



TO: ACC-OC Infrastructure and Technology Committee
FROM: Eric Joseph, Policy Analyst
DATE: January 12, 2018
SUBJECT: Connected and Automated Vehicles White Paper (First Draft)

This white paper discusses the current and future impacts of connected and automated vehicles (CAVs) on local municipalities. It lays out practical legal and policy considerations and is intended to help cities make informed decisions regarding CAVs by detailing the benefits and challenges that these vehicles present to local communities.

Introduction

A Chevrolet Bolt maneuvers through San Francisco's Civic Center, traveling past City Hall before seamlessly edging into an intersection on Grove Street. First checking for pedestrians and then for oncoming traffic, the Bolt ultimately makes a left turn onto Van Ness Avenue. Meanwhile, two thousand miles away in Michigan, a Ford Fusion repeats these same driving maneuvers on the streets of Ann Arbor.

At first glance, both cars seemingly have nothing in common aside from adhering to rules of the road, making a left turn, and possessing a single driver. However, with closer examination, these cars have one striking similarity that distinguishes them from most vehicles on the road that day. They are connected and automated vehicles and the individual sitting behind the wheel is a passenger, not the driver.

The Bolt and Fusion safely navigated the busy streets of Ann Arbor and San Francisco, no minor accomplishment as human error accounts for tens of thousands of driver related deaths

each year.¹ CAVs have arrived and increased driver safety is one crucial reason that they are here to stay. Cities throughout California need to begin planning today to prepare for the future.

Since the introduction of the gasoline powered automobile to the United States in the late 1890s, the automotive industry has played an integral role in shaping economic, safety, health, workforce, and land use policies in the United States. This industry, which during the mid-nineteenth century was the largest in the nation, still accounts for approximately \$665 billion of the Gross Domestic Product (GDP) and 1.7 million jobs.² One significant reason that vehicles have remained economically relevant for over a century is the advancements made in the automotive and technological industry.

The development of automatic transmissions and emission reduction engines through the process of fuel injection and supercharging, revolutionized the automotive industry in the twentieth century. In addition to generating billions of dollars for the U.S. economy, these technological advancements helped to shape America, particularly the development of cities. Municipalities responded by creating public policies and infrastructure to address the development of motor vehicles.

Connected and automated vehicles have the potential to transform cities in the twenty-first century. Today's local governments must prepare to examine, create and modify policies to meet the new challenges, benefits, and needs CAVs present. Cities will need an open, creative, and collaborative mindset to maximize the benefits of this developing technology.

Defining Connected and Automated Vehicles

The term “connected and automated vehicle” refers to a truck or car that incorporates aspects of both connected and automated technology (Figure 1).³ When vehicles merge

¹ According to an October 2017 [report](#) compiled by the National Highway Traffic Safety Administration (NHTSA), an agency of the US Department of Transportation, motor vehicle-related crashes claimed 37,461 lives in 2016. In California the number of vehicle related fatalities totaled 3,623.

² [Data](#) compiled by the Bureau of Economic Analysis, a research arm of the U.S. Department of Commerce, states that the nation's Gross Domestic Product (GDP) totaled over \$19 trillion in 2017. The Center for Automate Research [estimates](#) that the automotive industry accounts for 3-3.5 percent of the overall GDP.

³ Examples of connected technology include GPS navigation, cellular connectivity, smartphone linking (Bluetooth, Wi-Fi, etc), infotainment, and telematics. Examples of automated technology include traffic jam assist, adaptive cruise control, lane keeping assist, and automatic emergency braking.

features of both technologies, one capability that is possible is cooperative automation platooning. Such platooning would enable CAVs to reduce traffic congestion, carbon emissions, and travel time. Connected and automated technology are each limited in their current form. Experts think that a combination of both technologies would allow for cities and relevant stakeholders to best capitalize on the many projected benefits of the CAV industry.

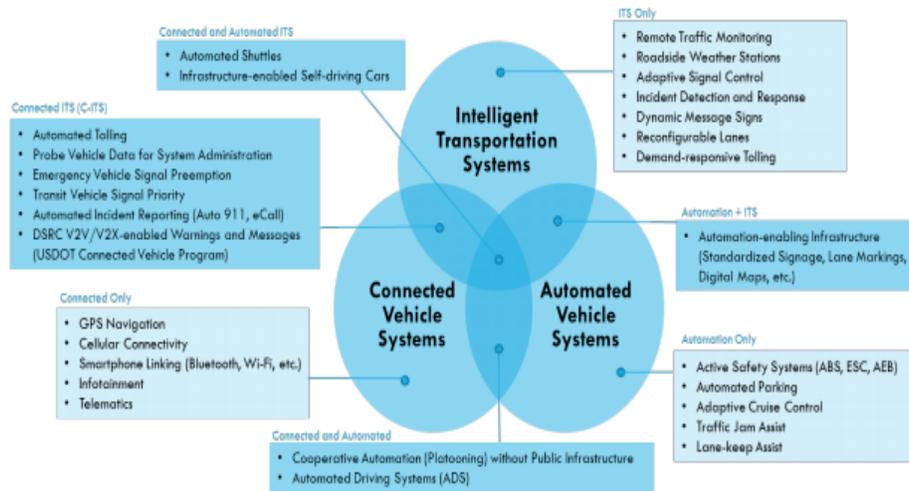


FIGURE 1: Advanced transportation technologies

Eventually, once technology further develops, CAVs are intended to be replaced with level 5 “autonomous vehicles” or “AVs”. These fully autonomous vehicles will no longer need to rely on human drivers, as an Automated Driving System (ADS) will control the vehicle and handle all driving related tasks. For information about the Society of Automotive Engineers (SAE) International’s Levels of Driving Automation for On-Road Vehicles click [here](#).

Benefits of Connected and Automated Vehicles

Extensive research has been conducted on the benefits of CAVs on American society. In most of these studies, the economic potential of the connected and automated vehicle industry is highlighted as a prominent reason that federal, state, and local governments should take a vested interest. Economically, these vehicles are projected to generate trillions of dollars for the federal economy according to many experts. For local governments specifically, CAVs could have a net positive impact on municipal budgets in excess of one-half of a trillion dollars. The value of these vehicles is further strengthened by predictions that they will completely eliminate traffic-related accidents and deaths. The elimination of traffic

accidents directly correlates to annual savings of over \$18 billion, reflecting the healthcare costs from emergency room visits related to minor vehicle injuries.⁴

Increased mobility is another potential benefit of connected and automated vehicles that could positively impact local governments. Statistics show that drivers typically waste 5.5 billion hours stuck in traffic each year, one-third of these hours due to traffic accidents. CAVs are capable of eliminating accidents and lessening congestion; the productivity gained as a result of reclaimed driving hours could boost the Gross Domestic Product by over \$1 trillion.

CAVs also have the capability to stimulate local economies by improving mobility options for non-driving communities such as youth, seniors, and those with disabilities. Increased mobility among non-drivers, which accounts for one third of the population, has the potential to increase spending and facilitate easier access to jobs and educational opportunities in communities. Providing these individuals access to connected and automated vehicles also has important social consequences that local municipalities should not overlook.

Problems with Connected and Automated Vehicles

Despite the data and statistics available highlighting the many benefits of CAVs, potential problems still exist. Security, affordability, job loss, and the decline of public transportation are issues that could arise with the development of these vehicles and technologies. Because these vehicles will need access to networks that must handle significant amounts of data, safeguarding these networks is of utmost importance. The technology employed by CAVs is constantly evolving; cybersecurity threats will consistently present new challenges.

Affordability of connected and automated vehicles is an issue that cities should monitor closely. The lack of affordability raises important social equity and feasibility concerns.

General consensus among experts is that these vehicles will remain unaffordable for the next one or two decades because of production and technology costs.

Job loss and the potential decline of public transportation are other important factors to

⁴ More information on the potential financial impact of connected and automated vehicles can be found [here](#).

consider and are closely linked. According to research conducted by Goldman Sachs, U.S. drivers could see job losses at a rate of 25,000 a month, or 300,000 a year. A bulk of that job loss, according to the report, will be truck, taxi, and public transit operators.⁵ Other studies claim that the entire public transportation industry as currently designed could collapse once these vehicles become more accessible and affordable. Cities need to decide the extent that they prioritize public transportation.

Exhibit 8 Autonomous Vehicle Potential Benefits and Costs

Benefits	Costs/Problems
<i>Mobility for non-drivers.</i> Provide independent mobility for non-drivers, and therefore reduce the need for motorists to chauffeur non-drivers, and to subsidize public transit.	<i>Increases costs.</i> Requires additional vehicle equipment and services, and possibly roadway infrastructure.
<i>Reduced stress, and increased comfort and productivity.</i> Reduce the stress of driving and allow motorists to rest and work while traveling.	<i>Additional risks.</i> May introduce new risks, such as system failures, be less safe under certain conditions, increase crash severity due to platooning and higher speeds, and encourage road users to take additional risks (offsetting behavior).
<i>Reduced driver costs.</i> Reduce costs of paid drivers for taxis and commercial transport.	<i>Reduced security and privacy.</i> May be used for criminal and terrorist activities (such as bomb delivery), vulnerable to information abuse (hacking), and features such as GPS tracking and data sharing may raise privacy concerns.
<i>Increased safety.</i> May reduce accident risks and therefore crash costs and insurance premiums. May reduce high-risk driving, such as when impaired.	<i>Induced vehicle travel and increased external costs.</i> By increasing travel convenience, autonomous vehicles may induce additional vehicle travel and sprawled development.
<i>Increased road capacity, reduced costs.</i> May allow platooning (vehicle groups traveling close together), narrower lanes, and reduced intersection stops, reducing congestion and roadway costs.	<i>Social equity concerns.</i> May have unfair impacts, for example, by reducing the convenience and safety of other modes.
<i>Increase fuel efficiency and reduce pollution.</i> May increase fuel efficiency and reduce pollution emissions.	<i>Reduced employment and business activity.</i> Jobs for drivers should decline.
<i>Reduced parking costs.</i> Can drop off passengers and park away from destinations.	<i>Reduced support for other solutions.</i> Optimistic predictions of autonomous vehicle benefits may discourage communities from implementing more cost-effective transport solutions such as better walking and public transit improvements, and other demand management strategies.
<i>Supports vehicle sharing.</i> Could facilitate carsharing and ridesharing, helping to reduce total vehicle ownership, leveraging reductions in total vehicle travel.	

It is important to first detail federal regulations in order to later address policy solutions.

Federal Legal Considerations

In 1966, the National Traffic and Motor Vehicle Safety Act authorized the U.S. Department of Transportation, through NHTSA, to issue federal motor vehicle safety standards for “motor vehicles” and “motor vehicle equipment.” Once NHTSA has adopted such a safety standard, the federal law preempts the states from adopting conflicting legislation or regulations. State and local government maintain regulatory primacy over the “driver,” whom they regulate through insurance rules, licensing, and common law tort guidelines. States and municipalities can likewise act if NHTSA has not yet adopted a safety standard. connected and automated vehicles disrupt this balance of power however, because vehicle hardware and software can now be programmed in advance to perform tasks formerly within the scope of the driver’s

⁵ <https://www.cnbc.com/2017/05/22/goldman-sachs-analysis-of-autonomous-vehicle-job-loss.html>

control. The distinction between “drivers” and “vehicles” is thereby blurred and so is the key distinction that has been used to allocate regulatory responsibility between states and the federal government for the past 50 years.

As a result, traditional roles that cities and states play in developing safety standards for their citizens are being called into question. The lack of clarity between these levels of government is leading to a policy disruption as connected and automated vehicles do not fit neatly into a preexisting legislative or regulatory safety scheme used for other “motor vehicles”.

The H.R. 3388 SELF DRIVE Act and S.1885 AV START Act of 2017 are the first pieces of federal legislation introduced to provide a regulatory framework for CAVs. They are particularly relevant legislation discussing the role of cities in regulating connected and automated vehicles within their jurisdiction. Section 3 of the SELF DRIVE ACT states that “No State or political subdivision of a State may maintain, enforce, prescribe, or continue in effect any law or regulation regarding the design, construction, or performance of highly automated vehicles, automated driving systems, or components of automated driving systems unless such law or regulation is identical to a standard prescribed under this chapter.” Part A of Section 3 further clarifies that “Nothing in this subsection may be construed to prohibit a State or a political subdivision of a State from maintaining, enforcing, prescribing, or continuing in effect any law or regulation.... on the street within a State or political subdivision of a State... unless the law or regulation is an unreasonable restriction on the design, construction, or performance of highly automated vehicles, automated driving systems, or components of automated driving systems.”⁶

It is important that cities have a basic understanding of these sections because of their potential implications for the near future. Although H.R. 3388 is designed to promote innovation, it immediately undermines this goal by preempting any state or local government from adopting or enforcing “any law or regulation regarding the design, construction, or performance of highly automated vehicles, automated driving systems, or components of automated driving systems,”⁷ even in the absence of a federal motor vehicle safety standard.

⁶ <https://www.congress.gov/bill/115th-congress/house-bill/3388>

⁷ <https://www.congress.gov/bill/115th-congress/house-bill/3388>

This preemption could create a safety gap that will persist for some time. The SELF DRIVE ACT would direct NHTSA to issue a final rule within two years. During this time, state and local government would be unable to create policies that fill this regulatory void.

To date, despite possessing the sole authority to do so, NHTSA has not adopted any mandatory federal safety standards for CAVs. Instead it has issued a series of voluntary policy guidance documents that lay out best practices for car manufacturers. Consequently, if the House legislation is enacted into federal law, CAV manufacturers could use city streets and public highways as their private laboratories however they choose and with no safety protections.⁸ Unless the proposed legislation is amended cities could lose the ability to regulate their own roads.

Cities must be prepared to take action quickly in order to ensure that the federal legislation results in definitions that protect current state and city regulatory capacities. For example, both the House and Senate bill use the term “performance” without providing a definition. This term has far-reaching implications and if NHTSA creates a definition that is too broad, federal government could assume state and city responsibilities. Fortunately local governments still have time to play a role at the policy making table, both in the Senate committee and the conference committee to follow.

State Legislation

California Vehicle Code (CVC) Section 38750 grants the Department of Motor Vehicles (DMV) the power to adopt regulations governing both the testing and public use of autonomous vehicles on California roadways. Since adopting its first CAV regulations, the DMV has worked extensively to refine its connected and automated vehicle regulations, holding multiple public comment periods. The most current regulations were released on November 2017 and can be found [here](#).

Current state CAV regulations which govern municipalities, potentially could be made moot by the passage of federal legislation. Loopholes that would be created by this legislation has

⁸ Consumer Watchdog's Privacy Project Director John M. Simpson laid out this argument in a press release in 2017.

the state in limbo, as it waits for the final decision regarding their role in regulating connected and automated vehicles within the state. Cities and other relevant stakeholders need to work collaboratively with state agencies and the Legislature to define their roles.

Strategies and Policies for Connected and Automated Vehicles

The following recommendations are intended to help Orange County municipalities prepare for the arrival of connected and automated vehicles in their communities. They will focus on solutions that address the benefits, problems, and legal issues detailed on pages 3-8 of this policy paper.

Recommendation 1: Policy Advocacy

The most important and immediate step that Orange County cities should take is to organize at the local and state level to address the potential problems in the currently proposed federal legislation. Actions should include various types of lobbying activities. In order for the advocacy to succeed, it is vital that cities speak with a uniform voice which requires a concrete plan of action. This plan should help shape new federal legislation and safety regulations by:

- 1) Ensuring that the traditional federal partnership with state and local governments continues.
- 2) Guaranteeing that federal legislation establishes limited federal preemption by prescribing specific policies to remain with state and local governments.
- 3) Clarifying the distinction between “drivers” and “vehicles” in federal laws and regulations. A key distinction that has been used to allocate regulatory responsibility between states and the federal government for the past 50 years.
- 4) Creating a clear definition of the term “performance” to further protect the division of power between federal, state, and local governments.

Recommendation 2: City Transportation Goals and Plan

Regardless of the outcome on federal legislation, cities must pre-emptively prepare for connected and automated vehicles by developing short and long term transportation goals. Whether it is increasing mobility, safety, or building the local economy, city planners need to ask themselves what transportation and societal problems they are looking to solve. Should automated vehicles focus on public transportation, public health, traffic reduction, energy savings, active modes of transportation, or other issues? It is essential to identify the role that

connected and automated vehicles will play in future public transit. Once decided, policy advocacy needs to be an integral part of the city's plan.

Recommendation 3: Infrastructure Inventory and Upgrades

Due to their technology, connected and automated vehicles are reliant on municipal infrastructure to maximize safety and mobility. With this in mind, cities should invest the time and resources needed to conduct a thorough infrastructure inventory and develop a plan that works to make connected transportation a reality.

Connectivity is essential for the deployment of this technology; smart cities are based on smart infrastructure. Cities need to be able to gather data in real-time from their Internet of Things (IoT) enabled assets. IoT describes a system where items in the physical world, and sensors within or attached to these items, are connected to the Internet via wireless and wired network connections. Intelligent IoT-enabled transportation systems improve capacity, enhance travel experiences and make moving anything safer, more efficient and more secure by monitoring services related to transportation, such as traffic management, parking, and transit systems. This system must be able to integrate connected and automated vehicles.

To make a connected, smart transportation system a reality cities will need to invest in their technology infrastructure. This could include improving data centers and building physical connected traffic signals and sensors along roadways. Cities, counties, and other relevant stakeholders should also collaborate to build interconnected intelligent traffic management systems that optimize the overall road capacity within a region and between regions.

Rather than reinvent the wheel, cities could take the reference designs for connected and automated vehicle systems provided by the U.S. Department of Transportation and use them to plan and build their technology infrastructure.

Recommendation 4: Workforce Impact Study

The connected and automated vehicle industry is projected to both create and eliminate jobs. In the private sector for example, companies that develop this connected and automated technology are expected to see job gains. Construction companies that create infrastructure for these vehicles are also predicted to experience an influx of new jobs. According to many

experts, most private sectors companies that are transportation intensive will realize productivity gains.

In contrast, private sector companies that depend heavily on existing transportation models could experience significant job losses. With fewer accidents occurring as a result of the adoption of CAVs, automobile repair and maintenance firms could experience reduced business. It is also expected that the taxi industry will undergo further disruptions when ride sharing services, such as those offered by Uber and Lyft, start using the vehicles. These ride-sharing services will in turn experience job loss as connected and automated vehicles begin to replace their human drivers.

This impact on the workforce is not limited to the private sector, as government workers will also be effected. As cities develop their strategic plans for automated and connected vehicles, studies must be conducted as to the impact on their workers. As IT workers become more important to the workforces, cities should develop retraining programs for their employees who will be displaced. Educating employees about the new direction of workforce needs should start early. Retraining should make use of both the private and public sectors. Collective bargaining agreements will also need to be redesigned. Engaging employee representatives in workforce planning, will deflect problems before they occur.

Recommendation 5: Partnerships and Funding

Just when cities are experiencing a landmark shift in mobility trends and developing their long term plans to accommodate these changes, public funding for transportation projects continues to decline. The uncertain nature of transportation funding will require collaboration between public, private, and NGOS. These funding partnerships close collaboration in the planning process. Effective partnerships between the public, private, and NGOS create possibilities for improved service delivery, more effectively developed and maintained infrastructure, and integration of new and innovative modes and technologies into the existing mobility network.

Recommendation 6: Future Issues

Planning and Zoning

Cybersecurity

Health and Safety

Environment

Energy

Federal Relationships

Funding

Conclusion

Connected and automated vehicles pose a variety of challenges for cities due to the ambiguity of their technology and because the long term planning must be built on uncertainty. However, the benefits of these vehicles outweigh the problems and cities must get ahead of this technology and make it an integral part of their future.

The Association is here to help our members adapt to the changing technology. Based on the findings of this paper, the committee should discuss and develops next steps needed to help all of our members with this topic.