



July/August 2019

## Connected and Autonomous Vehicles

### Early Considerations for a Complex Issue

By Dylan Tuttle, Junior Planner, Dutchess County Transportation Council

Connected and Autonomous Vehicles (CAVs) might be the hottest topic in the transportation world, with many professionals and pundits predicting that the technology will bring about a mobility shift akin to the introduction of the automobile. As might be expected with a complex and rapidly evolving technology, there is confusion and uncertainty about what CAVs might mean for our communities, and how those of us in local governance can be prepared. This newsletter addresses the key broad questions surrounding CAVs, and describes what municipalities might expect to see in the coming decades.

### Definitions

The terms *connected* and *autonomous* describe two distinct but related technologies, with different implications for local policy and different market arrival times.

- **Connected** means that the vehicle is getting real-time information from the other cars and infrastructure around it through a wireless network. If someone three cars in front of you hits the brakes hard, your car would know it, and could warn you or even apply the brakes for you. It could also warn you if you're approaching a red light too quickly, or tell you how tight an upcoming curve is. This kind of technology exists and is [already being tested](#) around the country. Within a few years the primary hurdle to its deployment might be funding, not the technology itself.
- **Autonomous** refers to a vehicle's ability to sense the world around it—using a combination of radar, [lidar](#), GPS, sensors,

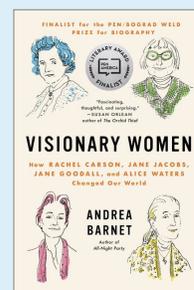
### What We're Reading

Ever wondered what your friendly county planners are reading these days? We've launched this new segment to share interesting books, blogs and more to further spark your interest in the how's and why's of placemaking. We hope you find it inspiring!

Heather's BOOK REVIEW

#### **Visionary Women: How Rachel Carson, Jane Jacobs, Jane Goodall, and Alice Waters Changed Our World**

by Andrea Barnet



This one might seem a bit tangential, but I'm using Jane Jacobs as my "in" for this planning newsletter book review. *Visionary Women* is a well-written examination of the unexpected and decades-long global influence of four "uncredentialed" women who may be household names today, but who were unexpected changemakers in their respective fields back in the 1960s.

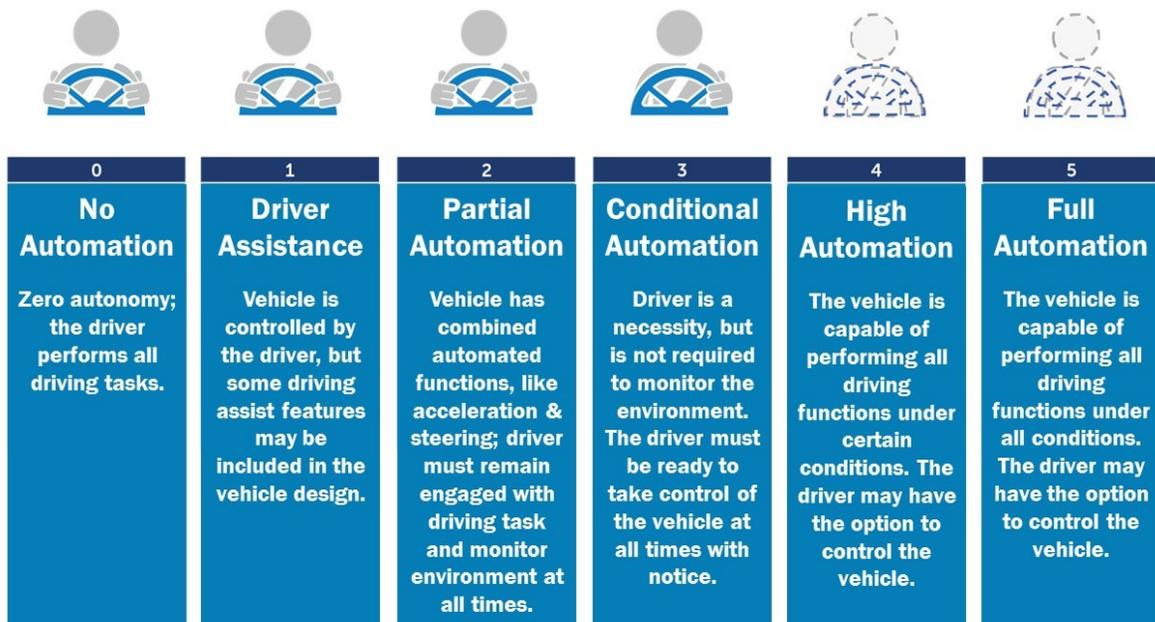
As someone who read Rachel Carson's *Silent Spring* in college and reveres Jane Jacobs as the mother of good city planning, this book caught my eye. Well worth the read, I discovered a fresh perspective from which to view their accomplishments. 1950s America was generally distracted from noticing the social and economic destruction of urban renewal, chemicals reigning over the food supply, and the escalation of a growing global environmental crisis. In Barnet's words, "And then into this blustery, all-male world of patriarchs and company men...walked four

and cameras—and to navigate through it without human assistance. There is a scale of automation that ranges from basics like adaptive cruise control and lane-keep assist, all the way to full autonomy.

For consistency, this article uses the acronym “CAV” to describe the combination of these technologies likely to be found in future vehicles. Many policy questions focus more on the autonomous part of that combination, so you will often see reference elsewhere to the “AV” portion of the technology.

women who saw things differently and were unafraid to say so; four women joined not by friendship, or generation, or even their fields, but by the stunning convergence of their ideas, which, taken together, would not only shape and inform the ethos of the emerging counterculture, but also become the building blocks for today’s progressivism, in effect all but changing our world.”

Listen to an interview with the author on [WAMC’s Roundtable](#)



*The Society of Automotive Engineers (SAE) Automation Levels — Level 3 technology is currently on the market, but it’s an enormous leap to go from level 3 to 4, and then 5. [Image source: National Highway Traffic Safety Administration]*

## Benefits

CAVs have the potential to bring about tremendous improvements in safety, mobility, economic efficiency, and environmental sustainability:

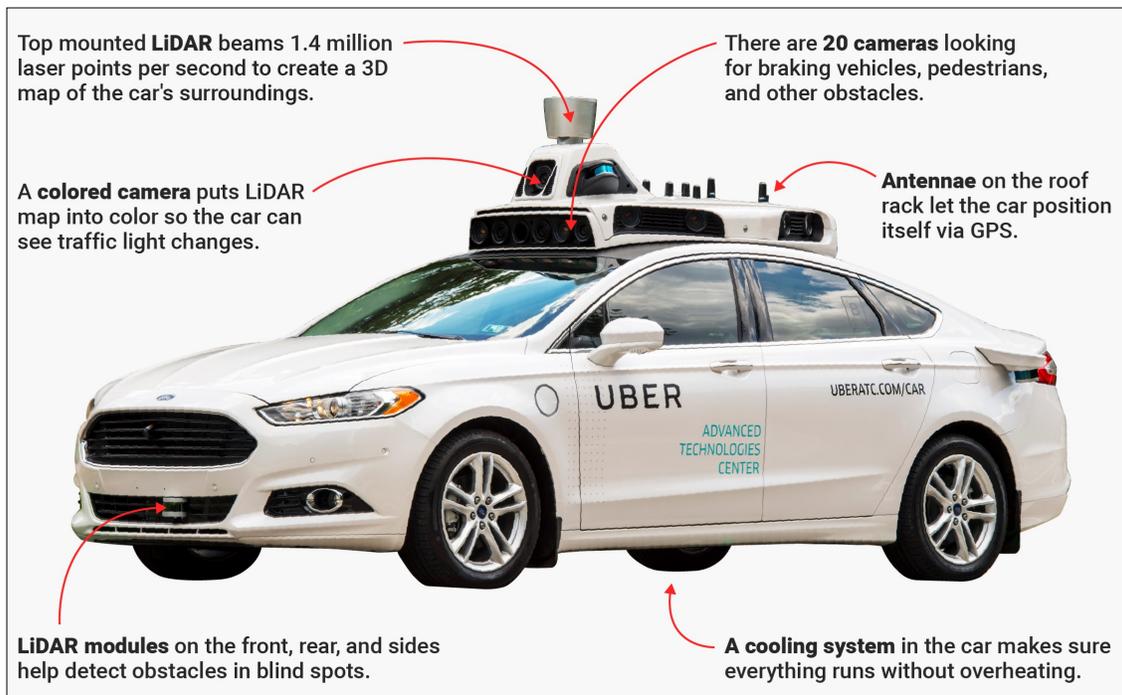
- With 94% of crashes attributable to human error or behavior, CAVs could virtually eliminate one of the leading causes of preventable death in the United States.
- The elderly, young, and disabled could see their mobility increase tremendously if vehicle travel no longer required a driver.
- CAVs are also likely to increase the potential of pooled car services (discussed below); with the costs of personal ownership eliminated, shared cars could improve mobility for millions of lower-income individuals.
- Better traffic flow, [truck platooning](#), and other CAV-centric improvements will enable us to move people and goods faster, increasing productivity.

- Improved traffic flows also have the potential to reduce vehicle emissions, currently the largest source of air pollution. As discussed later, the extent of this benefit will depend on the ways in which CAVs alter our lifestyles and traveling habits.

## An Uncertain Timeline

The transition to CAVs is bound to be uneven, with a wide variety of social, technological, financial, and political factors influencing the timeline:

- The cost of conversion, both public and individual, will be high, slowing adoption and [raising important equity questions](#). The price of vehicles that incorporate these technologies may limit their use to the wealthy at first, while the price of necessary infrastructure improvements (discussed below) may lead to a faster adoption in wealthier and more urbanized communities. That could create problems for CAVs when they cross from a municipality with good CAV infrastructure into one without. Investment at the state and federal level, coupled with a focus on the public transit applications of CAV, will be necessary if we want to avoid those hurdles.



*Self-driving cars rely on a combination of technologies to “read” their environment. [Image source: SFGate via Uber]*

- For automated vehicles, the interim stages between total human control and total vehicle control raise serious safety concerns, with confusion about the limits of this evolving technology [already apparent](#). The public has little tolerance for safety lapses in new technologies, and [a 2018 tragedy in Arizona](#), in which a pedestrian was killed by a “level three” automated car, has already stalled testing once. The timeline of adoption could change dramatically if future safety incidents occur.
- Privacy and security concerns also complicate the discussion. CAVs will inevitably be tracked, and data from them collected, both to improve the technology and to become a commodity in their own right. Careful regulations at the federal and state level will be needed if we want to protect the privacy of individuals and prevent potentially catastrophic security breaches. Such laws are [already being considered](#), but it is an open question if they will be effective or go far enough.

- Finally, not to be overlooked is our attachment to driving. Driving your own car has been seen as symbolic of independence and responsibility for most of a century now. As much as we stress behind the wheel and complain about our commutes, how many of us are going to be willing to abandon that? For many Americans, a transition to CAVs will be as much an emotional shift as a technological one. In fact, our national love of driving may mean that we never go fully autonomous, and that [the coexistence of conventional cars and CAVs will extend beyond the transition period](#).
- One possible reaction to these challenges may be to designate some roads or lanes (existing or new) as CAV-only, while active driving would be required on others, especially throughout the transition years.

### Massive Upgrades to Infrastructure

For automated vehicles to read the world around them, the pavement markings, signs, and signals along our roads [need to be legible](#). Fog lines and center lines might be needed where none were before, [retroreflectivity](#) standards might need to be stricter, and the uniformity of signals and signage across political jurisdictions may need to increase. Here in the north, winter maintenance will also be of particular concern: do we try to clear our roads more quickly, or limit access during and after snow events, or will technology [be able to overcome](#) this problem? By far the largest necessary investment, though, will be in the roads themselves. Overall road quality is considered very important to the proper functioning of CAVs, requiring us to deal with our immense backlog of deferred maintenance and hold our roads to a generally higher standard. One researcher estimates the initial cost of such repairs and upgrades at \$2 trillion.<sup>[1]</sup> The savings from reduced crashes and congestion have the potential to be far greater still, but a new funding model for our infrastructure will be a key component of a CAV transition.



*Line painting and other roadway maintenance will be key for successful CAV adoption. [Image source: NYSDOT Twitter]*

### A New Model of Ownership?

Fully autonomous vehicles could allow individuals access to a car without the costs of private ownership. Instead of buying a car, you could purchase a subscription to a car service. Every morning, it would show up at your door, right when you needed it, to take you to work. You could get another car for a lunchtime trip to the store, and a third would take you home (while a fourth took the kids to soccer practice). No more searching for a parking space, or maintenance headaches, or registration and inspection. Without the need to pay a driver, the cost would be relatively low.

Many researchers believe that such subscriptions will be an important, if not dominant, model of vehicle use in an automated future, at least in urban settings. Private industry [seems to be thinking the same thing](#), and companies like [Uber](#), [Lyft](#), [GM](#) and [Waymo](#) are already positioning themselves to provide that service. Such a model could have many benefits, including a lower individual cost, increased mobility for those who might not be able to afford a car, reduced

parking needs, and fewer overall cars on the road as one subscription car takes the place of several privately-owned ones. Those fewer cars, however, would be on the road more often, potentially increasing overall vehicle miles traveled, and there is speculation that in some circumstances CAVs could even [increase congestion](#), not decrease it. Subscription-style CAVs could also result in more car trips by those who would otherwise have taken transit or another means, much as Uber and Lyft have. At the same time, [transit agencies could also benefit from CAV conversion](#), providing better service for a lower cost. Transit agencies will need to determine what their role should be in this changing mobility framework.

## Land Use Impacts

Perhaps the most important impact of CAVs for local planners and officials is the way they could alter our land use patterns, both positively and negatively. Three overarching changes are likely:

- CAVs will alter our urban streets. With cars providing door-to-door service, far less “convenience” parking in front of stores or along streets may be necessary. Instead, dedicated drop-off zones will be needed, as will off-site garages where unneeded cars can await their next ride. The changed parking dynamic has the potential to transform our downtowns, enabling us to fill the gaps in urban fabric created by surface parking and convert on-street parking lanes into wider sidewalks, bike lanes, or other amenities. At the same time, interactions between CAVs and people walking [could be problematic](#): when walkers know that a car will stop for them, how will their behavior change? And how will we react to that? Will we start enforcing jaywalking laws, or even put barriers up between streets and sidewalks? We spent much of the 20th century cutting people off from the street, with terrible consequences for our downtowns. Will we make the same mistake again?
- If a subscription model really does become popular, the infrastructure of private car ownership is likely to change. Roadside fueling stations (already likely to be altered by the growth of electric cars) may be less necessary if many cars are part of a fleet. Similarly, maintenance and repairs may occur at a fleet auto center, not at traditional auto repair shops. Redevelopment of these auto-centric sites would create a unique opportunity to enliven a downtown or commercial strip, but also pose the challenges common to brownfield sites.
- The primary negative land use impact of automated vehicles is their potential to encourage sprawl development. If you can watch a movie or conduct business during your commute, spending an hour each way in the car doesn’t sound nearly as onerous. The growth of far-flung suburban and rural housing would endanger productive farmland and sensitive ecosystems, increase our climate impact, and damage our downtowns.

## Some Early Steps for Municipalities

Good planning in general is good planning for CAVs. The core principals of modern planning—smart growth and open space protection, investment in multiple transportation modes, flexible downtown parking standards—do not change with the introduction of CAVs, but in many cases they become more urgent.

At this early stage, there are a few important actions for municipalities to take:

- ***Integrate CAVs Into Your Comprehensive Plan*** – Consider how the impacts described here might affect your community. What might the mix of private and fleet cars look like? What kind of infrastructure improvements might be needed? How would a drop-off zone/remote parking scenario affect your centers? How would your current land use controls handle an increase in sprawl pressure? Considering these questions now can enable you to react as changes occur in the coming decades.

*Good planning in general is good planning for CAVs.*

- ***Incorporate Some CAV-Oriented Flexibility into Site Plan Reviews*** – With the rise of Uber and Lyft, some communities are already considering the need for drop-off/pick-up zones in new developments. The importance of these zones will only grow in a CAV future. When evaluating major developments, boards should be considering how the site plan accommodates this evolving use. While it may not be necessary to require a drop-off zone, applicants should be able to describe how the site could be adapted to serve this purpose.
- ***View as an Opportunity*** – While a lot of planning, regulating and funding will be needed, CAVs have the potential to positively impact safety, congestion, land use, and overall access and mobility. The upcoming years, when the technology actually hits the streets, will be an exciting time to be involved in local governance—but [we must begin planning for it now](#).

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[1] Nelson, Arthur C., PhD, FAICP, FAcSS. "Connected." Planning Magazine, May 2018.

## More Information

The volume of material on CAVs is difficult to wade through, but a few resources stand out as valuable for local government officials and planners.

- The [American Planning Association \(APA\) "knowledgebase"](#) page on automated vehicles: This page lists dozens of resources on CAVs, ranging from academic articles and policy guides to sample codes and plans. It is an excellent place to begin your own research.
- [Strong Towns](#): Always an interesting resource, Strong Towns has several worthwhile articles and podcast episodes on CAVs. Two of them are linked above: [a podcast episode](#) about CAVs and equity, and [a provocative article](#) on CAVs' potentially negative consequences for urban streets.
- For Construction Pros' [How Automated Vehicles Will Change Pavement Markings](#) article: This article, also linked in the infrastructure upgrades section above, is an excellent introduction to the roadway changes that will be necessary for CAVs to function properly.
- USDOT's [Preparing for the Future of Transportation: Automated Vehicle 3.0 Report](#): DOT's third CAV report, released in late 2018, lays out the Department's perspective on the technology and government's potential role in its introduction and regulation.
- The APA's PAS Report 592, [Planning for Autonomous Mobility](#): This extensive but readable guide provides an introduction to CAVs, describes their potential impacts, and discusses policy and investment considerations (free to members, \$25 for others).

Click here to [view past issues of Plan On It](#).

This newsletter was developed by the Dutchess County Department of Planning and Development, in conjunction with the Dutchess County Planning Federation.

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