Moving toward policy for new mobility: A guide for cities and states

Summary

Autonomous vehicles (AVs) are a new and potentially disruptive transportation technology—if not carefully planned for—that offers the potential to revolutionize our transportation networks, particularly in cities. While it may seem that the technology is still in its infancy, in reality we are moving towards its full implementation whether cities and states prepare for them or not.

In fact, AVs are already on our roadways, and development of this technology has been proceeding faster than expected, albeit with some pitfalls. Pilot projects exist all over the country. The widespread deployment of AVs is likely not far in the future.

This means that cities and states are at a crossroads in terms of implementation of this technology. They have a period of time of uncertain duration to make preparations for the successful mass adoption of this technology, likely in the not so distant future.

At the same time, we are seeing that travel trends have already been changed by another technology that raises some of the same policy concerns: Transportation Network Companies (TNCs.) The ability to summon a ride at any time with a swipe on one's cell phone has changed how people move around cities large and small. Car ownership is down, curb space is at a premium in popular areas for TNC pick up and drop off, and regulation of TNCs range from non-existent to strict in different cities.

What we may see in the future is the merging of these two technologies. TNCs have an incentive to dispense with the drivers altogether, as they are the most expensive component of the system.

In addition to AVs and TNC, we are seeing the sharing of cars and bicycles, electric scooters, and other new technologies and transportation options that are changing the way we get around; how our streets, curbs, and sidewalks are used; and how we think about mobility. We are calling all these options and issues surrounding them "the new mobility."

The deployment of widespread AVs and increased presence of TNC, as well as AV-TNC mergers, and other forms of new mobility have the potential to hold either positive or negative consequences for states and cities. In this document, we will examine policies that can be enacted in the near term to help make the best of new mobility – and to avoid pitfalls.

What do we want, and want to avoid, in AVs and other forms of new mobility?

Many governmental entities have developed policy goals in this area. Perhaps the crispest version comes from the Urban Mobility Lab at MIT:

- AV development should accommodate the different needs, preferences, and abilities of a community's diverse population.
- AV service should be available and accessible to all citizens, regardless of their income; where they live, work, and play; or the technology they own.
- AVs should contribute to a reduction in transportation-sector greenhouse gas emissions.
- AV rollout should help eliminate fatal and serious traffic collisions.
- AV should be to make walking, biking, public transit, and sharing a ride more attractive.

While this list comes from academia, it encapsulates the general thinking around goals by governments as well. For example, the city of Portland has launch a Smart Autonomous Vehicles Initiative to essentially operationalize the MIT goals. The initiative will:

- Spur innovation and guide this emerging transportation technology to serve community goals;
- Show how autonomous vehicles can advance our Vision Zero goal to eliminate all traffic deaths and serious injuries by 2025. AVs must show that they can and will drive at safe speeds and stop for pedestrians, bicyclists, disabled people, emergency vehicles, red light, and stop signs.
- Prioritize fleet autonomous vehicles that are electric and shared. Shared electric autonomous vehicles are most likely to reduce congestion, climate pollution, and travel. costs for low and moderate income Portlanders;
- Establish a clear permitting process for public or private sector partners to apply to PBOT to test autonomous vehicles at specific times, in specific locations, in Portland;
- Encourage testing new technologies to benefit low and moderate income Portlanders and high value trips like public transit and freight.

What is less clear is how to achieve these goals. Without new policy, for example, AVs could spur greatly increased driving, as they reduce burdens of driving and can even be sent on tasks with no passengers at all. With that increased driving comes additional congestion, curb-space competition, and energy use and emissions.

Maybe less obviously, new mobility is already reducing parking demand and will likely continue to do so. Therefore assumptions about parking capacity and pricing need to be revised.

What follows is an incomplete list of state and local policy considerations and near-term actions that decision-makers can take to begin to address new mobility now, so that when Level 5 AVs arrive we have already built some of the policy infrastructure to address them. Policy recommendations are addressed to states and cities separately, though this distinction does not always hold. For example, while most curb space is city-controlled, state DOTs operate many of the most important arterials in cities as well.

Strategy: Manage travel demand

AVs have the potential to increase both vehicle miles traveled and congestion. Although AVs will be able to operate more efficiently within the existing right of way, possibly leading to less congestion in the short term, when vehicles are able to drive without a human operator, the temptation will be to summon a vehicle, make the passenger trip, and then send the vehicle away until it is needed again. This avoids the current cost of parking in crowded urban environments, but it also significantly increases overall VMT by adding zero-passenger miles. AVs will also lessen the burden of driving for single-occupancy travelers, as riders will be able to work or entertain themselves during trips. We have already witnessed this effect with TNCs. In some cases, cities have found that the entry of TNC have led to increased VMT, because of deadhead trip segments or because TNC trips have replaced transit trips.[1]

There are ways to limit the number of vehicle trips, length of the trips, and demand at peak hour. Making more trips shared and increasing occupancy of each vehicle will make vehicle trips more efficient, but moving many trips to other modes can also contribute to desired outcomes.

Policy lever: Less capacity expansion

Because AVs will be able to operate more efficiently within existing capacity, adding capacity to roadways may not be money well spent. Project selection that keeps more efficient use of existing capacity in mind will avoid wasting scarce funds where they are not needed.

Policy lever: Per-mile pricing based on occupancy

Already states are starting to look at mileage-based user fees or VMT-based roadway pricing to replace fuel taxes. In order to incentivize efficient use of AVs, states can look to basing their VMT fees on the number of passengers in the vehicles. Pricing zero-passenger miles at a steep premium would be a price signal that would keep these trips to a minimum.

Oregon implemented the United States' first road use charge system in 2015 where users prepay their charge through fuel taxes at the pump - and then receive a bill or credit at the end of the month based on how far they drive.

Policy lever: Transportation demand management

In addition to traditional TDM aimed at commute trips and implemented through employers, cities can take the lead by requiring developers of new buildings to contribute to transportation options and improve infrastructure for transit, walking, and biking. SSTI has an accompanying paper that gives examples of this type of TDM in the context of the building approval process.

States can lead by assuring that they do not legally preempt city authority to put these requirements on new developments. States can also assemble best practices and sample ordinances for cities that need help in this area.

[1] https://www.citylab.com/transportation/2017/10/the-ride-hailing-effect-more-cars-more-trips-more-miles/542592/

Policy lever: Disincentivize cruising

One existing mechanism that many cities have on the books is anti-cruising laws. These outlaw any vehicle passing by a location multiple times in a short time period. These anti-cruising laws would not solve all the problems with zero-passenger miles, but they would keep AVs from simply circling until the owner summons it.

Policy lever: Parking pricing and zoning

Although this is related to curb space management—discussed below—parking is its own separate category. All types of parking are controlled in some way by cities, and they all can be used to influence congestion in cities.

Several cities have experimented with dynamic pricing for parking, most famously San Francisco[2]. Cities that have properly priced parking, either by time of day or by geographic demand, find that drivers can find parking more easily in every location without additional circling of the area to find available spots, cutting down on congestion. Drivers are also less likely to drive around looking for spots, because they know both the availability and cost in advance.

States play a role because they may control certain roadways that run through city centers or may prescribe design standards that cities must follow for their own roadways. States can ensure local jurisdictions have control over the design standards for curb space to allow them to innovate solutions to control the curb space.

With AVs, cities will need to decide if they still want parking to be located in dense urban areas or on the outskirts. Locating parking on the periphery saves valuable downtown land, but risks additional VMT as the vehicles will have to travel to and from the parking areas.

Strategy: Encourage more efficient use of vehicles

Besides cutting the number of trips overall, more efficient use of vehicles can cut emissions and congestion and also increase the safety of roads. Efficiency can be measured by both the number of passengers that each vehicle transports, and also by environmental efficiency.

Moving more trips towards shared rides will serve both of these goals. Minimum environmental standards for vehicles will cut emissions.

If future mobility options become all electric, GHGs will inevitably be reduced. However, an EV future is not assured, and there are other levers that states and cities can use now to both prepare for more electric vehicles and to reduce GHGs before EVs become common. In addition, all jurisdictions can use policy levers to incentivize use of electric vs. fossil-fuel vehicles.

Many other groups have written at length about planning for and siting charging stations throughout a state or city, so we will not delve into that. However, all levels of government should be thinking about locations, pricing, and management of EV charging stations.

[2] http://sfpark.org/

States and localities can both also incentivize the creation of electric vehicle infrastructure. All levels of government can require that new public and private parking facilities have a minimum number of electric vehicle charging stations and that new buildings be wired for their eventual installation. Many jurisdictions require new buildings to achieve LEED or another green building standard. Electric vehicle charging stations are often added to many projects to contribute to achieving this goal.

Policy lever: Incentivize shared rides and fleet ownership of vehicles

Fleet ownership of vehicles, whether by employers, cities, or for-profit entities such as TNC will naturally create an incentive to maximize use of the vehicle. TNCs earn more money when vehicles are used more hours of the day, with higher passenger occupancy, but they earn nothing if they are empty. Licensing of vehicles as fleet vehicles instead of individual ownership can serve as an incentive for more efficient use of each vehicle.

Policy lever: Minimum occupancy roads and congestion charging

Another policy lever that can be used is minimum occupancy for certain roads. Just as highways often have high-occupancy lanes, areas of the city or certain roadways may be restricted to vehicles carrying multiple passengers.

Although no U.S. city has yet implemented congestion charges, several have considered it.[3] [4]

In Seattle, the city is considering the following per-mile roadway pricing structure:

- Tier 1 (elevated surcharge): Zero-occupant automated vehicles
- Tier 2 (base surcharge): Single-occupant automated vehicles
- Tier 3 (reduced surcharge): Automated vehicles using smart lanes with less than three passengers
- Tier 4 (no surcharge): Automated vehicles using smart lanes with three or more passengers
- Tier 5 (additional surcharge on Tiers 1–3): Peak travel period surcharge for all nonpublic transit vehicles trips with less than three passengers, including freight[5]

Policy lever: Environmental standards for TNCs accessing high-demand destinations

As TNCs have proliferated, some destinations such as airports have seen more cruising and circling of the area by drivers waiting for passengers. Instead of waiting at a traditional taxi stand, TNC drivers can come and go based on a moment's change in demand. This can cause increases in emissions as vehicles circle.

[3] http://www.hntb.com/HNTB/media/HNTBMediaLibrary/Home/Fix-NYC-Panel-Report.pdf

[4] https://www.seattletimes.com/seattle-news/transportation/seattle-mayor-wants-a-tolling-plan-to-reduce-traffic-congestion-greenhouse-gases/

[5] https://planning-org-uploaded-media.s3.amazonaws.com/document/Autonomous-Vehicles-Symposium-Report.pdf

But some airports have chosen to impose both order on the location of pick up and drop off locations and also minimum emission standards and MPG requirements for taxis and TNCs using the airport property and curb space.

Besides designating specific pick up areas for TNC passengers, the Seattle-Tacoma International Airport (SeaTac) has gone a step farther by imposing strict rules regarding the fuel efficiency standards. While any vehicle operating for one of the three TNCs can drop off passengers at SeaTac, only those vehicles with a fuel efficiency of 45 mpg for Uber[6] and 40 mpg for Lyft[7], based on federal standards, can pick up passengers.

In addition, these drivers must follow staging procedures for pickups that do not allow circling the airport. Drivers are only allowed to pick up a passenger after reporting to an electronic pen on the airport grounds. They are then released based on first-in/first-out assignments.

Strategy: Multimodal integration

Technology has allowed anyone with a smartphone or computer to plan a trip using a variety of modal options, including walking, bicycling, using a bike-share or electric scooter, all types of transit, TNCs, car-sharing, and driving a private vehicle. Even carpooling can be done on the fly. Facilitating access to this information and the infrastructure to seamlessly change modes can lead to fewer vehicle trips and less congestion. However, land use and lack of connectivity can make intuitive changes between modes difficult

States can fund pedestrian and bicycle connections to make active transportation and first- and last-mile connections more convenient and comfortable. Cities can study their accessibility and connectivity to find where gaps occur and plan to fill these critical connections.

On a larger scale, both states and cities can look at building multimodal hubs and places where many modes can be accessed

Finally, either cities or states may want to facilitate technology solutions to bring information on all modal options, locations, and schedules together into a sponsored platform to make it easy to choose an alternative to driving alone.

Policy lever: Increase cooperation between transit agencies and TNCs

Smaller transit agencies are already moving toward using TNC and other on-demand services to replace or supplement fixed-route service. This makes sense for communities where high-capacity transit is not practical due to land uses and existing travel patterns. Instead of running low-occupancy transit vehicles, TNCs may provide an alternative in these areas or at off-peak hours.

[6] https://www.uber.com/drive/seattle/airports/sea-tac-international-airport/

[7] https://help.lyft.com/hc/en-us/articles/115012922967#sea

However, fixed-route transit will still provide the most efficient transportation in denser areas and peak hour. States and cities, or regional transit agencies, can begin to plan now which routes and times are best served by existing transit options and which might be converted to on-demand services and TNCs. In some cases, low-performing transit routes that serve to feed higher capacity lines may be those that are prime for conversion.

One important consideration is that on-demand and TNC rides that replace existing transit still need to be affordable and physically accessible to transit dependent, those without smart phones, or low-income residents as well as those with physical disabilities. In Altamonte Springs, while demand for Uber has skyrocketed, many residents have effectively been shut out of the city's new transit system. [8]

Policy lever: Improve first- and last-mile connections

Another way that transit agencies, states, and cities can reduce potential congestion is by planning an integrated system of alternatives to serve the first- and last-mile connection to existing high-performing transit routes. Although TNCs and other on-demand services may be one option, others exist and are becoming easier to coordinate as technological solutions improve. Examples are bicycle sharing, dockless bikes, e-scooters, and carpool apps. Facilitating the interoperability and seamless integration of these options within a city or region will go a long way toward reducing congestion.

Mobility hubs—a central location that connects various modes of transportation such as transit, bicycles, pedestrians, and vehicle connections such as TNCs—can make these transitions easier. Cities such as San Diego are already investing in them to help provide transportation choices and to bridge the "first mile, last mile" gap.

Mobility hubs "provide a focal point in the transportation network that seamlessly integrates different modes of transportation, multi-modal supportive infrastructure, and place–making strategies to create activity centers that maximize first–mile last mile connectivity."[9]

Policy lever: Provide transportation information

Virginia DOT and Mobility Lab in Arlington partnered to develop Transit Information Displays to allow people leaving employment and shopping centers to see their options, including real-time information on traffic congestion, arrivals and departures of transit, and walking times to transit stops.[10] The company that provided the technology can also provide availability of bike-share bikes, shared cars, and trip times by TNCs.[11]

As part of TDM and traffic mitigation requirements, some cities are also encouraging or mandating that employment centers and large residential developments provide transportation information on available modal options. Developers and building management may also meet

[8] https://www.theverge.com/2016/9/1/12735666/uber-altamonte-springs-fl-public-transportation-taxi-system

[9] http://www.urbandesignla.com/resources/docs/MobilityHubsReadersGuide/lo/MobilityHubsReadersGuide.pdf

[10] https://www.ssti.us/2017/07/real-time-travel-information-better-for-businesses-better-for-travelers/

[11] https://www.citylab.com/transportation/2016/12/a-smarter-way-to-visualize-zillions-of-travel-options/511322/

these requirements by having on-site staff to provide residents and employees with transportation information.

Strategy: Design safer roads

Much has been written about the need to assure that AVs are able to "see" and interact appropriately with pedestrians and bicyclists. Non-motorized users of the right of way will not be carrying sensors or transmitting devices, and it is not realistic or desirable to expect them to be more restricted in their movements than they currently are with human-operated vehicles. Besides the technological requirements that would allow safe interactions between pedestrians, bicyclists, and AVs, states can take the lead in a number of areas that will improve safety for all users.

Policy lever: Focus on multimodal transportation through roadway design

Roadways in the future will look and operate very differently than they do today. One of the first uses for AVs will likely be transit vehicles, since they will operate on a fixed route, one that the vehicle uses every day multiple times.

However, transit—whether with a human operator or as AV-based system—operates most efficiently when passengers can access transit ways easily and safely on foot. Roadway designs that emphasize safe bicycling and walking can both support transit use now and prepare for increased transit use in the future.

NACTO's *Blueprint for Autonomous Urbanism* describes how they believe the roadways of the future will be organized. In their vision, several types of roadways will include transit infrastructure as a prominent feature. For example, multiway boulevards—roadways connecting neighborhoods—will have transitways in the center of the street. Major transit streets will feature dedicated transit lanes. All roadways will include ample space for pedestrians and bicyclists.[12]

Policy lever: Adopt lower speed limits and design speeds

Reducing default speed limits to 25 mph or less in urban areas is another way that cities or states can pursue in the interest of safety. Because AVs will not need to have as much of their movement controlled by traffic signals and will operate more efficiently in general, even with slower speeds, trips may become faster. This will blunt resistance from those who value travel speed.

States can make sure that they have not preempted the ability of cities to set lower, safer speed limits on local streets. In addition, because many state highways become main streets in communities, states can help improve safety goals by working with communities on safer designs and lower speed limits.

States can update design manuals to plan for slower speeds at the local level. Adopted changes to design standards, described above, are another way to force today's human drivers to slow down.

[12] https://nacto.org/wp-content/uploads/2017/11/BAU_Mod1_raster-sm.pdf

While AVs won't necessarily be influenced by visual cues, the critical design changes to our roadways that they bring about will encourage more people to walk, including as they begin and end their trip.

Strategy: Ensure equitable access

Policy lever: Require TNCs to meet geographic and demographic equity rules

Most taxi companies are required to serve all areas of a city and not discriminate based on the origin or destination of the passenger. Likewise, taxis cannot discriminate based on any of the protected demographics within their city or state. States or cities can extend these protections to TNCs or other mobility options that may appear in the future.

Policy lever: Assure that transit and other transportation options serve all populations and areas

Poverty has increasingly moved to the suburbs or the edges of cities, areas that frequently have far fewer transportation options. At the same time, new developments near transit, walk- and bicycle-friendly neighborhoods, and neighborhoods with high access scores to jobs and daily needs are becoming too expensive for transit-dependent residents.

Denver has found that people moving into transit-oriented developments are often more well-off and less likely to use transit. To combat this problem, the regional government has set up a program to preserve affordable housing along transit lines.[13]

Cities can examine their transit services, bicycle- and car-sharing locations, and accessibility scores to assure that areas with densities of low-income, elderly, and people with disabilities are well served by transportation options.

Overarching policy levers

A number of policy levers serve to advance more than one of the goals outlined above.

Policy lever: Project selection

AVs will be able to use existing roadway capacity more efficiently by operating closer together and requiring shorter signal cycles. Adding capacity may not be necessary when planning for new transportation options. However, agencies may want to rethink existing capacity to improve efficiency and safety for transit, walking, and biking as well as emphasizing connections to facilitate multimodal access.

Cities will require updated design standards to prepare for the anticipated transition to AVs as well as today's TNCs, but they will also need the flexibility to serve their residents in appropriate ways. Both cities and states need the authority to test new design standards, as they rethink how roadways will fit their needs. However, states control much of localities' roadway funding and

[13] https://www.ssti.us/2018/07/how-denver-and-seattle-are-working-to-preserve-affordable-housing-near-transit/

design standards. Therefore, it is critical that they do not preempt local innovation, allowing cities to be the drivers in determining how best to accommodates new mobility options.

Policy lever: Changes to parking requirements and use of existing parking facilities

Communities considering building new parking should recognize that TNCs, AVs, and other transportation technology are expected to reduce vehicle ownership in the future. This means that communities may want to consider reducing required parking minimums in their zoning codes for new developments, particularly those projects located in or adjacent to walkable downtowns and town centers. At the same time, cities may need require increased bicycle parking.

Seattle recently passed a package of parking reforms that would require larger residential and commercial developments to unbundle parking from overall rent. The changes also expanded the areas of the city with "frequent transit service," thus reducing the requirement for certain new developments to provide off street parking while increasing requirements for bicycle parking.[14]

The city of Chandler, Arizona has recently created two zoning code changes to parking requirements for new residential developments. Under the first change, if developers are able to show that self-driving vehicles and ridesharing will be used regularly by apartment dwellers, their parking requirements could be reduced by up to 40 percent. Under the second, developers are allowed a 10 percent reduction in parking for each loading-zone space. The city's zoning administrator has the authority to reject a reduction in parking minimums if they feel it would have a negative impact on parking availability in the city.[15]

In addition, partnerships with TNCs such as Uber and Lyft have discouraged some communities from building new public parking facilities. Summit, New Jersey, (a New York City suburb) avoided building a new parking structure at its commuter rail station by instead subsidizing TNC trips between residents' homes and the rail station.

Finally, several recent studies have examined parking facilities of the future, assuming that they will have a smaller footprint than they do today. AVs do not require human drivers to take their vehicle into the parking facility. This means that driving lanes can be narrower and auxiliary features like stairs and elevators can be reduced or eliminated. Instead of today's parking facilities with islands or driving lanes containing two rows of vehicles, AV parking facilities can be designed to hold more than two rows of vehicles per island/lane as long as there is a mechanism to avoid blocking in any particular vehicle.[16]

If states control parking at transit facilities or other destinations, they may want to consider these issues as well.

Policy lever: Taxing TNCs

[14] https://seattle.curbed.com/2018/4/2/17190712/seattle-city-council-parking-reform-vote

[15] https://www.ssti.us/2018/05/cities-and-developers-are-preparing-for-a-world-with-less-parking/

[16] https://www.ssti.us/2018/05/studies-suggest-autonomous-vehicles-will-have-reduced-parking-requirements/

Revenue from fees placed on TNC rides can be used for a variety of uses that can benefit the community at large, such as improvement of transit, TDM programing, or other public improvements.

Chicago first approved a per-ride charge on TNC trips in 2015, the first of its kind in the nation. The $0.52 fee primarily goes into the city's general fund, although a portion goes to pay to make taxis accessible. In November 2017, the city approved a $0.15 increase to that fee, for a total of $0.67. The newly added portion of the fee will directly fund transit, including the Chicago Transit Authority (CTA). This fee is expected to raise $16 million for CTA in 2018 and $30 million in 2019, with an additional $0.05 increase that will come into force. CTA plans to utilize the funding for specific long-deferred maintenance on its rail system, including upgrades to the track, structure, signal and power systems that will help to shorten commuting times and improve the overall reliability of the system.[17] New York and other places have also established similar fees.

States and localities can ensure their tax code is up to date to ensure their tax codes are up to date, reflecting today's proliferation of TNCs. For example, in Georgia a state tax applies to taxi rides but not TNC trips.[18]

Policy lever: Data agreements with TNCs, AV manufacturers, and other stakeholders to achieve goals

Third party data can provide new and more timely—even real time—information on roadways and other infrastructure than cities are able to collect on their own.

TNCs such as Uber and Lyft -- with extensive operations in many urban areas -- should be a natural data partner for cities or states to work with. Uber and Lyft collect extensive data on the vehicle trips taken using their services. However, until recently, getting TNCs to share the data they have collected has been a challenge. Urban planners have said that TNC data could help gauge demand for public transit and parking, traffic lighting syncing, and other uses in the public interest.[19]

Another advantage of data sharing between cities and TNCs is that it can help to standardize data that may be incomplete or inconsistent across jurisdictions. As an example, NACTO's SharedStreets program has partnered with Uber to help share its data with Washington, DC.[20]

States can ensure that localities are authorized and equipped to pursue agreements with real-time data providers such as Uber and Lyft, and cities can wrap data sharing into agreements with TNCs

[17] https://chicago.suntimes.com/chicago-politics/uber-lyft-fees-fund-cta-improvements/amp/

[18] https://www.nytimes.com/2018/02/18/nyregion/uber-lyft-public-transit-congestion-tax.html

[19] http://fortune.com/2017/02/05/uber-data-new-york-city/

[20] https://www.wired.com/story/uber-nacto-data-sharing/

Additional resources:

A number of research centers, think tanks, and writers have begun to cover much of the material that we have amassed here. Below are some of these resources for further reading.

Reshaping Urban Mobility with Autonomous Vehicles Lessons from the City of Boston

The World Economic Forum undertook to imagine how cities would change based on AVs. They tried to find areas where cities will need to develop policy or make changes. They also wanted to help mobility providers by outlining best practices that will lead to cleaner, safer, and more inclusive cities. And finally, they looked at how likely consumers are to adopt AVs and what the impacts of AV adoption would be on city streets. This is based on using Boston as an example, and surveys were conducted with more than 2000 Boston-area residents. The authors looked at both personal and freight trips.

While most of the shift to mobility-on-demand comes at the expense of personal car trips, our analysis also anticipates a slight decline in public transport use across the Boston metro-area. Shorter trips more likely to be completed by mobility-on-demand.

Overall, travel times would be reduced about 4 percent, but this varies widely across neighborhoods. Downtown neighborhoods would actually see a travel time increase, due in part to the substitution of travel-on-demand for transit trips.

What can cities do?

- *Creating occupancy-based pricing schemes: We tested this theory with the simulation and results indicated a 15.5% travel time improvement, compared to the current situation.*
- *Converting on-street parking: The simulation indicates that converting on-street parking will yield a 10% improvement to travel time, compared to current times.*
- *Dedicating lanes for autonomous vehicles: If they could operate in dedicated lanes, travel time could decrease by 8.3%, as indicated by the simulation.*

http://www3.weforum.org/docs/WEF_Reshaping_Urban_Mobility_with_Autonomous_Vehicles_2018.pdf

A Framework for Equity in the New Mobility

From Transform, a California-based group that is dedicated to walkable communities, transportation choice, affordable housing, and climate solutions.

The report, released in 20117, looks at solutions to avoid exacerbating the problems that the current transportation system has created for low-income and communities of color. As new mobility options appear, what are the equity questions that come with them and how can we work toward more equal access?

Several early examples show that these new options may exacerbate unequal access. For example, suburban bus operators are now turning to TNCs to help provide service, which may be too costly for lower income riders, and many car share and bike share systems are unavailable to people who are unbanked or don't have smartphones. As automated or "driverless" vehicles become more widespread, the impact of new mobility models will increase dramatically. What will this mean for disadvantaged communities?

http://www.transformca.org/sites/default/files/A%20Framework%20for%20Equity%20in%20New%20Mobility_FINAL.pdf

Automated Mobility Policy Project (MIT)

Research and policy center at MIT that is looking at the implications of the convergence of AVs, TNCs, and electric vehicles.

Through the Automated Mobility Policy (AMP) Project, JTL researchers bring together urban transportation planning, public policy, engineering, and behavioral science to analyze this revolution, by understanding how humans and policies interact with transportation technology: 1. Examining the formation processes of people's preferences for autonomous vehicles; 2. Embedding shared AV services within the public transportation system, through the integration of information, price, operations, and institutions; and 3. Envisioning how municipal governments can devise AV policies to produce more equitable, sustainable, efficient, and livable cities.

https://mobility.mit.edu/av

Rethinking the street in an era of driverless cars

The University of Oregon Sustainable Cities Initiative has a nice report on some of the ways cities may want to reuse and redesign the public right of way in an era of AVs.

This policy paper focuses on the primary concept of the street as space that can be repurposed – real estate that can be allocated in similar or different ways than done currently. Cities generally refer to this publicly owned and regulated space from one side of the street to the other as the right of way (ROW). Our focus is on the centrality of the ROW in dictating many other community functions and values – transportation and otherwise. And our particular bias is to focus on the opportunities that AV technology is likely to create to rethink how the ROW is allocated, so that our communities can meet their substantial and unique environmental, social, and economic challenges. This perspective is distinct from many other current publications and reports that have expounded on transportation innovations or revolutions that are occurring in parallel with the evolutions of autonomy and artificial intelligence.

https://urbanismnext.uoregon.edu/files/2018/01/Rethinking_Streets_AVs_012618-27hcyr6.pdf