

Centralina COG

Automated and Connected Vehicle (ACV) Roadmap *Actions to Prepare the Greater Charlotte Region*

Fall 2017 CCOG ACV Workshop Series



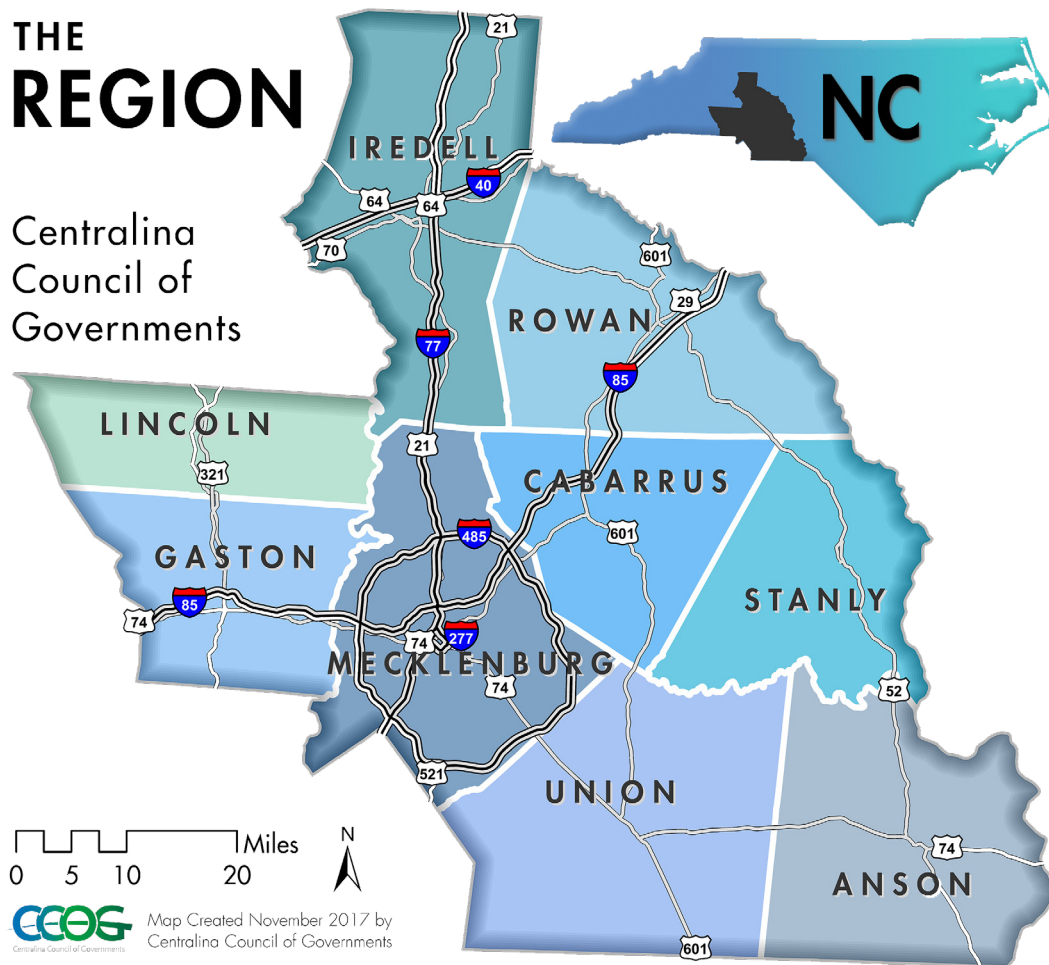
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Overview

This document provides an overview of the potential benefits and impacts of automated and connected vehicles (ACV); presents the CCOG Fall 2017 ACV workshop series; and introduces the *Centralina COG ACV Roadmap Action Plan* to help prepare the Greater Charlotte Region.

ACV technology is poised to disrupt the transportation industry and usher in a new paradigm for mobility and travel choices. The rise of Transportation Network Companies (TNC) which use mobile apps to “hail” non-commercial drivers (Uber, Lyft, Via, and Chariot) for passengers has increased significantly in the last five years. At the same time increased investment is expected in the coming years in roadside detectors, onboard vehicle technology and cloud/5G services which will alter communication capabilities and grow an “infostructure” network to automate trips across cities and state lines. Recent federal regulation acknowledges the need for safe standards and further testing to oversee these technological changes, yet automakers and technology companies are innovating rapidly to re-define how Americans will move in the future.

In response to these emerging technologies, the CCOG hosted a series of workshops in the fall of 2017 at their headquarters in Charlotte, NC to begin exploring ACVs and their implications for the greater Charlotte region. CCOG partnered closely with FHWA and NCDOT to promote these workshops with NCDOT providing planning research funds to support the initiative.

Although it is difficult to predict exactly how quickly or deeply ACVs will alter mobility, these new technologies will impact the entire transportation sector, including policy, long-range planning, traffic forecasting/demand modeling, traffic operations, system management, and fleet management. Governmental agencies must take steps to educate and prepare for this future change while maintaining a focus on advancing agency goals such as safety, mobility, and infrastructure health. The potential impacts and uncertainties present challenges to transportation professionals who must understand the industry forces behind such change, adapt practices to accommodate, and work closely across multiple agencies (state, regional, local) and transportation-related sectors (private, research, IT, etc.) to coordinate their response to change. The workshops and resulting **Roadmap Action Plan** are the first steps to help regions prepare for the impacts of ACVs.



“NCDOT recognizes that the emergence of ACVs poses many uncertainties and opportunities however, by examining the range of options that come with this shift, transportation professionals and partners in North Carolina can take steps to ensure these new technologies are seamlessly integrated to support our growing communities and the long-term visions we hold for them. In other words, we must own our future and adapt to change. The work being done to prepare our communities in both the greater Charlotte region and across the state of NC is not optional and will only serve to enhance our quality of life and provide a well-functioning transportation system well into the future.”

—Tony Lathrop, NCDOT Board Member

CCOG led three workshops to increase participants’ understanding of ACVs, assess their potential impacts, and develop preparedness strategies to equip transportation officials with a preliminary set of concrete actions to navigate future change. For the workshops, CCOG brought together regional leadership to develop collaborative solutions to multimodal transportation, freight, transit, healthy communities, and governance issues. The results of the three workshops form the basis for the **Roadmap Action Plan**. Participants included transportation planners, city/county elected officials, transit experts, modelers, land use planners, and the private sector. Agencies represented included NCDOT, greater Charlotte region’s Metropolitan and Rural Planning Organizations (MPO/RPO), and other cities and counties in both North Carolina and South Carolina. An average of 50 participants attended each workshop.

ACV 101

What is an Automated Vehicle?

Automated vehicles (AV) (also known as self-driving, driverless, or robotic or Automated Driving Systems (ADS)), are vehicles in which some aspect of vehicle control is automated by the car. These vehicles have the potential to increase safety, improve mobility, and reduce environmental impacts on a global scale. Many vehicles on the market today already include some level of automation, such as adaptive cruise control, lane-keeping assistance, and parking assist, with more features expected in the next year or two.

The Society of Automotive Engineers (SAE) provides a formal classification system focused on the degree of human intervention needed (http://www.sae.org/misc/pdfs/automated_driving.pdf):

- » **Level 0—No Automation:** The full-time performance by the human driver of all aspects of the dynamic driving task, even when enhanced by warning or intervention systems.
- » **Level 1—Driver Assistance:** The driving mode-specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the human driver performs all remaining aspects of the dynamic driving task.
- » **Level 2—Partial Automation:** The driving mode-specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the human driver performs all remaining aspects of the dynamic driving task.
- » **Level 3—Conditional Automation:** The driving mode-specific performance by an Automated Driving System of all aspects of the dynamic driving task with the expectation that the human driver will respond appropriately to a request to intervene.
- » **Level 4—High Automation:** The driving mode-specific performance by an Automated Driving System of all aspects of the dynamic driving task, even if a human driver does not respond appropriately to a request to intervene.
- » **Level 5—Full Automation:** The full-time performance by an Automated Driving System of all aspects of the dynamic driving task under all roadway and environmental conditions that can be managed by a human driver.

Automation Technologies



Connected Vehicles (CV) combine advanced technologies (like advanced vehicle sensors, wireless communications, GPS, smart infrastructure, and others) to identify hazards and delays on the roadway and to provide drivers with warnings and real-time traveler information. CV technology can be used in vehicles with or without automated functions, and will play a significant role in the evolution of automated vehicles.

Example CV Functions: Curve speed warnings, forward collision warnings, advisories and warnings of deteriorating/hazardous driving conditions.



Automated Vehicles (AV) encompass a spectrum of vehicles at progressing levels of automation. AVs at lower levels perform some driving functions but require a human to monitor the road. AVs at higher levels perform some to all driving functions as well as monitor the road in some to all situations.

Example AV Functions: Preemptive braking systems, parking assist systems, adaptive cruise control, lane centering systems.

SAE Levels of Automation



Highly Automated Vehicles (HAV) refer to automated vehicles at higher levels of automation, and are distinguished by the capability to monitor the driving environment. HAVs monitor the road in some to all situations and conduct some to all driving functions.

Example HAV Functions: Performs all driving tasks in specific situations; performs all driving tasks in all situations/ no steering wheel or pedals.

SAE Levels of Automation



What is a Connected Vehicle?

Connected vehicle technology is distinct from automated vehicles. A connected vehicle refers to the capability of the various elements of the modern surface transportation system (personal, transit, and freight vehicles; roadside infrastructure; transportation management centers; etc.) to electronically communicate with each other on a rapid and continuous basis. Dedicated short-range communications (DSRC) allow rapid communications (up to 10 times per second) between elements of a connected vehicle network, particularly for safety critical applications. With safety as a primary goal, connected vehicle technology is anticipated to aid motorists in actively avoiding crashes and other incidents.

A widespread deployment of connected vehicle technology is anticipated to provide numerous additional benefits beyond safety. Dedicated DSRC technology will enable innovative mobility deployments such as cooperative cruise control and vehicle platooning, increasing roadway throughput, and reducing congestion.

Coordination between vehicles and infrastructure will mitigate unnecessary braking and stopping at intersections, resulting in reduced fuel consumption, and lowered emissions.



"We want to be at the forefront of providing the infrastructure, laws and safety policies we'll need...As in all other areas of government, everyone's looking for increased efficiency, and it takes more collaboration, so you've got to have multiple plans, from your most optimistic to a mid-range 'most-likely-to-occur' plan to a 'least-likely-but-most-damaging-outcome' plan," he said. "Then you have to work with partnerships at all levels. Everyone has an interest and can bring value, but it's unique to their perspective." The transportation secretary said there are equal challenges at all levels. "The solution comes by getting everyone to work together to find solutions for all the challenges, not just 'mine.'"

—NCDOT Secretary Trogon,
reflector.com, 6/21/2017

Anticipated Benefits of ACV



Economic and Societal Benefits

Automated vehicles could deliver additional economic and additional societal benefits. A National Highway Traffic Safety Administration (NHTSA) study showed motor vehicle crashes in 2010 cost \$242 billion in economic activity, including \$57.6 billion in lost workplace productivity, and \$594 billion due to loss of life and decreased quality of life due to injuries. Eliminating the vast majority of motor vehicle crashes could minimize these costs.



Mobility

ACVs have the potential to transform mobility for people in North Carolina and across the United States. These vehicles might be able to provide new mobility options to millions of Americans who might not have the ability to drive. According to the Centers for Disease Control and Prevention (CDC), today there are 49 million Americans over age 65 and 53 million people have some form of disability that could be well served by on-demand services of ACV.



Efficiency and Convenience

Roads filled with ACVs could also cooperate to smooth traffic flow and reduce traffic congestion. According to the Texas Transportation Institute, in 2015, travel delays due to traffic congestion caused drivers to waste more than 3 billion gallons of fuel and kept people stuck in their cars for nearly 7 billion extra hours—42 hours per rush-hour commuter. With ACVs, the time and money spent commuting could be allocated elsewhere.

Anticipated Impacts of ACV

Automated and connected vehicles will impact almost every operation across public agencies and the private sector. There are many possible impacts and many potential challenges to be solved, such as data management, privacy and security, market acceptance and driver adaptation, a mixed fleet (ACV and non-ACV) for many years, changing requirements for infrastructure, permitting and liability changing criteria for transportation investments, and potentially dramatic demographic and economic disruptions. The information below provides a high-level summary of some of the potential impacts at the regional level. For more information on ACV impacts, visit the CCOG ACV resource page: <http://www.centralina.org/regional-planning/transportation/autonomous-and-connected-vehicles/>.

ISSUES HIGHLIGHTED IN ACV PLANNING	POTENTIAL IMPACTS
Transportation Planning	<ul style="list-style-type: none">• Impacts will stretch across all modes and facilities.• Vehicle Miles Traveled (VMT) could increase or decrease depending on implementation.• Potential of much richer planning data but new tools and techniques will be needed to assess impacts on capacity, mobility, safety, environment, and land use.
Traffic Engineering and Operations	<ul style="list-style-type: none">• Operational benefits to increase capacity, speed, and safety could include Intelligent Intersection Control Systems, speed harmonization, queue warning/spillback detection, and autonomous breaking.
Transportation Capital Investment	<ul style="list-style-type: none">• ACV will have major impacts on investment decisions if mobility and safety benefits are realized. Enforcement revenues from ticketing and parking could be reduced significantly.
Public Transportation	<ul style="list-style-type: none">• ACV technology has the potential to reframe public transportation, particularly in low to medium density areas. ACV shuttles are already starting to be implemented.• ACV in Public Transportation can utilize current technology like Transit Signal Priority and Computer Aided Dispatch (CAD)/Automated Vehicle Location (AVL).
Data Management and Security	<ul style="list-style-type: none">• Data capture management presents great opportunities for proactive mobility operations, and further study in safety and mode share.
Non-motorized Transportation	<ul style="list-style-type: none">• ACV technology combined with smart phone apps provide opportunities to enhance safety and mobility of non-motorized transportation.• Potential for increased roadway capacity could allow conversion of roadway space to non-motorized use.



CCOG ACV Workshop Series

Workshops' Purpose

CCOG represents 9 counties, over 70 municipalities, and roughly 2 million people in the greater Charlotte area; and routinely engages South Carolina Department of Transportation, the Rock Hill-Fort Mill Area Transportation Study (RFATS), and Catawba Regional Council of Governments (CRCOG) on bi-state planning issues.

Given the rapid growth and disruption of ACV to transportation over the next 5, 10, and 20 years and their role as a regional leader and convener, CCOG decided to foster an ACV dialogue with regional partners in the fall of 2017. Staff had recently led a successful development of the region's first Greater Charlotte Regional Freight Mobility Plan (which included an intelligent transportation system (ITS) review in light of ACV). This established a valuable starting point for deepening the ACV discussion among the region's various transportation professionals and leaders and shaped a highly interactive, collaborative process to identify key actions and adaptive strategies to prepare for ACV related change.

Cambridge Systematics (CS) lent their industry expertise to CCOG by supporting workshop development, recruitment of other subject matter experts (SME), and co-facilitation. CS and CCOG also co-designed facilitation strategies and engagement techniques to foster interactive discussion and stimulate participant ideas throughout the workshop series. The workshops built upon each other to develop a well-rounded understanding of the opportunities and challenges of ACVs and helped participant MPOs, RPOs, and local governments consider how proposed actions could also benefit the region's transportation system resiliency and reliability, the economy, safety, and convenience for users.

The target audience for these workshops were staff of MPOs and RPOs, cities, counties, the NCDOT Transportation Planning Division, and transportation policy board members. Nearly 50 participants attended each workshop, represented mostly by local agencies but also by a few other jurisdictions in North and South Carolina.



Workshops' Purpose: **Educate, Inform, Empower**

Result: The basis for the **Roadmap Action Plan**



Assess the region's readiness for future mobility, including ACV.



Educate local transportation leaders on current and future disruptive technologies.



Understand how ACVs will impact the region's work and how these technologies interact with long-range goals and objectives in areas such as public transportation, transportation planning, land use, modeling and forecasting, and fleet services.

Methodology

With a deep understanding of ACVs and the Centralina region, CS and CCOG developed three workshops to help prepare local leaders for the changes in mobility that will impact North Carolina’s transportation network. The workshops featured experts from the public and private sectors.



Each workshop brought a deeper understanding of ACV issues, starting with the latest industry terms, trends, regulations, and policies. This building block approach equipped participants to engage with speakers and each other about effective local actions, in a prioritized and manageable structure that would provide the basis for a preparedness plan or *roadmap*.

Workshop elements included:

- » Knowledge transfer presentations.
- » Panel discussions.
- » Interactive, facilitated breakout discussions.
- » Live polling to incorporate “real time” input and solicit response to critical questions.
- » Networking breaks to allow for “cross pollination” of ideas.
- » Vehicle demonstrations.

CCOG staff posted articles, publications, and news stories to CCOG’s webpage (<http://www.centralina.org/regional-planning/transportation/autonomous-and-connected-vehicles/>) to augment the ACV learning curve throughout the workshops. The workshops were designed to be replicable. CCOG is documenting their approach to help facilitate the conduct of similar workshops in other regions.

Workshop 1: Clearing the Hype (August 23, 2017)

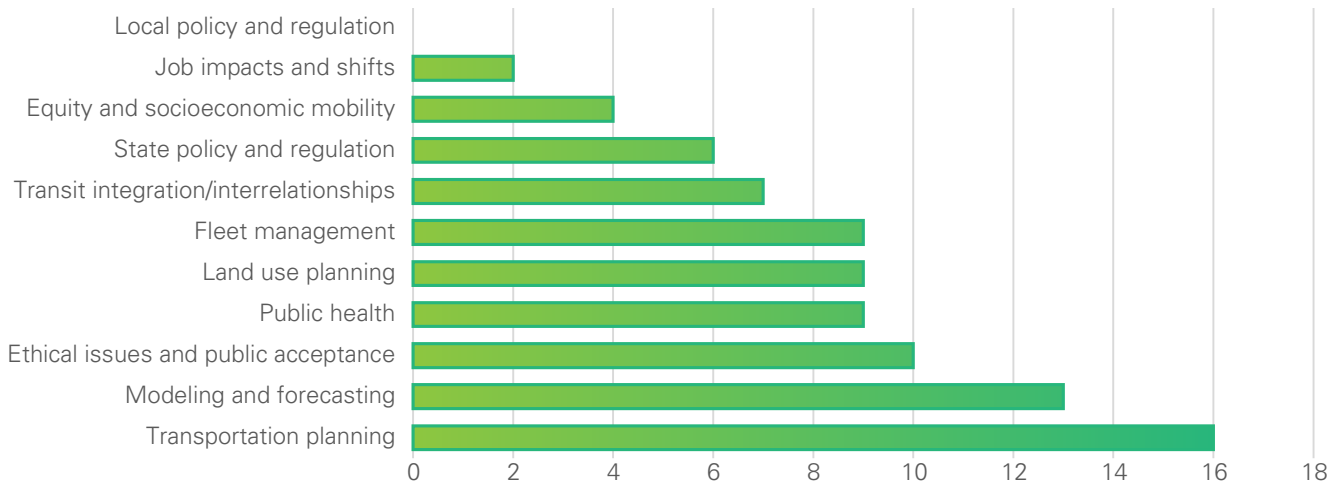
Workshop 1 was an educational session on what the transportation industry understands concerning ACV and what is anticipated in the next 5 to 10 years. Participants left the workshop more aware of key ACV issues, and developed a clearer sense of the ACVs' emerging and disruptive forces. They began to grasp its growing near-term impacts within transportation and considered the types of adjustments and practice changes to put in place today to prepare for tomorrow. Participants learned about NCDOT's early strategy and response to this impending change and were briefed by subject matter experts through presentations and panel discussion associated with the latest ACV research, legislation, and other state DOT and MPO actions.

Workshop 1 presentations:

<p>» Impacts and Timing of Adoption of ACVs Panel Discussion <i>Brian Burkhard, Jacobs Engineering; Doug Gettman, Ph.D., Kimley Horn & Associates; and Keith Hangland, HERE</i></p> <p>» ACVs in 25 years <i>Sam Van Hecke, Cambridge Systematics</i></p>	<p>» National and State Efforts to Prepare for ACVs <i>Kevin Lacy, NCDOT</i></p>
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During the Breakout Session, participants were asked to identify the roles and responsibilities of local governments and transportation planning organizations. Next, the group identified key areas they expected to be impacted by ACVs and began asking questions related to those issue areas about readiness and the need for action.

ACV Issues of Greatest Importance, What Was Heard in Workshop 1



Assessing Roles and Responsibilities

Assessing Impacts

Raising Key Questions About Readiness and Need for Actions

Workshop 2: Discussing the Impacts (September 20, 2017)

The workshop began with a panel discussion on the impacts of ACV through local, regulatory, and practitioner lenses. During the Breakout Session, participants discussed and identified various responsive actions categorized by short-, medium- and long-term time horizons and across transportation issues. Participants then highlighted highest priority actions to include in the roadmap and identified policy, planning, and programming gaps, which could stymie or deter these actions. A few of the priority actions are shown in the word cloud below, to see all, please view the **Roadmap Action Plan** matrix starting on page 13.

Workshop 2 presentations:

<p>» Planning for Change A Local Perspective <i>Anna Gallup, CDOT; Bob Cook, CRPTO; and Bjorn Hansen, Union County</i></p> <p>» Planning for Change Regulatory- and Practitioner-Based Perspectives <i>Paul Lewis of Eno Center for Transportation; and Jitender Ramchandani of Virginia DRPT</i></p>	<p>» NC Turnpike Authority Triangle Expressway and Managed Mobility <i>Dennis Jernigan, NCTA</i></p> <p>» Planning For Change—The Next Frontier The next evolution in forecasting and scenario planning which builds upon shared local, national, regulatory, and practitioner perspectives. <i>Marty Milkovits, Cambridge Systematics</i></p>
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Key considerations from the participants:



Discussed Impacts



Identified Gaps in Policy, Planning, and Programming



Assessing Roles and Responsibilities

Workshop 3: Developing an Action Plan (October 25, 2017)

The final workshop in the series, focused on the key steps agency leaders and staff could take to “operationalize” change and establish a process which maintains a steady course towards roadmap implementation. Agency representatives reviewed a summary of proposed and prioritized actions and agreed to form an ACV Task Force to leverage ongoing input and direction from local government, business, economic development, and academia interests.

Workshop 3 presentations:

» Where We Have Been and Where We Are Going?

Review and report out on overarching themes from Workshops 1 and 2.

Jason Wager, Centralina COG

» What Are Cities Doing Across The Country?

A review of the results from a recent National Cooperative Highway Research Program (NCHRP) survey on ACVs and highlight of the key questions metro areas are asking with regard to planning for ACVs.

Stacy Cook, Cambridge Systematics

» Where Do We Go From Here?

This facilitated discussion is focused on clarifying and confirming next steps and understanding our roles in ensuring momentum around key issues.

Alpesh Patel, Cambridge Systematics

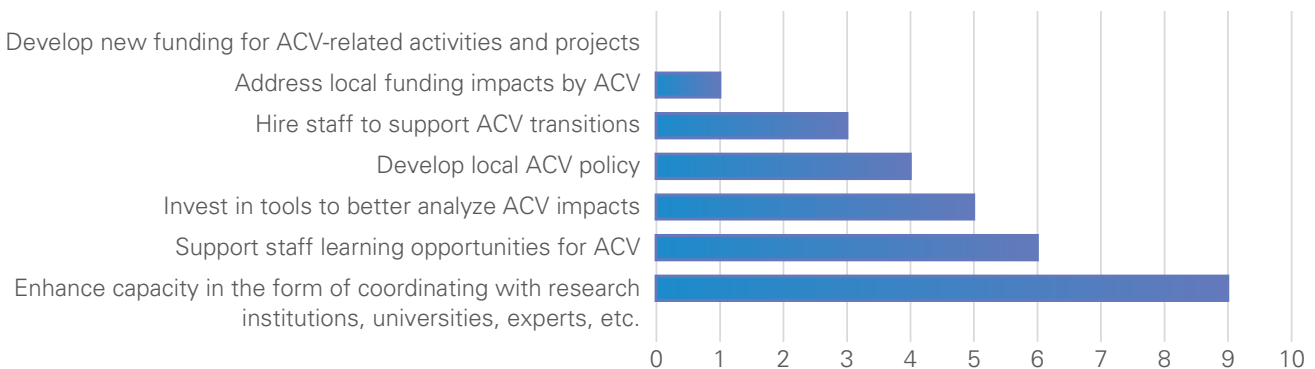
» Closing Remarks

Timeline and implementation opportunities.

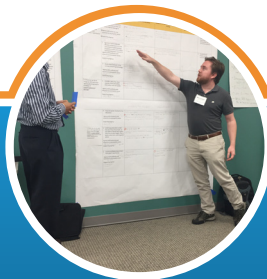
Michelle Nance, Centralina COG

During the Breakout Session, participants selected their preferred topic to discuss. Each breakout group was provided a large matrix that included the key issues identified in Workshop 1, and the priority short-term actions to address those issues, as developed in Workshop 2. The breakout activity first focused on validation of the issues and actions. Next, the groups were asked to brainstorm obstacles to progress for each short-term action, and then identify solutions to overcome those obstacles. Next, the groups converged on timelines for the short-term actions, determining when each should take place in a 1 and 10 year span. Following the morning breakout activity, Alpesh Patel of CS facilitated the report out of the key obstacles and potential solutions to overcome those obstacles. This discussion unveiled common themes in actions, obstacles, and solutions across topic areas. The results of the three workshops is the basis for the **Roadmap Action Plan** matrix.

What one action regarding ACV would you like to encourage within your agency/jurisdiction/organization?



Assessed Preparation for ACVs in Other Cities



Validated Actions



Identified Obstacles to Action and Defined Solutions

Workshop Outcomes: Developing a Roadmap and Keeping the Momentum

The Workshop Series led to the development of key issues highlighted in the **Roadmap Action Plan** (Workshop 1), prioritized actions (Workshop 2) to advance change within those areas, and key steps needed to achieve those actions (Workshop 3). Additional results of the workshops include:

- » Participants initiating preparation of ACVs and consider ways to adapt—both in the short term but also with an eye towards long term.
- » While uncertainty remains, agency representatives identified practice and process changes under their control to build momentum towards adaptation.
- » Participants noted possible barriers which could prevent or slow down change but also identified methods to overcome such challenges.
- » Along the way participants shared their professional perspectives on the realities of making changes and discussed avenues (such as the update of MPO LRTP) to apply those changes. They “discovered” adjustments to agency roles and discussed institutional resources needed to support and sustain change.
- » A replicable approach to conducting similar workshops across the state and nation, enabling peers to develop their own ACV Roadmap.

Flowing from Workshop 3 poll results that overwhelmingly indicated the desire to continue support of regional coordination on this effort (as shown in the word cloud), the group of participants resolved to keep the momentum going around the topic of ACVs. Continued convening of ACV stakeholders would be key to achieving this aim. Therefore, CCOG will develop an ACV Task Force. Its initial task will be to clarify and formalize its charge based on the workshops’ outcomes, time availability among those involved, and resources that can be accessed over the long term.

Along with the development of an ACV Task Force, CCOG has also developed this ACV Roadmap for the region. This document will serve as a critical guiding resource for the Task Force and as an educational tool for those in the region when acting as an ambassador on this topic in communities and among networks.

Finally, CCOG will continue updating the ACV website with upcoming events, interesting news articles, and other important ACV developments and resources impacting the region at this link: <http://www.centralina.org/regional-planning/transportation/autonomous-and-connected-vehicles/>.

Participants’ comments on next steps and actions:



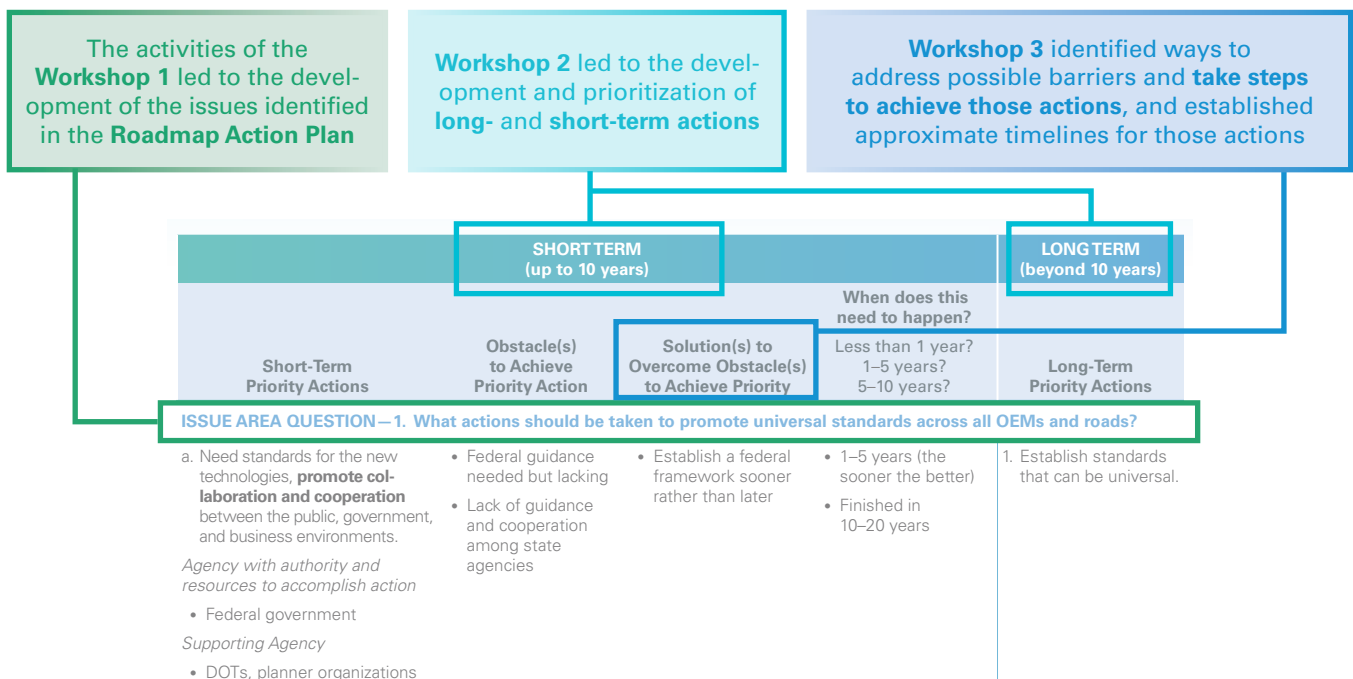
Roadmap Action Plan

The **Roadmap Action Plan** matrix summarizes the outcomes of the workshops—this information does not represent a final detailed implementation plan, but rather focuses on preliminary actions and considerations which the CCOG Regional ACV Task Force and partners can further detail and develop. Given the fast pace of change with ACV technologies, this action plan is anticipated as a living document to be revisited every six months, at a minimum, to update the status of the actions and to identify new and revise existing strategies and actions as needed.

The CCOG ACV Task Force, which is meant to serve for a limited time during this period of technology advancement, will function as the primary custodian of this plan to coordinate partners and to prioritize and advance strategies. However, the **Roadmap Action Plan** is a collaborative effort, and is intended for ownership and use by all partners in the region.

In summary, at a high level these actions include the following themes:

- » **Convene regional stakeholders** to identify organizations and partnerships that can implement key local actions that capitalize on the emergence of ACVs while ensuring the integrity and long-term visions of the region’s growing communities.
- » **Incorporate** ACV in planning studies and documents.
- » **Update tools** to be able to evaluate ACV impacts.
- » **Consider possible implications** of ACV on capital investment needs (e.g., road widenings, parking structures).
- » Continue to seek opportunities to **educate and inform** regional political leaders, agency leadership, and staff.
- » **Provide the voice of the regional perspective** on ACV issues in the state and national conversations on ACV.
- » Identify opportunities to **be partners in pilot tests** for new technologies.



How to Use the Roadmap

To implement the plan, the CCOG ACV Task Force will need to:

1. Review the **Roadmap Action Plan** during upcoming meetings.
2. Prioritize short-term actions for implementation.
3. Self-identify lead agencies and individuals for the first actions to advance.
4. Define a more detailed approach for implementation of these selected actions.
5. Determine and locate resources needed to complete the action.
6. Develop discrete steps to complete the action.
7. Develop a schedule for the actions.
8. Begin implementation.
9. As part of each ACV Task Force meeting, time should be routinely set aside to discuss action and strategy implementation, and enable collaboration to problem solve and identify regional resources to advance actions.
10. Continue development of the action plan for other priority issues identified, including transit integration, ethics and public acceptance issues, and public health impacts.

This **Roadmap Action Plan** builds on and serves as an implementation tool for other planning efforts in the region. As an example, the Greater Charlotte Regional Freight Mobility Plan (2016) includes a number of recommendations related to implementing advanced technologies and Intelligent Transportation Systems (ITS) solutions. For example, one recommendation is:

Expand the use of Intelligent Transportation Systems (ITS), technology, and innovation to improve the flow of freight such as: surveillance systems to identify congestion or traffic disruptions, variable message signing, electronic tolling, and ramp control/metering during peak traffic hours.

A companion strategy in this **Roadmap Action Plan** that supports implementation of that Freight Mobility Plan recommendation is Transportation Planning, 2a (page 17) that recommends investing in IT infrastructure upgrades to handle data storage.

Greater Charlotte Region ACV Roadmap Action Plan

ISSUE AREA: FLEET MANAGEMENT

SHORT TERM (up to 10 years)			LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?

ISSUE AREA QUESTION—1. What actions should be taken to promote universal standards across all OEMs and roads?

<p>a. Need standards for the new technologies, promote col-laboration and cooperation between the public, government, and business environments.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> Federal government <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> DOTs, planner organizations 	<ul style="list-style-type: none"> Federal guidance needed but lacking Lack of guidance and cooperation among state agencies 	<ul style="list-style-type: none"> Establish a federal framework sooner rather than later 	<ul style="list-style-type: none"> 1–5 years (the sooner the better) Finished in 10–20 years 	<p>1. Establish standards that can be universal.</p>
<p>b. Establish a federal/universal framework (guidance) for software and hardware.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> Federal government <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> DOTs, planner organizations 	<ul style="list-style-type: none"> There is a need for effective data management/sharing/formatting 	<ul style="list-style-type: none"> Establish national or global standards 	<ul style="list-style-type: none"> 1–5 years 	

ISSUE AREA QUESTION—2. How to ensure there are short- and long-term requirements and potential retrofits in a mixed fleet environment?

<p>a. Establish a staging and transition plan for baby boomers and others that might be skeptical of new automotive technologies.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners 	<ul style="list-style-type: none"> Lack of public understanding Procrastination 	<ul style="list-style-type: none"> Need public examples and demonstrations of implementation Consider Misenheimer-Richfield pilot shuttle to transport students to downtown 	<ul style="list-style-type: none"> Beginning in 5 years 	<p>1. Education—Need to explore the following questions: When should people not be allowed to drive? Should people be forced into ACVs if they are deemed much safer?</p>
<p>b. Need to have proven safety first; public roads are not testing grounds. Bikes and people cannot be excluded.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners 	<ul style="list-style-type: none"> Need proving ground, lack demo sites 	<ul style="list-style-type: none"> Find opportunities for proving grounds Offer timelines and desired outcomes, not methods 	<ul style="list-style-type: none"> As soon as possible 	

SHORT TERM (up to 10 years)				LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?	Long-Term Priority Actions
ISSUE AREA QUESTION—3. What actions can be taken in the short or long term to transition into mixed fleet use and operation?				
<p>a. Don't over-regulate the testing of ideas. <i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners 	<ul style="list-style-type: none"> Temptation of authorities to over-regulate 	<ul style="list-style-type: none"> Evolve training and government regulations with changing technology 		<p>1. Facilitate the shifting of drivers' responsibilities from a driver to a monitor.</p>
<p>b. Promote training and education for the driving workforce. <i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners 	<ul style="list-style-type: none"> Business as usual with existing motorists, licensing without updated training 			

ISSUE AREA: MODELING AND FORECASTING

SHORT TERM (up to 10 years)			LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?
			Long-Term Priority Actions

ISSUE AREA QUESTION—1. What actions should be taken to address modeling needs for these new technologies? What steps can be taken now and in the long term to adapt assumptions, surveys, and other standard tools for trend analysis?

<p>a. The model is not ready for major changes, but the state can now start developing a plan for it. Data access is a big issue. Need access to the new data source, and need to learn how it can be incorporated.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners 	<ul style="list-style-type: none"> Staffing resources—need people that can adapt data and work with models Need awareness of data needed for models Need right data at right time Lack of policies and assumptions Need multiple scenario models Land use assumptions No data, and will be costly 	<ul style="list-style-type: none"> A lot of data is going to be in the private sector—may need feds or states to require sharing or might need to purchase the data. Private sector might control the data State and federal policies re: data Need to make public aware of the needs for this data to be able to use models Be aware of how the technology is moving and start developing strategies on how to change the model Need to develop scenario models 	<ul style="list-style-type: none"> 1–3 years, will make assumptions about penetration rates Policies as soon as possible Will cost more in the future so get it in place now 	<p>1. Long-term needs: monitoring, scenario testing, and tracking physical effects.</p>
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ISSUE AREA QUESTION—2. What actions can be taken to adapt the approach to model capacity? Short-term capacity will include a mix of traditional vehicles, connected/automated vehicles, and electric vehicles. Long-term capacity might include vehicles sized quite differently from today (such as vehicles designed with capacity to transport only one person).

<p>a. Wait and watch (use existing real-time data resources such as Regional Integrated Transportation Information System (RITIS)). Cannot “jump the gun” because the effects are unknown.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners 	<ul style="list-style-type: none"> Understand mode share Decision to focus on what will happen first. Treat connected vehicles and automated vehicles separately Need to trust the model 	<ul style="list-style-type: none"> Need to study how mass transit would be impacted Be aware of how the technology is moving and start developing strategies on how to change the model Limit mistakes based on outdated/inaccurate assumptions Remember the model is a tool in the planning process—it’s an input! 	<ul style="list-style-type: none"> Ongoing 	<p>1. Develop microsimulations to connect land use and transportation changes, as well as monitoring.</p>
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SHORT TERM (up to 10 years)				LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?	Long-Term Priority Actions

ISSUE AREA QUESTION—3. How can the state evaluate and predict possible mode shares changes? For example, attitudes might change toward transit and other options/more complex multimodal trips.

<p>a. 1) Conduct attitudinal surveys, 2) conduct data analytics on past data, and 3) wait and watch. For the foreseeable future, efforts should be focused on building out scenarios with current models.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners 	<ul style="list-style-type: none"> See above 	<ul style="list-style-type: none"> Be aware of what more urban/progressive cities are doing; conduct research to stay on top of best practices Learn from others due to limited funds Understand impacts/plans for transit (Uber, etc.) Be open to on-demand transit (example of Orlando TNC transit cost sharing) 	<p>(No long-term action identified)</p>
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ISSUE AREA: TRANSPORTATION PLANNING

SHORT TERM (up to 10 years)				LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?	Long-Term Priority Actions

ISSUE AREA QUESTION—1. What ordinances will need to be looked at to prevent unintended consequences?

<p>a. Consider potential for HOT/HOV lanes to be converted into ACV lanes.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> FHWA <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> NCDOT, CRTPO 	<ul style="list-style-type: none"> Would need FHWA approval and NCDOT and MPO as supporting agencies—one obstacles is 77 contract in place—50 year contract Changing driver expectations Repurposing the HOV/HOT lanes (contract issues, change in driver/public expectations) Integration of ACV versus non-ACV vehicles Disadvantages to non-ACV owners (equity and affordability issues) 	<ul style="list-style-type: none"> Study unintended consequences and get public input Consistent public engagement 	<ul style="list-style-type: none"> Now: public engagement Study: 3 years <p>1. Address zoning ordinances, land use, parking requirements, and setbacks. Once ACVs actually happen these can be changed but it would be premature at this time.</p>
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SHORT TERM (up to 10 years)				LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?	Long-Term Priority Actions

ISSUE AREA QUESTION—2. What actions can be taken to address assumptions and collect data regarding future capacity needs?

- What can be done to analyze when changes will take place, how they will impact planning?
- How can the state start capturing data that will provide better real-time and reduced time/cost planning processes?

<p>a. Develop “a plan for the plan” and identify needs such as data needs. Engage in scenario planning, which will be very important.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> • CRAFT (All—MPO/RPOs, COG) <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> • Local governments, research agencies/universities 	<ul style="list-style-type: none"> • Make right assumptions about the data—so many changing concepts • Need coordination • Local government capacity to collect/maintain real-time data • Sharing of third-party data (competition among companies collecting data) • Public acceptance/ethical implications • MPO/RPO staff and members of these agencies on-board and active participation 	<ul style="list-style-type: none"> • Need federal and state requirements—need guidance from top down • Third party data collection • Find funds for “plan for the plan” • State requirement to incentivize planning • IT infrastructure upgrades to handle data storage • Increase public/private partnerships for ACV 	<ul style="list-style-type: none"> • Yesterday 	<p>1. Equity needs to be addressed in the long term in having this kind of technology. Need to proactively determine how all communities can best take advantage of ACV technology. (How can equity be created for all communities?)</p>
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ISSUE AREA QUESTION—3. What actions can be taken to challenge our assumptions on which planning is reliant?

<p>a. Conduct political and educational outreach so that politicians and the public can understand the changes that are coming.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> • To be identified by CCOG ACV Task Force and partners <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> • To be identified by CCOG ACV Task Force and partners 	<ul style="list-style-type: none"> • Determine how to conduct public engagement over a long period of time • Change is hard • So many unknowns to focus “education” • Messaging: constant and right message • Elected official “turnover” • Continued outreach and education: changes and implications; “what does it mean for me?” • Funding to implement changes and mitigate unintended consequences • Getting “elected” to the table 	<ul style="list-style-type: none"> • This should be a standing discussion at MPO and RPO meetings—engage people everywhere possible, such as neighborhood block parties • Demonstration of ACVs for public and elected as part of educational efforts • Local agencies + interdepartmental coordination 	<ul style="list-style-type: none"> • Yesterday 	<p>1. Try to challenge and change assumptions in current models (e.g., do roads keep needing to be built?)</p>
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ISSUE AREA: INFRASTRUCTURE COSTS

SHORT TERM (up to 10 years)			LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?
			Long-Term Priority Actions

ISSUE AREA QUESTION—1. What steps can be taken to transition institutional structures focused on capital planning to future focus on life-cycle cost planning and asset management/operations?

<p>a. Agencies need to inventory what they have so they can know how to leverage it.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> • NCDOT, FHWA, Muni DOTs <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> • RPO/MPOs, consultants, universities, ITRE 	<ul style="list-style-type: none"> • Life-cycle costs—difficult to demonstrate projects • It is hard to know the costs of infrastructure—when you are talking about infrastructure—the costs are changing a lot and people can't see the investment • Who takes the risk first? • Acceptance, especially in rural areas • Shift of capital spending (not seeing the changes) • Knowing potential costs (budgeting) • Training/expenses needed • Broadband issues and telecommunications 	<ul style="list-style-type: none"> • Educated officials that are making investment decisions • Need a public/private investment—probably need state or federal help (e.g., Town of Cary provided person power and some of the infrastructure to partner with private firm that provided the technology—need clear agreements) • Demonstration projects • Transparency (public and private)—promotion • DOT partnering with universities • Re-prioritization of planning projects 	<p>1. Evaluate the costs versus benefits of technology to demonstrate why it is worth the investment.</p>
<p>b. Agencies need to educate officials so everyone is on the same level of understanding (establish a vision and conduct outreach/education around it).</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> • Local governments, universities <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> • COG 	<ul style="list-style-type: none"> • Public-/private-sector relationships • Special interests (commercial) versus public good • Proprietary knowledge and data 	<ul style="list-style-type: none"> • Agreements of sharing information (permissions and limitations), both public/private and transjurisdictional (local, state, federal) • Economy of scale—strengthening new partnerships 	<p>2. Tie benefit/cost analysis into the comprehensive plan.</p>

SHORT TERM (up to 10 years)				LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?	Long-Term Priority Actions
<p>c. Study driver behavior in the context of evolving technology.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> Universities, police, FHWA, SOG <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> Consultants, OSHA 	<ul style="list-style-type: none"> How to measure driver behavior How to fund it (the study of driver behavior) Development of proper models How to enforce 	<ul style="list-style-type: none"> Train police and fire and lobby for legislation to allow government to study behavior—involve the university to conduct studies New engineering standards Re-prioritization of planning projects 	<ul style="list-style-type: none"> Legislation first 	<p>3. Take into account the economic conditions that limit funding.</p>

ISSUE AREA QUESTION—2. What can be done to integrate ACV and local agency planning (and/or funding) of transit/pedestrian/bicycles?

<p>a. Consider safety first, then capacity. Share the safety information with the public.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> Federal transit, grant fund groups <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> Local governments, DOT, bike groups, county, COGs 	<ul style="list-style-type: none"> Educating the public is a big concern—and pedestrian and bikes are now fighting for funding so need to convince proponents of non-motorized transportation as to the benefits of this technology Sharing funding Safety issues—public trust, programming Different safety policies by competing ACV manufacturers 	<ul style="list-style-type: none"> Universities/DOTs/colleges could likely help with this—research and pilot programs to mitigate some risk Sharing information via social media—such as videos of technology to be shared—to inform the public Studies >> data >> facts Federal standards for safety Funding agencies prioritize by: transparency, health benefits, environmental benefits, job creation 	<p>1. Secure funding for software technology to interact between modal groups.</p>
<p>b. Keep the public involved in the discussion.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> Same as #1 above 	<ul style="list-style-type: none"> Public input interest Publicize findings, progress, and challenges Public resistance to loss of individual control Rising costs of car ownership/use (by businesses too) 	<ul style="list-style-type: none"> Automate transit first, and other public vehicles so that people see it first—use transit to demonstrate ACV Education More affordable leasing programs Tax incentives 	

SHORT TERM (up to 10 years)				LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?	Long-Term Priority Actions

ISSUE AREA QUESTION—3. What can be done now, and in the long term, to assess how ACV might impact roadway design, parking requirements and other infrastructure investments?

<p>a. Continuing education is vital. Interact with others that can provide insights. This is both a short-term and long-term action.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> • Planning departments, local government, American Planning Association (APA) and other industry groups, federal and state governments <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> • To be identified by CCOG ACV Task Force and partners 	<ul style="list-style-type: none"> • Too big for local and state government • Switching to electrical = the electrification of transportation (transitioning) • Losing momentum in the market—will ACV themselves be obsolete too soon for big investment? 	<ul style="list-style-type: none"> • Incentivize ride sharing and disincentivize zero occupancy (ZOV) • Improvements to modeling • Federal energy lab work 	<p>1. Continue to work on standard designs, which are super important in the long run.</p>
<p>b. Continue collaborating to learn from peers' experiences.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> • State, COGs <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> • School of Government • Universities 	<ul style="list-style-type: none"> • Time involved • Bringing the knowledge to rural communities • Expertise 	<ul style="list-style-type: none"> • Social media and other online webinars, especially with video • Road shows/ workshops 	

ISSUE AREA: LAND USE PLANNING

SHORT TERM (up to 10 years)			LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?
			Long-Term Priority Actions

ISSUE AREA QUESTION—1. As potential impacts of ACV on land use and population growth are considered, what strategies or actions can be employed to mitigate possible negative impacts (such as isolation or disconnected communities)?

<p>a. Identify the potentially isolated and disconnected communities. Allow more mixed use development in suburban areas. The necessity is more critical in these areas above and beyond good planning practices.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners 	<ul style="list-style-type: none"> Concerns about isolated communities—physically, economically, technologically isolated How will this impact where people choose to live? Level of comfort with technology Underserved areas <p><i>Note: There was general acknowledgment that local government controls land use but there a lot of opportunities to research and support and inform those jurisdictions.</i></p>	<ul style="list-style-type: none"> Education Support entrepreneurial solutions to provide training and education for technologically isolated populations Identify heavy uses, collaborate for ways to improve efficiency Supporting entrepreneurial solutions 	<p>1. Stay vigilant. The communities will change, regulations (like Title 6) will change. Need to stay aware.</p>
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ISSUE AREA QUESTION—2. In what ways can land use planning and ACV be better coordinated to open up more right of way for other modes or to create additional choice for users?

<p>a. Require flexible transportation in site plans. Walk and drop-off stations could be beneficial for ACVs.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners 	<ul style="list-style-type: none"> Carrot versus stick—how do you incentivize results? Uncertainty there—trial and error Local governments’ willingness to modify or be flexible with regulations Businesses’ willingness to change model Transition 	<ul style="list-style-type: none"> Education, case studies, on ground examples Templates, model designs—sharing information Flexibility, openness to innovation, forward thinking 	<p>2. Preserve Right of Way (ROW) for innovative ideas. Don’t know how it will play out but need to ensure that the door is left open.</p>
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SHORT TERM (up to 10 years)				LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?	Long-Term Priority Actions
<p>c. Promote round-about installations instead of signals. ACVs increase round about capacity.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> To be identified by CCOG ACV Task Force and partners 	<ul style="list-style-type: none"> Lots of discussion over parking—including where parking will happen and even width of parking; if getting dropped off—will every building look like a school in a suburban community; how to manage pick up and drop off Discomfort/confusion using roundabouts 	<ul style="list-style-type: none"> Need land use planning to address this Design Education Time 	<ul style="list-style-type: none"> The sooner the better for all issues listed here—reality of decisions being made might be a few years off 	<p>2. Promote road diets depending on the capacity gains and the lack of parking needs—Don't know how much we will need.</p>

ISSUE AREA QUESTION—3. What steps can be taken to increase flexibility in regulatory environments, especially parking, and how can it be transitioned to supportive land use planning in sync with how the fleet evolves?

<p>a. Connect modes (related to the drop-off areas). Support existing modes and prepare for the future.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> Local governments <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> Regional organizations 	<ul style="list-style-type: none"> “Storage” of vehicles when not in use—outlying communities? Zombie vehicles? Drop off queue line—front door versus stations 	<ul style="list-style-type: none"> Pedestrian friendly design of parking structures Redesign of streets and drop off areas Flexible versus fixed features, travel lanes, drop offs/pick ups 	<p>1. Move some parking to the periphery if able.</p>
<p>b. Reduce or eliminate parking (8 foot space reduced to 6.5 foot)</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> Local governments <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> Regional organizations 	<ul style="list-style-type: none"> Parking standards, size, number Public perceptions, desires, expectations, location of parking Managing transitions Parking operations/ owners/businesses Public opposition to reduced parking requirements/ provisions Market shifts, speed 	<ul style="list-style-type: none"> Observing needs Monitoring, reporting, capacity assessment on a regional basis Encouraging flexibility Carrot and stick approaches Re-evaluating standards 	

ISSUE AREA: STATE POLICY AND REGULATIONS

SHORT TERM (up to 10 years)			LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?

ISSUE AREA QUESTION—1. What actions should the state take to ensure that state and local agencies are well informed about ACV?

- **Two state bills passed**
- **Triangle proving ground**
- **Connected corridors by end of 2017 (NC55)**
- **Encourage regional dialogue**
- **Consistency between local and state policy and federal policy**

<p>a. Develop statewide vision and goals, with goals in place so that a website can be set up where a consistent message can be sent to the public. Host regional workshops and presentations.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> • NCDOT, transit agencies <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> • MPOs, cities, RPOs, COGs, transit agencies 	<ul style="list-style-type: none"> • There are different goals of public and private sector • Public acceptance • Developing a consistent message (ability to do so) • Urban/rural divide • Funding • Ability to develop policy and regulations that remain relevant against rapidly changing technology • NCDOT prioritization does not reflect ACVs 	<ul style="list-style-type: none"> • Develop pilot projects to demonstrate technology • Involve the media (and social media) • Develop phasing plan for implementation • State DOT educational campaign 	<p>1. Identify a central contact group in order to keep the message consistent.</p>
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ISSUE AREA QUESTION—2. What regulations, if any, should the state have to ensure ACV improves safety and mobility?

- **Consistency between local and state policy and federal policy**
- **Different private sector profit and public sector acceptance of risk**
- **Unclear roles re: implementing policy—what level of government is responsible?**
- **Cyber security issues**

<p>a. NC has provided regulatory guidance in the state ACV roadmap.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> • NCDOT, transit agencies <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> • MPOs, cities, RPOs, COGs, transit agencies 	<ul style="list-style-type: none"> • Differing priorities (local, state, and private) • Ability to develop policy and regulations that remain relevant against rapidly changing technology • Different private-sector profit and public-sector acceptance of risk • Determining who is responsible for infrastructure • Cybersecurity, vulnerability of data management 	<ul style="list-style-type: none"> • Legislative work group • Uses of technology for more than one use • Public/private partnerships 	<p>1. Need to implement state statutes and recommendations, and make sure that NC is adapting as uncertainties become clear.</p>
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SHORT TERM (up to 10 years)				LONG TERM (beyond 10 years)
Short-Term Priority Actions	Obstacle(s) to Achieve Priority Action	Solution(s) to Overcome Obstacle(s) to Achieve Priority	When does this need to happen? Less than 1 year? 1–5 years? 5–10 years?	Long-Term Priority Actions
ISSUE AREA QUESTION—3. What actions should the state take to ensure a coordinated approach to ACV planning and implementation? Are there actions, events, tools or other resources that the state could provide?				
<ul style="list-style-type: none"> • Consistency between local and state policy and federal policy • Unclear roles re: implementing policy—what level of government is responsible? 				
<p>a. The state has already implemented ordinances, and needs to ensure that there is coordination between the state and neighbors.</p> <p><i>Agency with authority and resources to accomplish action</i></p> <ul style="list-style-type: none"> • Timing re: technology investment between local and state <p><i>Supporting Agency</i></p> <ul style="list-style-type: none"> • Need to address potential for conflict between local policies and state statute 	<ul style="list-style-type: none"> • Need to have a consistent message across the state, especially given urban/rural divide • NCDOT prioritization does not reflect ACVs • Ongoing conflict between administrative roles, local policy and state regulation • Differing priorities (local state, and private) 	<ul style="list-style-type: none"> • Involve media and consider legislative work group—senate bill that put parameters around the AV program in the state and set a requirement for a group to meet starting in December for this working group—meeting four times per year in 2018 <ul style="list-style-type: none"> » Private industry is in the group as well • Federal guidance needed immediately (syncing local, state, and federal policy and these related moving parts can be challenges) • Public/private partnerships 		<ol style="list-style-type: none"> 1. Need a statewide and national standard. Need to dedicate funding to specific projects for planning and implementation.

Glossary

5G: Fifth-generation mobile networks, an upcoming telecommunications standard expected to deliver 10 Gbps and ultra-low latency. See also over-the-air (OTA) updates; vehicle-to-everything communications (V2X).

Artificial intelligence (AI): Intelligence and decision-making that come from a machine, such as an automated vehicle. Often referenced with deep learning; machine learning.

Automated Driving Systems (ADS): Commonly referred to as automated or self-driving vehicles.

Automated Vehicle (AV):¹ Sometimes referred to as “driverless vehicles,” the U.S. Department of Transportation recommends defining automated vehicle technology levels using the SAE J3016 standard, which divide vehicles into levels based on “who does what, when.”

Connected Vehicle (CV): A vehicle that communicates with the Internet (the “Cloud”), other vehicles (vehicle-to-vehicle [V2V]), roadside systems (vehicle-to-infrastructure [V2I]) and/or passengers.

Dedicated Short-Range Communications (DSRC): Similar to Wi-Fi, DSRC is a networking technology that provides the primary basis for communication flows among connected vehicles. Many vehicles today are already “connected” through cellular technology. DSRC offers unique opportunities for fast, secure, and reliable communications, and is not vulnerable to interference.

Floating Car Data (FCD): Is a system using data from vehicles currently being driven. FCD collects data about a vehicle’s movement and location while it is in motion and when it is stationary, e.g., in congestion, at traffic lights or in waiting areas. A data set contains at least a time stamp and the location’s coordinates. In floating car data, cars become mobile sensors or software agents.

Long-Term Evolution (LTE): A mobile standard that allows data transfer rates of between 100 and 300 Mbps, or up to 10 times faster than the 3G network, and can be used to rapidly download HD movies to a car, for example—even while the vehicle is in motion.

Platooning: Multiple ACVs could safely follow in a group, significantly improving aerodynamic performance at highway speeds. Likely to decrease fuel use and emissions.

Real-Time Data: Data that are collected continuously and made available for immediate processing. They include information about vehicles such as current fuel consumption, braking behavior and temperature, and information on the current level of traffic or the state of the road ahead.

Telematics: A combination of the words telecommunications and informatics. It is the means of linking at least two information systems using a telecommunication system and includes sending, receiving and storing information relating to remote objects—like vehicles—via telecommunication devices.

Transportation Network Company (TNC): Sometimes known as mobility service providers or MSPs, connects via websites and mobile apps, pairing passengers with drivers who provide such passengers with transportation on the driver’s non-commercial vehicle. As drivers are removed from the equation by ACVs, questions regarding increased congestion, “zero occupancy vehicles,” and related policies/issues emerge. Examples include Uber and Lyft.

¹ Vehicles with automation levels 3–5 must also incorporate connected vehicle technologies, and are sometimes referred to collectively as “highly automated vehicles” (HAV). <https://www.transportation.gov/sites/dot.gov/files/docs/AV%20policy%20guidance%20PDF.pdf>.

Acronyms

AAMVA	American Association of Motor Vehicle Administrators
ADS	Automated Driving Systems
AV	Automated Vehicle
ACV	Automated and Connected Vehicle
AVL	Automated Vehicle Location
CV	Connected Vehicle
DSRC	Dedicated Short-Range Communications
EV	Electric Vehicles
HAV	Highly Automated Vehicle
ITS	Intelligent Transportation Systems
IoT	Internet of Things
MPO	Metropolitan Planning Organizations
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
OEM	Original Equipment Manufacturer
RPO	Rural Planning Organizations
SAE	Society of Automotive Engineers
SME	Subject Matter Experts
TNC	Transportation Network Companies
U.S. DOT	United States Department of Transportation
V2I	Vehicle-to-Infrastructure
V2V	Vehicle-to-Vehicle
VMT	Vehicle Miles Traveled

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