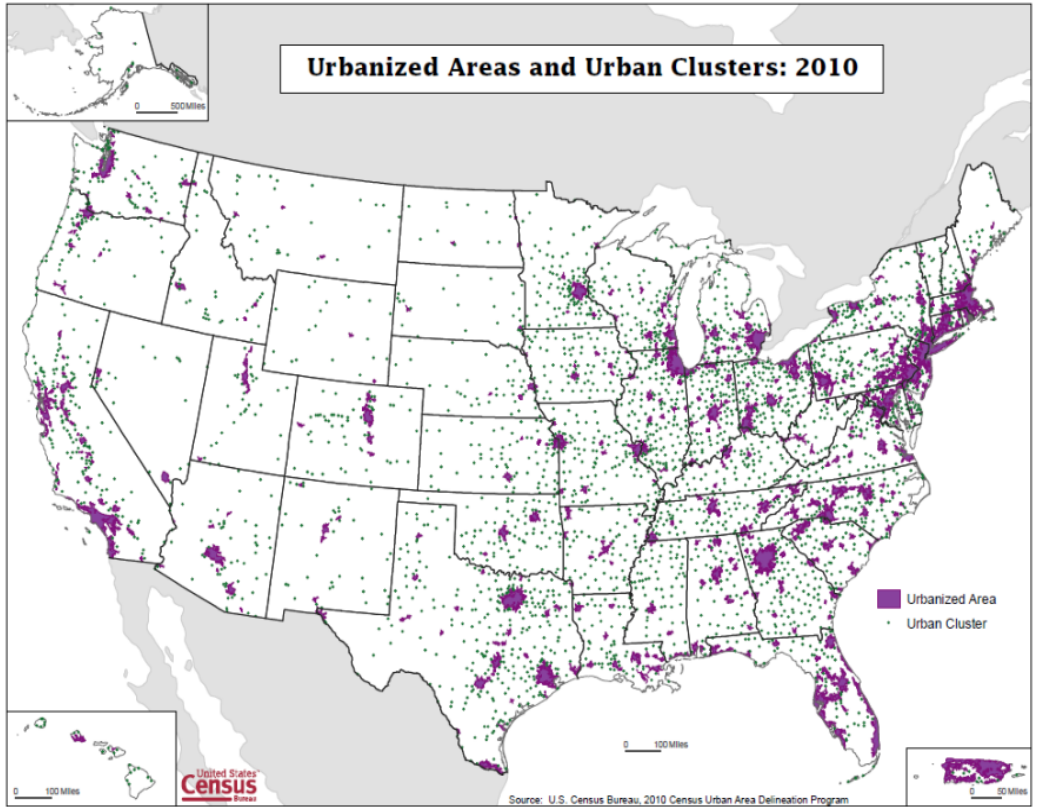




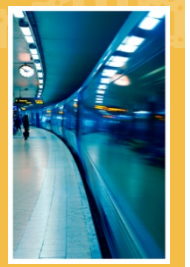
Importance of the MPO

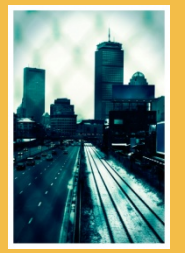
Importance of the MPO:

- 80.7% of the U.S. population is urban
- ~90% of the U.S. GDP is generated within metropolitan areas
- Shape the transportation system
- Maintain safety and equity
- Move people and goods regardless of mode choice
- Build relationships
- Guide how emerging technology can help meet regional transportation needs and goals



United States Census Bureau Urbanized Areas and Urban Clusters 2019

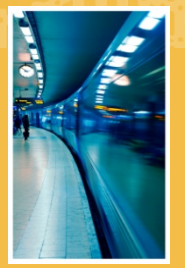


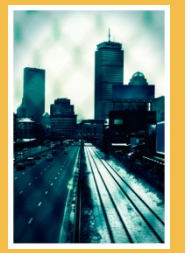


Vehicle Connectivity and Automation Impact Areas

Vehicle Connectivity and Automation Impact Areas:

- Safety and security
- Operations
- Mobility and mode choice
- Freight
- Transportation demand
- Infrastructure design and capacity
- Funding and financing
- New transportation service markets
- Equity
- Data collection and analysis, housing, availability, and affordability
- Public acceptance
- Land use
- Air quality conformity
- Policy Engagement and Coordination
- Employment

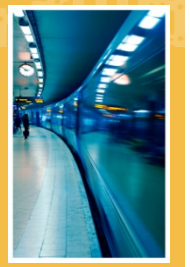


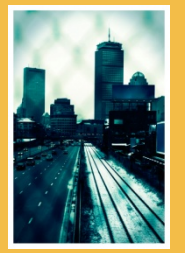


Impact Area	Benefits/Opportunities	Challenges/Risks	Considerations for the Transportation Planning Process
Safety	• Improved safety by reducing driver error and connecting vehicles to other vehicles, infrastructure and road users. In the long term, there is potential for significant reductions in fatal crashes, approaching zero fatalities. • More stakeholder acceptance of vehicle connectivity and automation as crash and fatality rates for highway transportation come in alignment with the rates for other transportation modes • Improved communications systems accelerate emergency response	• Safety in a mixed fleet environment during early deployment stages • Vehicle connectivity and automation used to "game" the system and enhance personal advantage at the expense of public safety or efficient system operation • Users develop a false sense of security at lower levels of automation • Stakeholder acceptance of fatalities and serious injuries in crashes where the cause is not human error or mechanical failure • Liability of fatalities and serious injuries in crashes where the cause is not human error or mechanical failure • Protection of privacy interests	• Impact on performance management and target setting
Security	• Improved communication among vehicles, infrastructure, and travelers could enhance security	• Vehicle connectivity and automation used for illicit purposes • Security breaches in vehicles and infrastructure systems could disrupt the transportation system	• MPO role in cybersecurity when funding technology projects
Operations	• Increased capacity and reduced congestion due to vehicles operating with fewer incidents, reduced headways, and narrower lane widths • Rich source of sensor data useful for improved operations and capital investment planning • "Surge" pricing associated with shared fleets of connected and/or automated delivers benefits associated with congestion pricing • Allowing in-vehicle activities other than driving—reduces costs associated with travel time delays	• Highway capacity projects being planned or implemented today not cost effective or relevant as vehicle connectivity and automation is more fully deployed • Cost of infrastructure and operational improvements necessary to support vehicle connectivity and automation • Empty vehicles could cause net increase in traffic and vehicle miles traveled	• Implications for the existing congestion management process • Impact on performance management and target setting

Recommendations

- **Engagement, Coordination, and Collaboration**
- **Policies and Investment Decisions**
- **Other Planning Products and Processes**
- **Institutional Readiness**
    - *Resources*

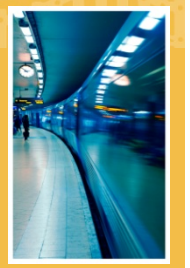


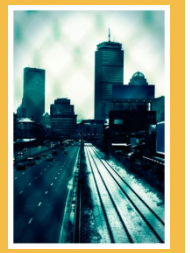


Recommendations

Engagement, Coordination, and Collaboration

- Advise policy and decision makers
- Build partnerships
- Inform and share information regarding the current reality of vehicle connectivity and automation deployment
- Develop a vision and goals for the desired future of transportation
- Discuss how vehicle connectivity and automation can help meet regional transportation needs and goals
- Include equity in communications
    - *Fact Sheet*
    - *Resource Packet*
    - *Impact Areas Table*





FACT SHEET

What is vehicle connectivity and automation and what does it mean for transportation?

Connected vehicles are connected through interoperable wireless communications to other vehicles, transportation infrastructure, and transportation system users.

Automated vehicles use on-board and remote hardware and software to perform driving functions. The National Highway Traffic Safety Administration (NHTSA) has adopted the Society of Automotive Engineers (SAE) Automation Levels.

While there are vehicles in the current fleet with elements of both connectivity and automation, there is still considerable uncertainty in how exactly full scale deployment will play out. Although this makes it difficult to predict its impacts with certainty, transportation agencies are exploring what it means for the transportation system and its users.

Vehicle connectivity and automation has the potential to greatly benefit the transportation system and its users. However, transportation agencies are closely monitoring this technology to ensure its deployment occurs with minimal disruptions and negative impacts to the transportation system and its users.

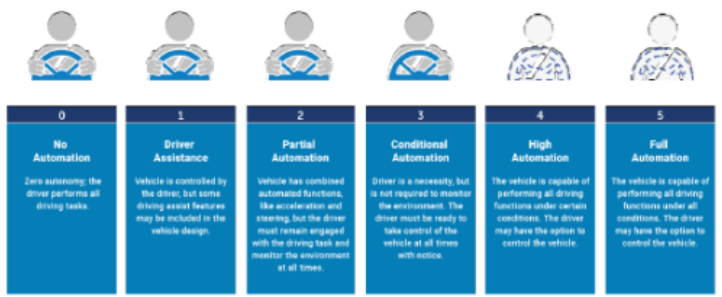
Example Elements of Vehicle Connectivity and Advanced Driver Assistance/Partial Automation

Vehicle Connectivity	Advanced Driver Assistance/Partial Automation
Vehicle to infrastructure (V2I) Information exchange between vehicles and highway infrastructure to provide applications such as red light and stop sign violation warnings. **Vehicle to vehicle (V2V)** Information exchange between vehicles to provide applications such as forward collision warning and left turn assist. **Vehicle to people (V2P)** Information exchange between highway infrastructure, vehicles, pedestrians, and bicyclists to, for example, provide collision alerts to pedestrians, bicyclists, and drivers.	• Adaptive Cruise Control • Automatic Emergency Braking • Blind Spot Detection • Electronic Stability Control • Forward Collision Warning • Lane Departure Warning • Lane Keeping Assist • Rearview Video Systems • Self-park • Traffic Jam Assist • Rear Cross Traffic Alert

Potential Opportunities and Challenges as Vehicle Connectivity and Automation is Deployed

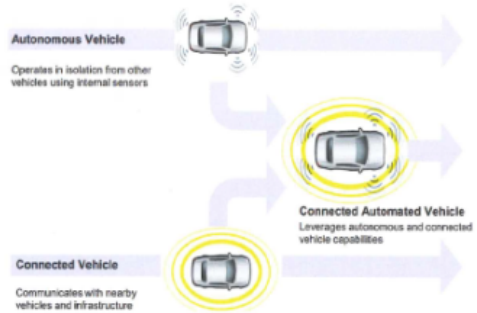
Opportunities	Challenges
• Improved safety due to reduced user error • Increased capacity, reduced congestion, and fewer high capacity improvements due to the potential to operate with fewer incidents, decreased following distances, and narrower lane widths • Improved first and last mile connections with transit • With appropriate design, moderated or decreased growth in vehicle miles traveled and increased ridesharing, public transportation use, bicycling, and walking • New funding and financing mechanisms and the potential to leverage private sector funds • Expanded mobility for those currently unable to drive • Increased efficiency for freight movement through improved efficiency and applications such as freight platooning • Additional data source • Potential to retrofit the built environment and provide more complete streets — for example to repurpose parking	• Safety in a mixed fleet environment during early deployment • Security from vulnerabilities and intrusions to connected elements • Increased vehicle miles traveled due to improved traffic flow, additional mobility options, and zero occupancy vehicles • Decrease in public transportation use due to the alternative mode options • Impacts to current funding and financing mechanisms as individual ownership could transition to shared fleets or on demand services • Cost of infrastructure required to support the new technology • Potential for deployment to disadvantage some transportation system users or impact vulnerable road users • Induce sprawl or encouraging "super-commutes" • Certain transportation investments may become obsolete

Society of Automative Engineers (SAE) Automation Levels



Source: SAE

Vehicle Connectivity and Automation

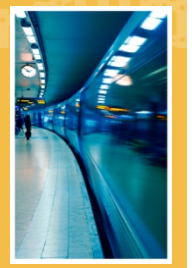


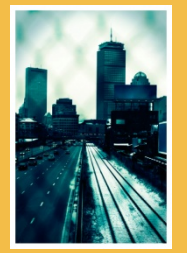
Source: NHTSA

Recommendations

Policies and Investment Decisions

- Support deployment scenarios that help meet the vision, goals, and needs of the transportation system
- Support an environment that fosters innovation
- Discuss vehicle connectivity and automation in the metropolitan transportation plan
- Ensure investment decisions support the current and future transportation system
- Encourage strategies that will minimize or mitigate potential increases in VMT
- Support data sharing and explore opportunities for using vehicle connectivity and automation as an additional data source





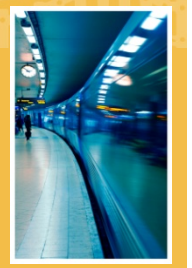
    - *Shared Use Mobility, Transportation Technology, and Intercity Transit Services, FTA 6/2018*
    - *Impact Areas Worksheet*

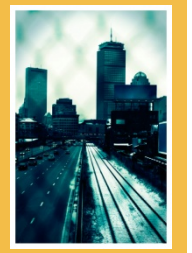
Impact Area	Issue	Opportunity/ benefit challenge/risk	Likelihood within 10 years	Likelihood beyond 10 years	Alignment with regional needs, vision, goals, and objectives	Conflicts with regional needs, vision, goals, and objectives	Drivers, triggers, or levers	Potential MPO actions	Potential partner actions	Resources Needed	Plausible Alternate Scenarios?
EQUITY	Shared vehicles could give disadvantaged populations access to highway speed travel at lower cost than private vehicle ownership	■ Opportunity/ benefit ☐ Challenge/risk	☐ Low ☐ Medium ☐ High ☐ Unknown ☐ N/A	☐ Low ☐ Medium ☐ High ☐ Unknown ☐ N/A							
	Improved mobility for persons now with limited access to vehicular travel	■ Opportunity/ benefit ☐ Challenge/risk	☐ Low ☐ Medium ☐ High ☐ Unknown ☐ N/A	☐ Low ☐ Medium ☐ High ☐ Unknown ☐ N/A							
	Vulnerable road users benefit from safety improvements built into vehicle connectivity and automation	■ Opportunity/ benefit ☐ Challenge/risk	☐ Low ☐ Medium ☐ High ☐ Unknown ☐ N/A	☐ Low ☐ Medium ☐ High ☐ Unknown ☐ N/A							

Recommendations

Other Planning Products and Processes

- Use modeling and scenario planning to explore future unknowns
- Be aware of the different dimensions of readiness: vehicle systems technology, supportive infrastructure, responsive institutions, and community acceptance
- Identify drivers, levers, triggers, and tipping points of scenarios
- Be aware of the potential for vehicle connectivity and automation to support performance measures, target setting, and national goals
- Explore the potential for vehicle connectivity and automation to impact air quality and transportation conformity
- Identify new data sets that are critical to inform decisions in the transportation planning process





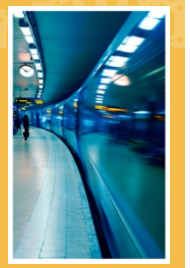
    - *Transportation Scenario Planning for Connected and Automated Vehicles (FHWA) – coming soon*

Recommendations

Institutional Readiness

- Identify needs for expanding staff skills sets or restructuring program areas
- When possible, provide training or participation in regional, state, or national dialogues
- Encourage staff to monitor the status
- Ensure staff are aware of how vehicle connectivity and automation technology impacts their program areas

  - *Resource Packet*
  - *Impact Areas Table*
  - *Sample AV Statewide Procurement Language*



University Affiliated

- **Texas A&M Transportation Institute (TTI)**

  TTI "develops solutions to the problems and challenges facing all modes of transportation. The Institute conducts over 700 research projects annually with over 200 sponsors at all levels of government and the private sector."

  - Relevance: Connected Transportation is one of TTI's focus areas. They have several connected transportation facilities including their Campus Transportation Technology Initiative, Connected Infrastructure Lab, Connected Vehicle Assessment Simulation Test Bed, Connected Work Zone, Proving Grounds Research Facility, Texas AV Proving Ground Partnership, and Transit, Bicycle and Pedestrian Safety Test Bed.
  - https://tti.tamu.edu/research-focus-areas/connected-transportation/
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- **University of Maryland Center for Advanced Transportation Technology Laboratory (CATT Lab)**

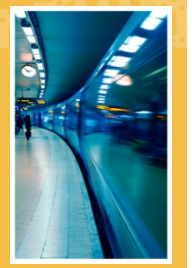
  CATT Lab's mission "To foster the development and application of innovative approaches to existing and emerging transportation needs through research, education, and deployment assistance."

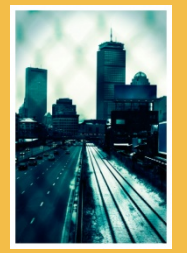
  - Relevance: The CATT Lab's current efforts include focuses on data, Automated Small Vehicle Transportation, and partnership with the I-95 Corridor Coalition.
  - http://www.catt.umd.edu/research

The MPO Perspective

Tom Bamonte, Chair of the Working Group
Senior Program Manager for Autonomous Vehicles
North Central Texas Council of Governments

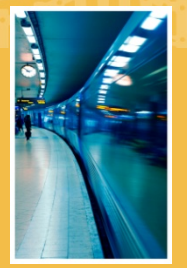
Eric Hill, Working Group Member
Director of Transportation System Management and Operations
MetroPlan Orlando

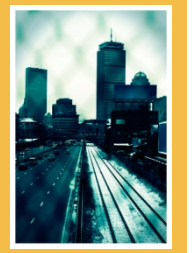




Thank you

The working group meetings are documented in a whitepaper. The Framework, whitepapers and other meeting materials may be found at:
http://www.ampo.org/resources-publications/ampo-work-groups/connected-and-autonomous-vehicles-working-group/





For more information, contact:
Bill Keyrouze, Technical Program Director
Rachel Roper, Technical Programs Manager
bkeyrouze@ampo.org | 202.624.3683
rroper@ampo.org | 202.624.3682