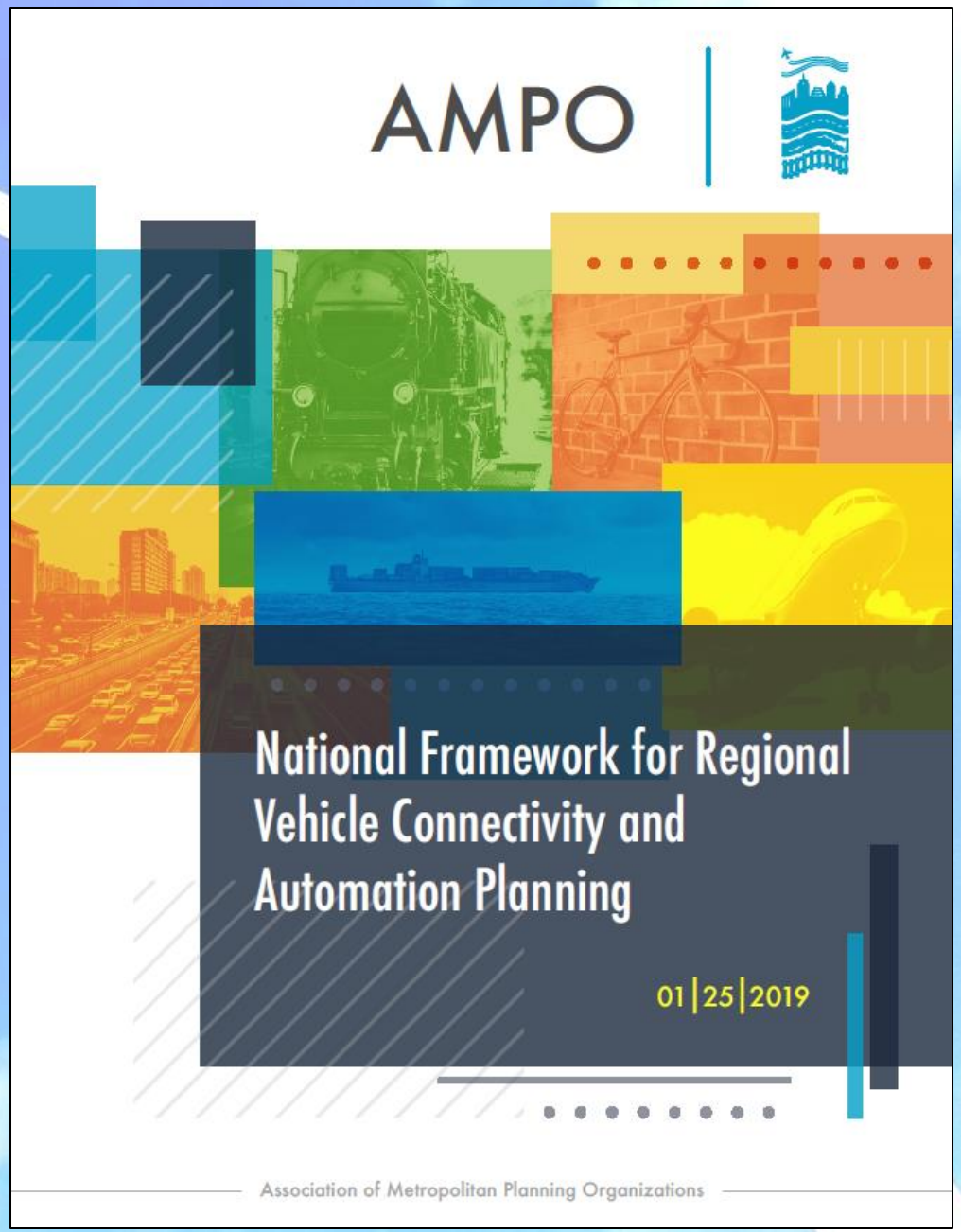
AMPO's Framework for Connected and Automated Vehicles and the St. Louis Region's Emerging Technology Study

NYSAMPO Conference
Syracuse, NY
July 16, 2019

EAST-WEST GATEWAY
Council of Governments
Creating Solutions Across Jurisdictional Boundaries

Overview

- Background
- Recommendations
- Resources



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

AMPO CV/AV Working Group

- Address knowledge gaps in vehicle connectivity and automation and build technical, institutional, and policy capacity
- Incorporate vehicle connectivity and automation in the planning process and leverage their benefits
- Provide a forum to engage MPOs and their partner agencies as vehicle connectivity and automation is piloted and deployed
- Support the USDOT's vehicle connectivity and automation efforts

Recommendations

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

- ***Resources***

Impact Areas Table

Table 1: Potential Impacts of Vehicle Connectivity and Automation on Transportation and Mobility

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

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

CV/AV Fact Sheet

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.

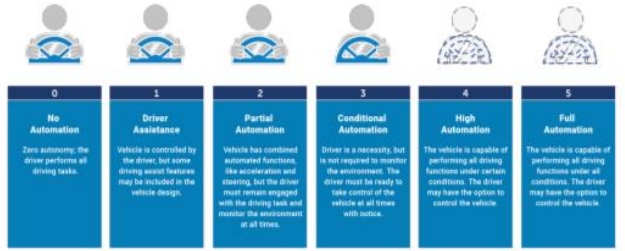
Example Elements of Vehicle Connectivity and Advanced Driver Assistance/Partial Automation

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.	• 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
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.	

Potential Opportunities and Challenges as Vehicle Connectivity and Automation is Deployed

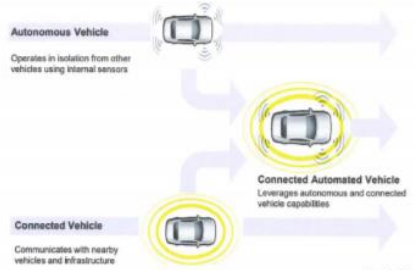
Opportunities	Challenges
• Improved safety due to reduced user error • Increased capacity, reduced congestion, and fewer high capacity improvements due to the potential to operate with fewer incidents, decreased following distances, and narrower lane widths • Improved first and last mile connections 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

Resource Packet

Appendix A

Vehicle Connectivity and Automation Resource Packet

The Vehicle Connectivity and Automation Resource Packet provides a compilation of ongoing activities from transportation agency partners, including federal, state, regional, and local agencies, academia, stakeholder associations, and private industry. Because technology is progressing at a rapid pace, this compilation is not intended to be exhaustive, but provide a broad brush picture of the status of vehicle connectivity and automation across the nation.

Associations

- **American Association of Motor Vehicle Administrators (AAMVA)**

  AAMVA "is a tax-exempt, nonprofit organization developing model programs in motor vehicle administration, law enforcement, and highway safety. The association also serves as an information clearinghouse in these areas, and acts as the international spokesman for these interests. AAMVA represents the state and provincial officials in the United States and Canada who administer and enforce motor vehicle laws...The association also serves as a liaison with other levels of government and the private sector."
  - Relevance: AAMVA has an Autonomous Vehicles Information Sharing Group, Autonomous Vehicle Best Practices Working Group, and Automated Vehicle Information Library.
  - http://www.aamva.org/Autonomous-Vehicle-Information-Library/
  - https://www.aamva.org/Autonomous-Vehicle-Best-Practices-Working-Group/

- **American Association of State Highway and Transportation Officials (AASHTO)**

  AASHTO is "a nonprofit, nonpartisan association representing highway and transportation departments in the 50 states, the District of Columbia, and Puerto Rico ... its primary goal is to foster the development, operation, and maintenance of an integrated national transportation system. AASHTO serves as a liaison between state departments of transportation and the Federal government."
  - Relevance: AASHTO has a number of working groups that are addressing vehicle connectivity and automation and collectively working on AASHTO policy recommendations.
  - https://www.transportation.org

- **American Planning Association (APA)**

  The APA "provides leadership in the development of vital communities by advocating excellence in planning, promoting education and citizen empowerment, and providing our members with the tools and support necessary to meet the challenges of growth and change."

- **Kansas and Missouri**

  Mid-America Regional Council (MARC)
  - Relevance: MARC developed an Autonomous and Connected Vehicle Framework that was released in October 2018.
  - http://marc.org/Regional-Planning/Innovation/Transportation-Innovation/Autonomous-and-Connected-Vehicle-Framework

- **Michigan**

  Michigan DOT
  - Relevance: Michigan DOT's Connected Vehicles Concept Program includes the evaluation of three subsystems (on board equipment, roadside equipment, and network subsystem) along with the Connected Vehicles Test Bed.
  - http://www.michigan.gov/mdot/0,1607,7-151-9621_11041_38217-,00.html

  Southeast Michigan Council of Governments (SEMCOG)
  - Relevance: In April 2017, SEMCOG held the Reimagining Transportation: Transforming Southeast Michigan summit, which included panel discussions on vehicle connectivity and automation.
  - https://semcog.org/Blog/reimagining-transportation-transforming-southeast-michigan-10132

- **Minnesota**

  Governor's Office
  - Relevance: In March 2018, Minnesota Governor Mark Dayton issued an executive order to establish an advisory council on vehicle connectivity and automation.
  - https://www.dot.state.mn.us/newsrels/18/03/7-executiveorder.html

- **Nevada**

  Nevada DOT
  - Relevance: Nevada DOT strives to be a national leader in testing, licensing, and regulation. Their initiatives include collaboration with the Northern Nevada Intelligent Mobility Living Lab on big data research, working with WayCare to harness in-vehicle data, participating in Audi Countdown to Green, which connects certain Audi models with NDOT's traffic signal network, and partnering with the USDOT, UNR, and National Center for Atmospheric Research on the Integrating Mobile Observations Project Connected Snowplows to test communications for snow plows.
  - https://www.nevadadot.com/mobility/avcv

- **New York**

  New York State Association of Metropolitan Planning Organizations (NYSAMPO)
  - Relevance: NYSAMPO is "a coalition of the fourteen MPOs in New York State, which have committed to work together toward common goals." They have eight technical working groups. In October 2017, their Regional Transportation System Management and Operations (RTSMO) Working Group released a whitepaper on Establishing a Regional Planning Framework for Connected and Automated Vehicles.
  - http://www.ampo.org/wp-content/uploads/2018/04/Establishing-a-Regional-Planning-Framework-for-CAV-NYSAMPO.pdf

Recommendations

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

- ***Resources***

Shared Use Mobility, Transportation Technology, and Intercity Transit Services, FTA 6/2018

Shared Use Mobility, Transportation Technology and Intercity Transit Services

A Field Guide to How These Issues Are Being Addressed in the Metropolitan Planning Process and How Public Transit Agencies Are Adapting to an Evolving Mobility Landscape

An informational research assignment conducted for:

Federal Transit Administration
REGION IV

June 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

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

- ***Transportation Scenario Planning for Connected and Automated Vehicles*** - The purpose of this study is to use the scenario planning process to develop several descriptive futures (scenarios) of the deployment, market uptake, use, and impacts of CV and AV technologies. The deliverables of this study will include the future scenario outcomes, a high-level assessment of these futures, and an illustration of how agencies can use scenario planning to develop their own, more localized future CV / AV scenarios. State and regional agencies may use this illustrative scenario planning process to anticipate likely issues and challenges they will face due to CV/AV adoption.

Recommendations

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

- ***Resource Packet***
- ***Impact Areas Table***

Carreteras inteligentes, ¿cómo integrarán a los coches autónomos?

20 de junio 2019

Fahrerlos im Stau *07.06.2019, 10:24 Uhr*

Selbstfahrende Autos lösen das Verkehrsproblem nicht

Driverless Cars Will Dramatically Change Where And How We Live

La voiture autonome : pour qui, pour quoi ?

След първата жертва на безпилотна кола

The Case Against Driverless Cars

Lax safety laws, public skepticism, and privacy concerns are among the issues that could pump the brakes on the autonomous-vehicle market.

Chris Neiger (TMFNewsie)
Sep 28, 2018 at 6:00AM

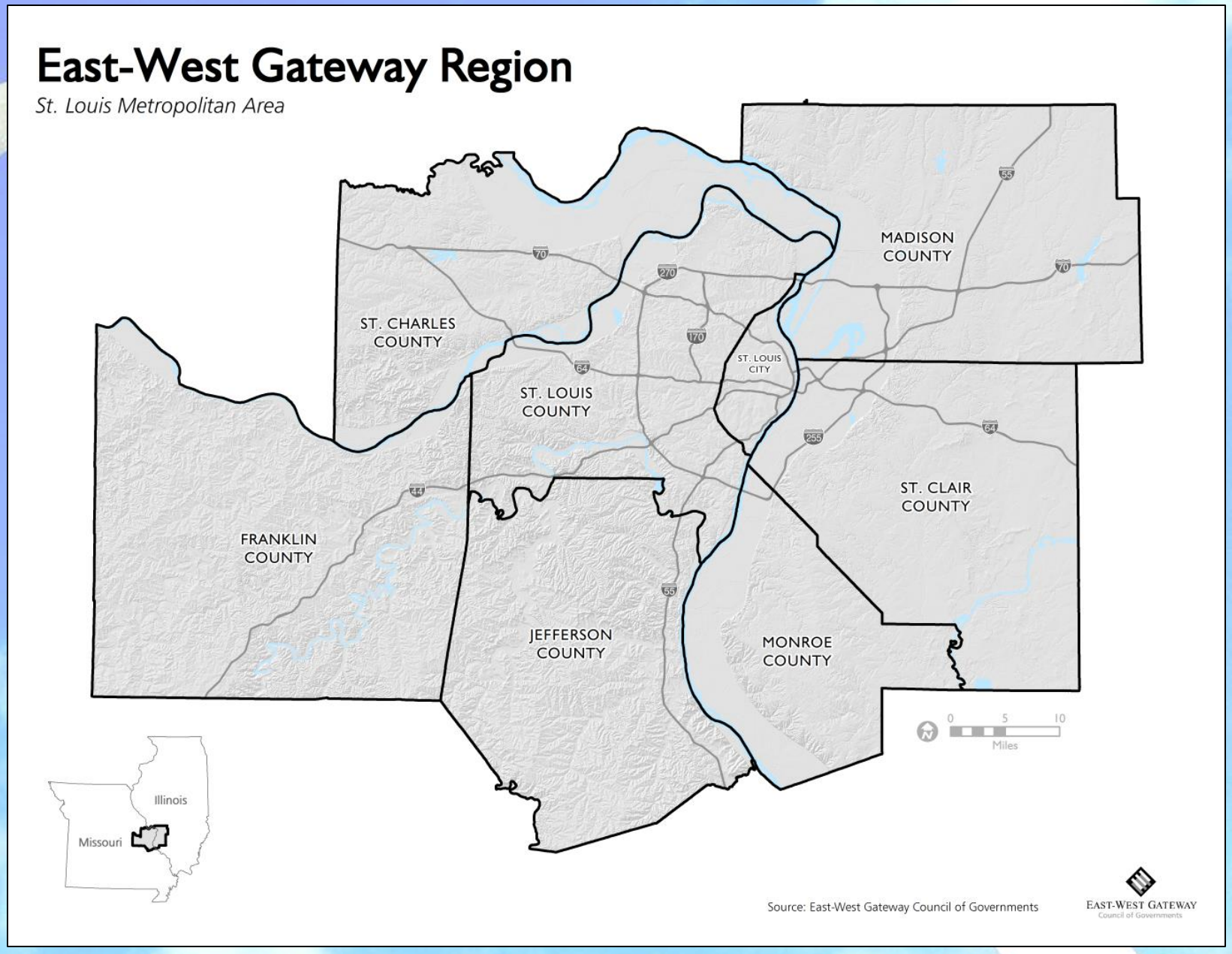
Will Driverless Cars Make the Roads More Safe or Less Safe?

By **Mike White** - September 25, 2018

Overview

- Background
- Project Elements
- Lessons Learned

- 8 Counties
- 203 Municipalities
- 2.6 million people
- $141 billion dollar economy
- 10,612 miles of roads
- 758 miles of the federal interstate system
- 3,304 bridges
- 45 million annual transit trips

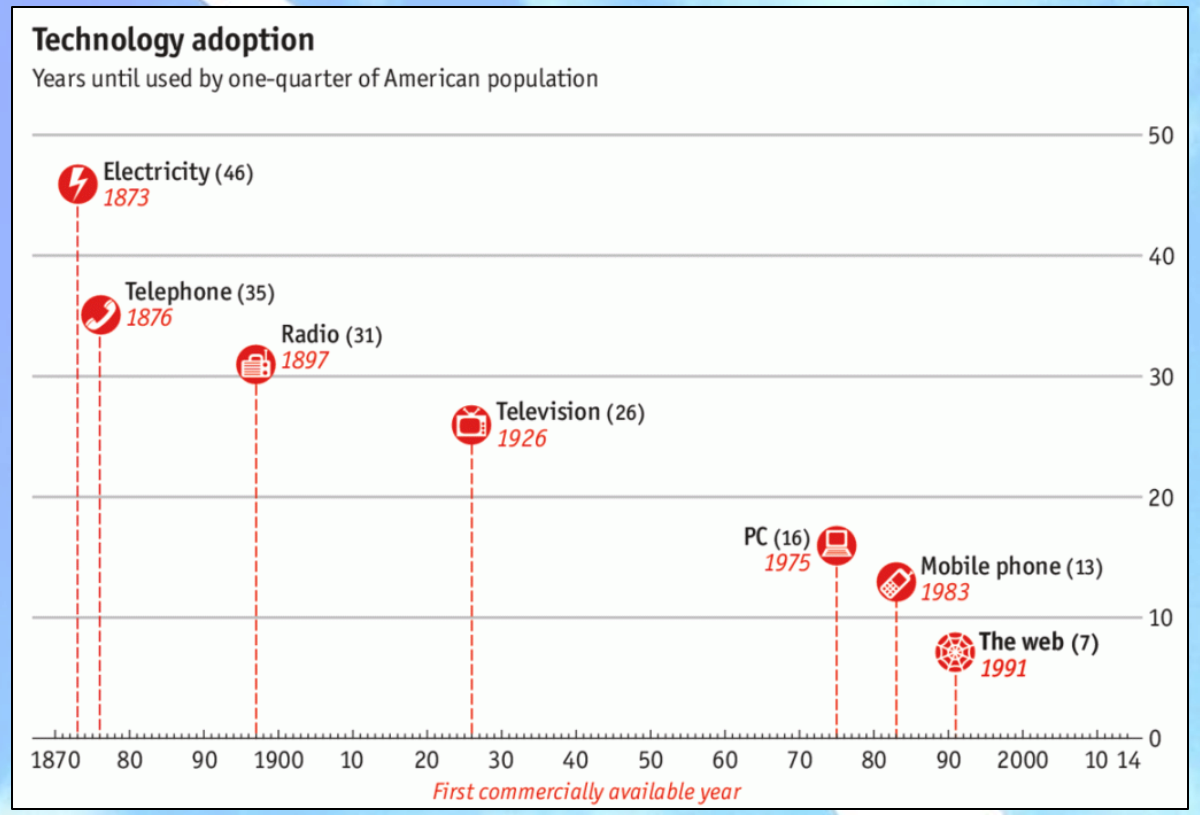


Connected2045: East-West Gateway Ten Guiding Principles

EWG's Ten Guiding Principles	
Preserve and Maintain the Existing System	Ensure the transportation system remains in a state of good repair.
Support Public Transportation	Invest in public transportation to spur economic development, protect the environment, and improve quality of life.
Support Neighborhoods and Communities	Connect communities to opportunities and resources across the region.
Foster a Vibrant Downtown and Central Core	Improve access to and mobility within the central core by all modes to increase the attractiveness of St. Louis and strengthen the regional economy.
Provide More Transportation Choices	Create viable alternatives to automobile travel by providing bicycle and pedestrian facilities.
Promote Safety and Security	Provide a safe and secure transportation system for all users.
Support a Diverse Economy with a Reliable System	Reduce congestion and improve travel time reliability to support the diverse economic sectors of the region.
Support Quality Job Development	Support the growth of wealth producing jobs that allow residents to save and return money to the economy.
Strengthen Intermodal Connections	Support freight movement and connections that are critical to the efficient flow of both people and goods.
Protect Air Quality and Environmental Assets	Encourage investments that recognize the linkages between the social, economic, and natural fabric of the region.

Background

- New technologies may fundamentally alter the way people travel in the future, with potentially dramatic impacts on safety, mobility, and system performance over the next 20-30 years
- The pace of technology adoption is quickening.



- The St. Louis Region needs to better prepare for the future in its regional transportation planning and investment decision-making.

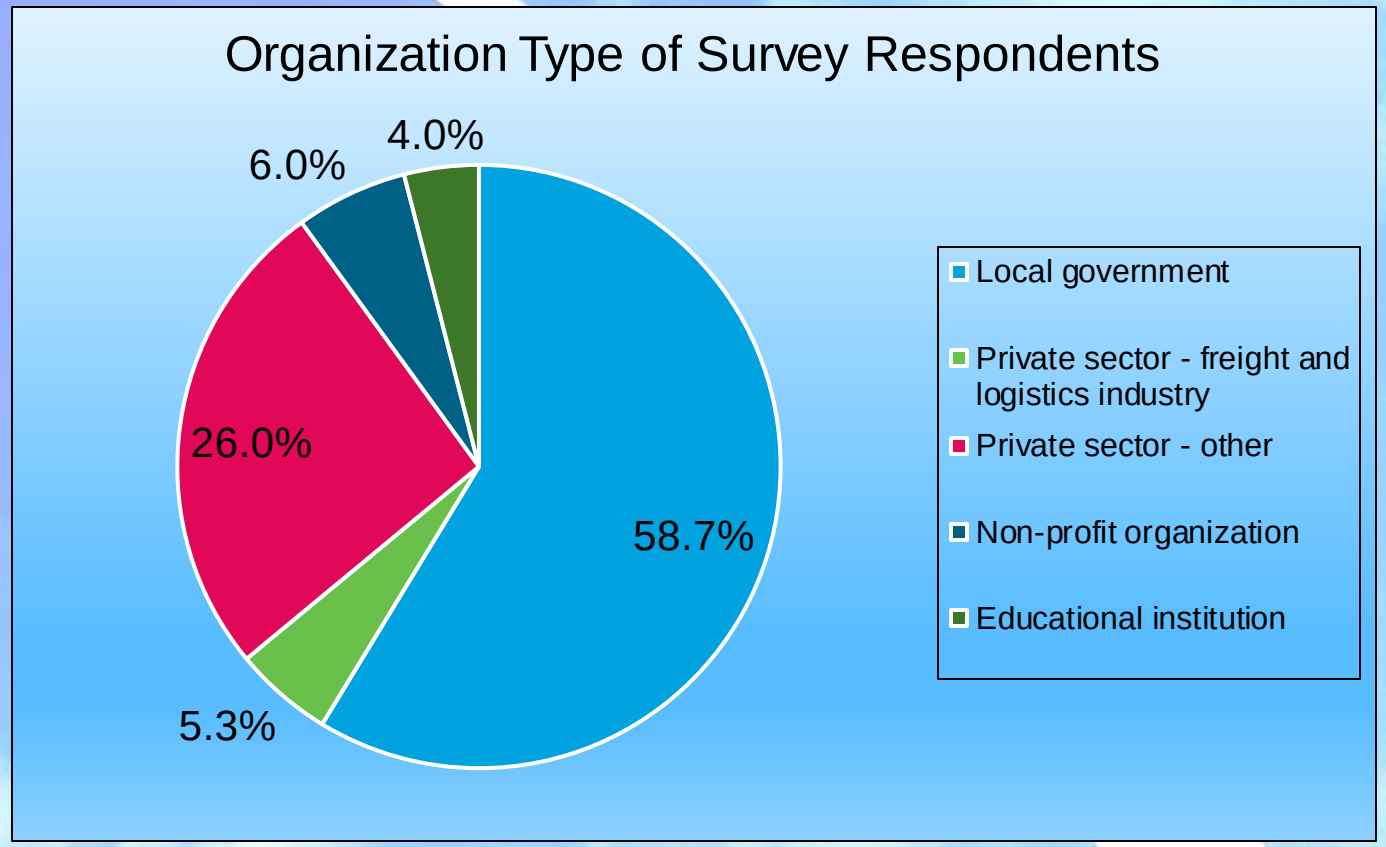
Project Elements

- Research & Analysis
- Survey
- Interviews
- Recommendations
- Final Plan

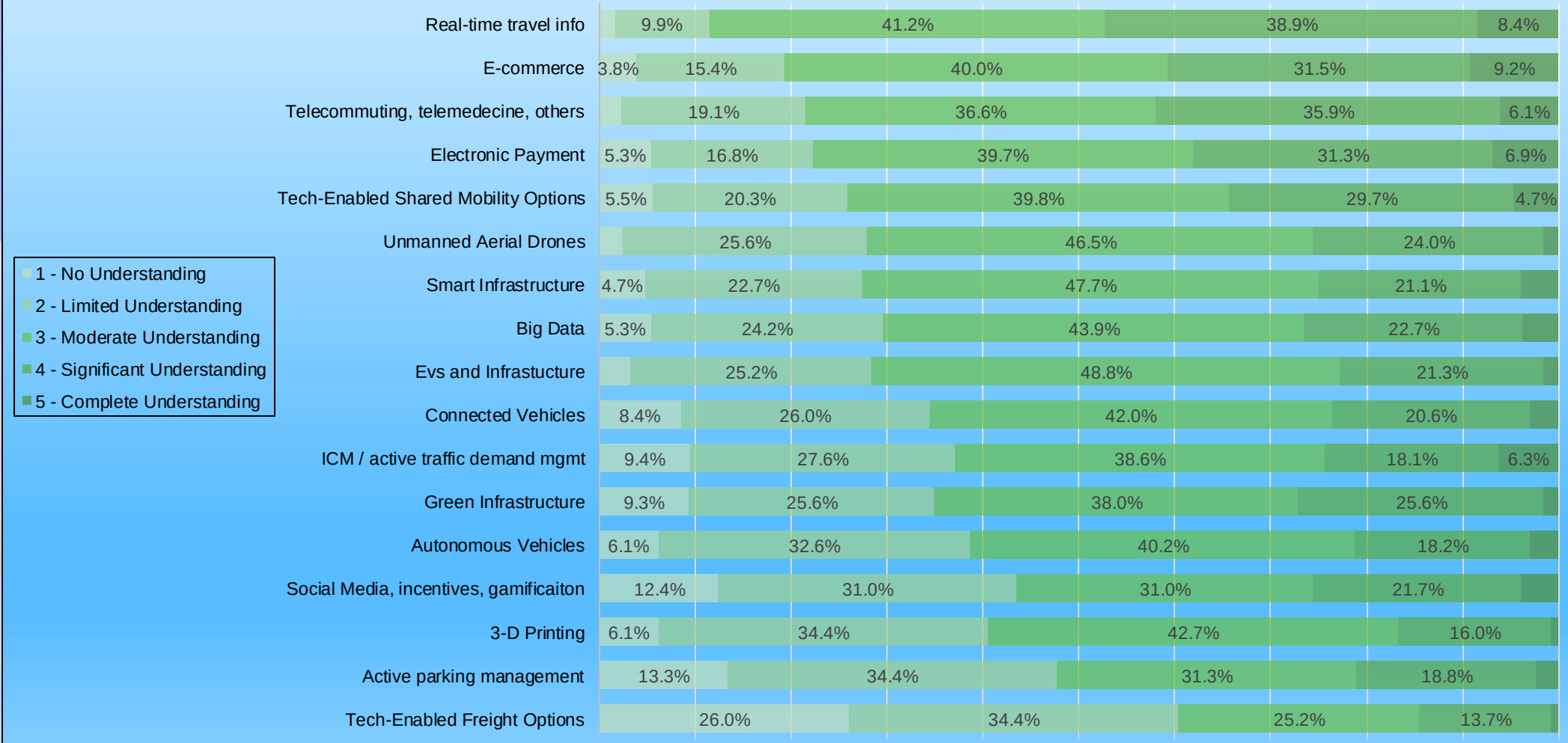
Survey

Organized to gather information on:

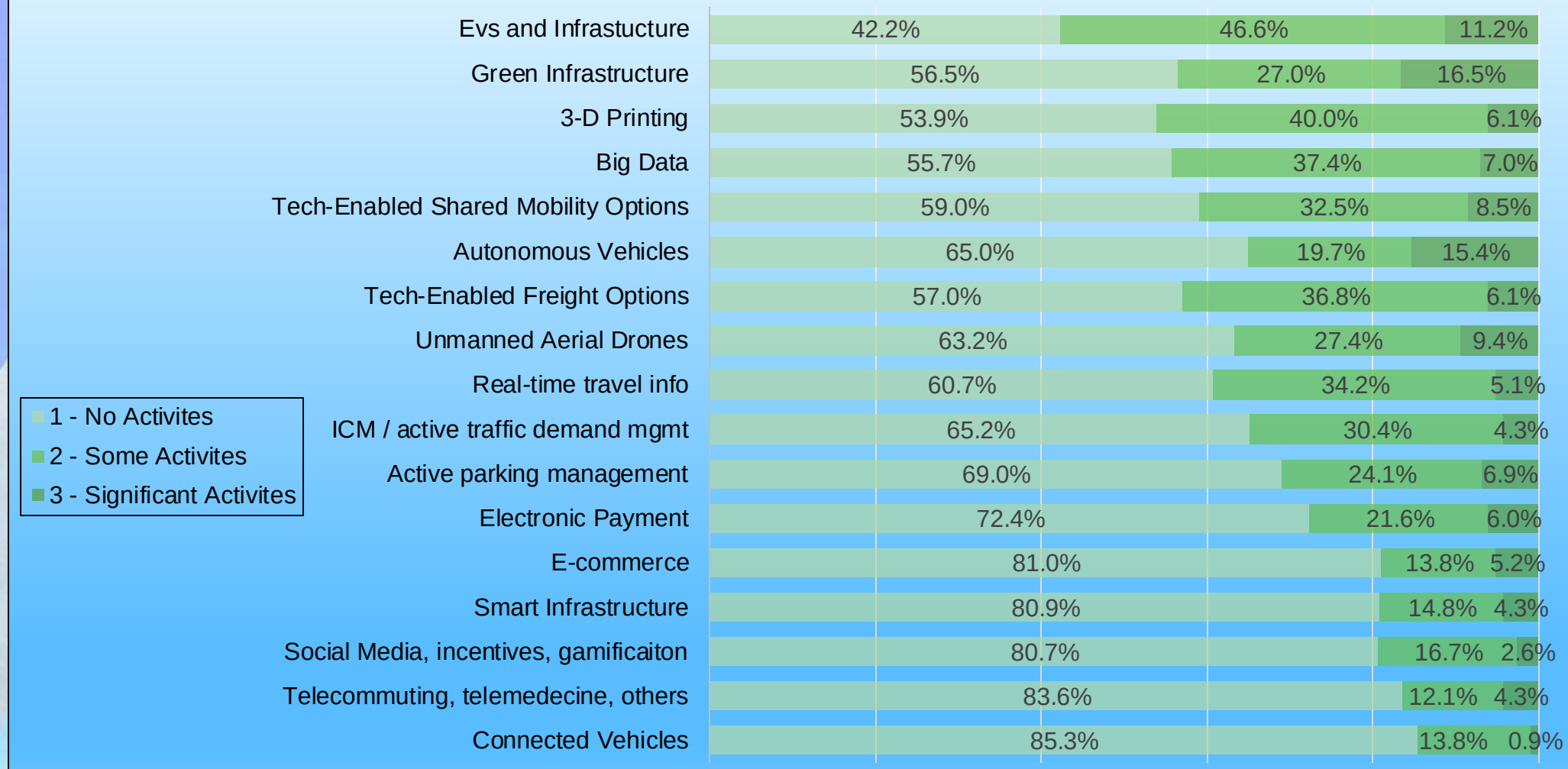
- Current level of understanding of emerging transportation technologies;
- Current activities related to, and investments being made in, emerging transportation technologies;
- Perspectives on the impacts of these technologies; and
- Desired regional coordination or policies related to transportation technology.



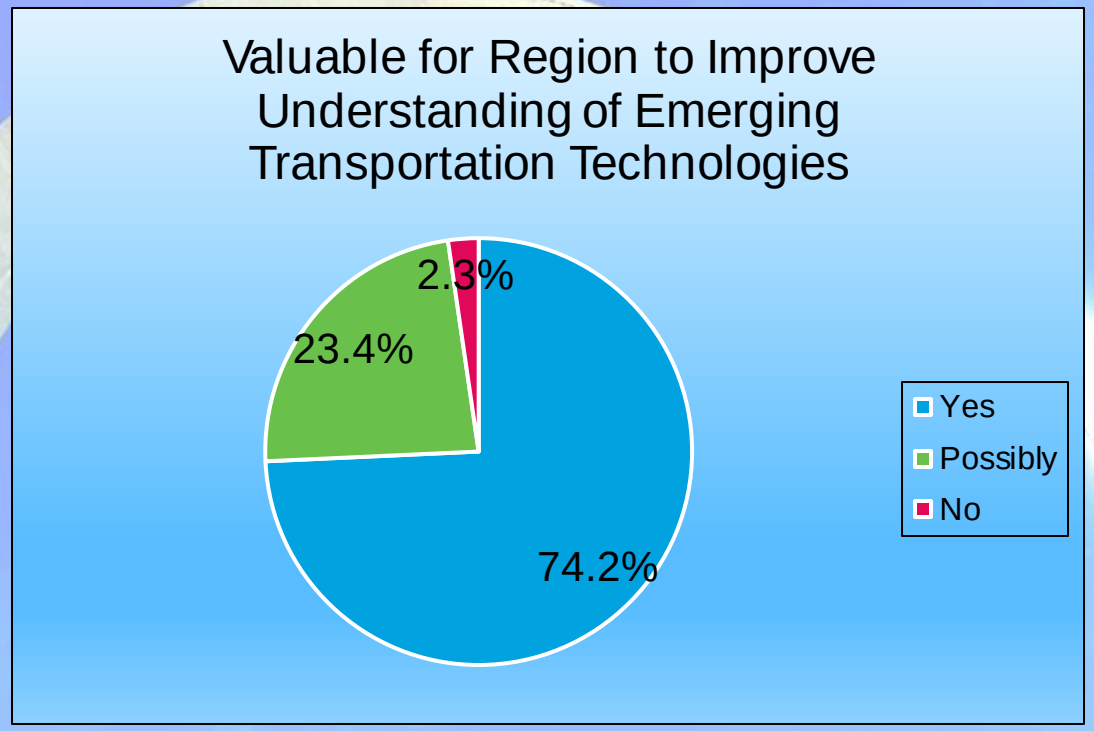
LEVEL OF UNDERSTANDING RELATED TO EMERGING TRANSPORTATION TECHNOLOGIES



LEVEL OF ACTIVITIES RELATED TO EMERGING TRANSPORTATION TECHNOLOGIES



Survey



If the deployment of emerging technologies in the St. Louis region could be accelerated or steered in a certain direction, would you like that to happen?	
Yes	86.5%
No	13.5%

Interviews - Themes

- Overall uncertainty –
  - adoption, comfort, acceptance, timeline
- Demographics
- Equity
- Funding
- Safety
- Congestion impacts
- Infrastructure investments
- Freight
- Impacts on transit
- Hyperloop

Implications of Emerging Transportation Technologies on EWG Guiding Principles

Guiding Principle	Potential Positive Impacts	Potential Negative Impacts
Preserve and Maintain the Existing System	•Use of drones for bridge inspections •Instrumentation of highways to monitor conditions •Pavements that can repair themselves, melt snow, and provide lighted lane striping	•Decline in traditional transportation funding sources through fuel taxes and vehicle registration fees
Support Public Transportation	•Improved transit signal priority, fare collection, and service enhancements •Potential for greater integration with on-demand services that provide first-mile last-mile connections	•Potential for autonomous vehicles, transportation network companies, and other service providers to reduce transit market share
Support Neighborhoods and Communities Throughout the Region	•May provide more access to opportunities for people without access to a private vehicle, as well as disabled and elderly populations	•Technology such as AVs might be primarily for those who can afford it •Potential negative implications of e-commerce on community businesses
Foster a Vibrant Downtown	•Increased shared mobility options could enhance the demand for urban living and working environments •Reduced vehicle and parking demands could provide more space to lower housing cost, add bike lanes, parks, or other amenities	•Reduced time burden of driving due to AVs could encourage more suburban sprawl •Electronic access to health care, education, etc. could reduce benefits of being in the urban core
Provide More Transportation Choices	•Technology enhances alternatives to personal auto use, including bicycle sharing, microtransit, and carsharing	

Implications of Emerging Transportation Technologies on EWG Guiding Principles

Guiding Principle	Potential Positive Impacts	Potential Negative Impacts
Promote Safety and Security	•CV and AV technology reduces driver error; technologies are designed to reduce crashes, injuries, and fatalities	•Potential concerns about cyber-security in relation to CV and AV technology
Support a Diverse Economy with a Reliable Transportation System	•Improvements in monitoring roadway conditions, as well as safety improvements, should directly result in fewer vehicle incidents, which would improve reliability •Better traveler information in vehicles enables travelers to re-route to minimize time stuck in congestion •More vehicle throughput within the existing transportation system that should help to reduce traffic congestion	•Increased VMT could offset some of these benefits.
Support Quality Job Development	•Connectivity has the potential to reduce barriers to travel and facilitate market interaction and overall economic growth. •Opportunities for quality job development in emerging fields, including advanced logistics and data analytics, as well as in the development of innovative technologies and services	•Vehicle automation could reduce direct employment in the transportation sector, as jobs related to driving (everything from truck drivers to taxi and transit service drivers) could be displaced
Strengthen Intermodal Connections	•Opportunities to optimize the supply chain through improved logistics and data sharing are anticipated, resulting in travel time savings •Improvements in passenger connections between modes and services are expected	
Protect Air Quality and Environmental Assets	•Potential for significant air pollutant and greenhouse gas emissions reductions from shifts to EVs •Potential for clean energy generation throughout roadways, including solar and kinetic energy	•Increased VMT could offset some gains

Examples of Impacts to Investment Needs and Priorities

- Reduced needs for new highway infrastructure
- Impacts on public transportation services
- Impacts on ITS infrastructure
- Changing needs associated with law enforcement
- Reduced parking needs
- Workforce development needs
- Transportation funding
- Equity

Examples of Implementation Strategies

	Responsibilities
Safety	
• Invest in V2I communications infrastructure to support safety applications for drivers and pedestrians	⇨ Illinois and Missouri DOTs, local governments
Urban Form and Public Transit	
• Advance automation in public transportation and quality improvements (e.g., free Wi-Fi) through pilot programs	⇨ Metro
Equity	
• Offer incentives for private services to provide services in marginalized areas, such as those with predominantly low-income populations	⇨ Metro and local governments
Infrastructure Preservation and Maintenance	
• Evaluate use of advanced technologies to support monitoring conditions, including use of drones and vehicle-generated data	⇨ Illinois and Missouri DOTs, Metro, and local governments

Recommendations: Moving Forward from Strategy to Implementation

Data, Modeling, and Analytics

- Bolster staff data analytics capabilities
- Develop a robust data collection plan, leveraging new forms of data to support performance measures
- Enhance modeling to address emerging transportation technologies

Long-Range Planning

- Establish a Technology Advisory Committee
- Develop a shared vision for technology to recommend regional strategies
- Conduct scenario planning to better understand alternative futures and to support more informed analyses of investment priorities
- Include considerations related to emerging transportation technology as a factor when prioritizing projects for the regional transportation plan (RTP)
- Update the regional ITS Architecture and Deployment Plan
- Update the Congestion Management Process and ensure that other regional planning products integrate emerging transportation technology

Programming and Funding

Update the current Transportation Improvement Process (TIP) project selection process to encourage innovative technology applications

Pilot Program Development

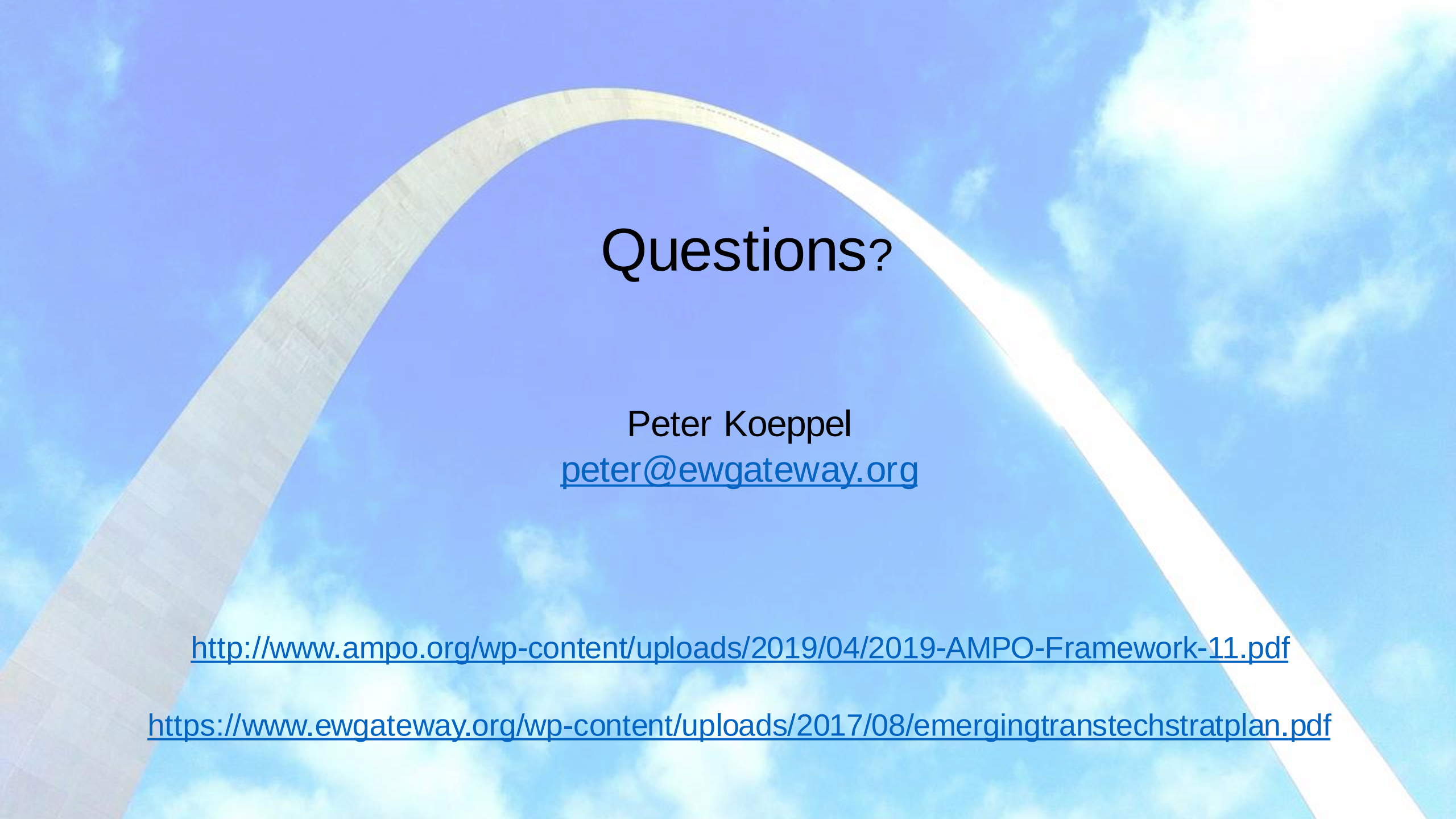
- Build federal grant readiness by creating a compelling grant narrative
- Establish a grant tracking system
- Develop and fund a regional technology deployment pilot program

Education, Convening, and Supporting Partner Efforts

- Work with local universities to identify opportunities to collaborate
- Coordinate peer-to-peer workshops and facilitate regional discussions on topics including public-private partnerships, changes to procurement policies, and data collection and analytics
- Conduct assessments of local governments' awareness and readiness regarding technology on a periodic basis

Lessons Learned

- Stay informed and engaged
- Everyone feels as though they should be doing *something*
- No need to be first
- Don’t forget about the basics
- Every region and state is different (obviously)
- This may all take longer than predicted/anticipated, or may never happen at all
- There will be unintended consequences
- No one technology will solve all of our problems



Questions?

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