Witness Testimony

U.S. HOUSE OF REPRESENTATIVES COMMITTEE ON TRANSPORTATION & INFRASTRUCTURE, SUBCOMMITTEE ON HIGHWAYS AND TRANSIT

Hearing: The Road Ahead for Automated Vehicles

Nico Larco, Director and Professor
Urbanism Next Center, University of Oregon
February 02, 2022

Chair Norton, Ranking Member Davis, and Subcommittee Members, thank you for this opportunity to testify on the future of automated vehicles and the impacts they could have on communities throughout the country.

My name is Nico Larco and I am a Professor of Architecture and Urban Design as well as the Director of the Urbanism Next Center at the University of Oregon. Urbanism Next is a cross-disciplinary center focused on understanding the impacts that emerging technologies such as automated vehicles (AVs), new mobility, and e-commerce are having and will continue to have on communities. Our focus is not on the mechanics of the technologies, but rather on their impacts on land use, urban design, building design, transportation, and real estate, and why these impacts matter for equity, health, safety, the environment, and the economy. We work extensively on these topics with cities and states throughout the country, as well as with private sector partners who are developing or deploying emerging technologies, professional organizations, other research organizations, and foundations. We have found a tremendous interest, across all these organizations, in understanding AVs' impacts and how to shape the deployment of emerging technologies to help achieve equity, sustainability, and economic goals.

Our country is at the earliest stages of developing AV technology and testing its performance in real world situations. What we don't know about AVs at this moment far outweighs what we do know about them and how they will impact our communities. One thing that is certain is the need to pay attention to AVs' transportation impacts as well as the cascading impacts they will have on communities. This includes issues such as safety, accessibility, congestion, equity, environmental, and land development impacts.

AVs are not just another vehicle – in the same way that over a century ago cars proved to be not just a different horse. I will describe how AVs might create cascading impacts beyond moving people and goods, and how they have the potential to substantially reshape our communities. The current degree of unknowns around this innovation, and the potential scale of impacts, suggests caution in the speed of AV deployment, a need for substantial pilots and research focused on cascading impacts, a need for federal, state, and local governments to work together on AV regulatory preparedness, and information sharing between all levels of government, the private sector, researchers, and concerned stakeholders.

Transportation Impacts

AVs have a strong potential to impact travel behavior, mode choice, and freight movement which would have a profound effect on congestion, parking, transit, and travel costs.

Congestion – While it is difficult to know the exact future impacts AVs will have on congestion, we do have insights that can guide us. We can think of ridesharing companies such as Uber and Lyft as proxies for future AV deployment. Both follow a similar model of calling a vehicle, having it pick-up a passenger, driving them to their destination, and then leaving to serve another trip. Studies on ridesharing's impact on congestion have shown that it leads to sizable inefficiencies as cars travel substantial distances without passengers onboard as they travel to pick up passengers and then reposition themselves after a drop-off.[i] With ridesharing, these 'empty vehicle miles' or 'zombie miles' are approximately 40% of total vehicle miles travelled (VMT).[ii] A study in San Francisco found that between 2010 (when ridesharing companies were introduced) and 2016, ridesharing contributed to a 62% increase in hours of delay.[iii] We suspect shared AVs will follow these same patterns and that owners of private AVs could have similar 'empty vehicle mile' impacts as they send cars to run errands, pick up other family members, or simply have a car drive around the block while they complete a task. AVs could potentially reduce some of this impact on congestion if they are able to increase travel flow by reducing stop-and-start behavior. However, an AV future that does not have controls in place could exacerbate the congestion trends we are seeing with rideshare, putting increased strain on our transportation system.[iv] This would impact infrastructure costs, the environment, and economic output.

Parking – AVs could reduce the demand for parking as vehicles drop off passengers and move on to their next trip instead of needing to be parked. Shared AVs in particular are predicted to reduce parking demand by as much as 90%.[v] Considering rideshare as a proxy for AVs, we are already seeing a 19.7% reduction in parking per passenger at airports due to high rates of ridesharing use.[vi] Changes in parking demand can have significant impacts on cities as parking is currently the largest single land use in urban areas as measured by surface area.[vii]

Transit – AVs have the potential to complement transit and/or compete with it, as we are finding with rideshare. On the one hand, AVs could be a boon to transit if the technology is applied to transit vehicles, adding technology costs, but reducing operating costs due to the reduced need for drivers. Labor currently represents up to 60% of transit agency expenditures.[viii] Eliminating the need for drivers would have serious labor consequences but could also potentially create savings that increase frequency of service and service area expansion. On the other hand, riders who can afford it may use personal or rideshare AVs in place of transit, reducing overall transit ridership and leading to a reduction of service frequency and coverage.

Travel Costs – Travel costs could change substantially with AVs. Increased technology and maintenance needs will potentially increase travel costs, while insurance, parking, and fuel cost

savings could bring costs down. The overall scale or final direction of impacts are yet unknown but estimates for future AV travel ranges from $0.60 -$1.00 per vehicle mile for privately owned AVs, and $0.50 to $1.00 per vehicle-mile for shared AVs. While this is considerably less than current rideshare or taxi vehicle-mile costs, it is substantially more than personal vehicle costs or public transit fares ($0.20 - $0.60 per passenger-mile).[ix]

Cascading Impacts

AVs are not only a transportation issue as their transportation impacts will have cascading impacts across communities. The attached Urbanism Next Framework describes some of these impacts across a range of domains and we further elaborate on these topics in our Multilevel Impacts of Emerging Technology on City Form and Development Report (based on Urbanism Next's NSF Smart and Sustainable Communities Grant).[x] Below we highlight cascading impacts on sprawl, government revenue, the environment, land and development opportunities, and equity.

Sprawl - A large question with widespread AV deployment is how it might impact metropolitan footprints and sprawl. The average commute in the US is approximately 27 minutes in each direction.[xi] AVs promise to reduce the friction of travel as they will purportedly move faster along freeways and arterials, while at the same time giving occupants the ability to do more while they commute as they do not need to drive themselves. With this, individuals might be willing to move farther out in search of less expensive housing, opening exurban areas to development, and increasing pressures on sprawl. This, of course, accelerates the conversion of agricultural lands, natural resource lands, and habitat areas into housing and urban development, impacting the environment, infrastructure costs, and equity.

Government Revenue – Not only might AVs cost riders more, they could also significantly impact the revenues of governments that use fuel tax, vehicle registration, licensing, parking fees, and traffic citations to fund transportation infrastructure and operations.[xii] A study conducted by my colleagues at the University of Oregon found that revenue losses could be between 3 and 51% with the direst predictions being for cities that heavily depend on fuel taxes and parking fees to fund transportation.[xiii]

Environment – AVs could create both benefits and challenges for the environment. For instance, as previously mentioned, expanded sprawl could significantly increase land consumed by urban development, destroying existing habitat, disrupting natural water systems, and putting more people at risk of wildfire in the wildland urban interface. Regarding energy, AVs have the potential to reduce energy consumption by accelerating the shift to vehicle electrification, and increasing opportunities for platooning, route efficiency, and the elimination of stop-and-go driving behavior.[xiv] Increases in the number of trips taken and the total amount of vehicle miles travelled, however, could dampen these impacts. Depending on the overall scale and direction of energy use, AVs could shift greenhouse gas (GHG) emissions and particulate pollution.

Land Value and Development Opportunities – Reduced parking demand could lead to existing parking areas becoming available for development. Parking requirements often limit how much housing developers can put on a given parcel. More and more communities across the US are choosing to prioritize space for people instead of cars through the reduction or elimination of those requirements. AVs could provide an attractive option for getting around without a personal vehicle, opening up these parcels to development.

AVs could also lead to an increase in the density of development possible on a given parcel as parking provision would no longer limit how many units of housing could be built. Reducing the need to build parking can also reduce the cost of development, increasing the affordability of housing, for instance, and increasing the number of projects that are economically viable. This might impact both urban and suburban areas, with greater impact in areas with the greatest amount of existing parking. The ability to redevelop land currently dedicated to parking could radically increase the land available for development, reducing the cost for that land.

Equity Impacts – AVs have the potential to increase road safety, an important equity concern as traffic crashes disproportionately impact low-income Americans[xv] and carry a heavier burden in terms of the costs of recovery from crashes. AVs impacts on accessibility, however, is not yet certain. Accessibility will be determined by issues such as the cost of trips and vehicles, if vehicles serve all areas of a region, if they physically accommodate users who are disabled, if users are sufficiently tech enabled, and in the model of shared vehicles, if users are banked and have access to digital banking. Research we conducted with the RAND Corporation for the American Association of Retired Persons (AARP) specifically pointed to these types of issues creating substantial barriers to AV use by older adults.[xvi] These barriers are not insurmountable, and many researchers and leading AV and rideshare companies are working on solutions to them, but firm solutions are by no means clear at this point.

Recommendations

To address the issues and challenges described above, we suggest the following recommendations to help shape AV deployment in ways that can support community needs:

1. **Fund Pilots Specifically Focused on the Cascading Impacts of AVs** – Pilots are an effective way of learning about the impacts of deployment and both the benefits and unintended consequences they might have. It is critical that pilots not only focus on technological developments, efficiency, and safety, but also focus on the operational impacts and the cascading impacts autonomous vehicles will have on communities. These pilots should also not only focus on large cities, or predominantly on the wealthy areas of these cities, but instead should also include mid-sized, small, and rural communities. These pilots should specifically include low-income areas, areas with poor transit access, and areas with a high number of older adults. If these communities are not included in the testing and piloting of these technologies now and we are not able to understand the impacts AVs will have on them, these communities will be ill prepared and will likely suffer adverse impacts from AV deployment in the future.

For example, in pilots funded by the Knight Foundation, the Urbanism Next Center at the University of Oregon, along with Cityfi, is working with cities across the country to understand how AV deployment might impact communities and how to best engage vulnerable communities in these conversations. These types of pilots, that go beyond the technical aspects of AV deployment, provide needed insights about what it will take to ensure that the benefits of the technology are felt by all. Additionally, these pilots allow government agencies to learn more about the technology before adopting potentially far-reaching legislation without a nuanced understanding of both the opportunities and challenges.

The inclusion of the Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Program in the IIJA is an excellent start, but this program is focused primarily on transportation efficiency and safety and not on the range of unresolved cascading impacts I have described earlier. We would encourage the expansion of the program, or the development of a new program of pilots that focus on the cascading impacts of autonomous vehicles. Pilots should be sure to include a range of AV vehicle types including passenger cars, SUVs, vans, busses, shuttles, and delivery vehicles including trucks, delivery vans, and drones.

2. **Support Research on the Cascading Impacts of AVs** – While AVs are in an early stage of deployment, we are in an even earlier state of properly understanding the impacts of AV deployment. Much research has been done on AV technology and on the transportation impacts, but what is largely missing and much needed is an understanding of AVs' impacts on land use, urban design, building design, and real estate – and an understanding of the implications this will have on equity, health, the environment, and the economy.

   The 'Center of Excellence for Automated Vehicles and New Mobility' in the IIJA is a promising step forward and we are thankful to Rep. Blumenauer who first presented the PLACE Act language that was the basis for this Center. We are also heartened with the launch of programs such as the Inclusive Design Challenge by USDOT. We encourage an expansion of these types of programs to give us the knowledge we need to make informed decisions that can maximize the benefits of AVs while eliminating or minimizing potential negative impacts.

3. **Assist Local Governments and States with AV Regulatory Preparedness** – Local governments and states are just beginning to understand the need to manage AV deployment in a way that can serve community goals. This encompasses not only enabling regulations (such as permitting, infrastructure, insurance, and emergency response policy), but also understanding governmental roles in how to best steer deployment. This includes understanding how best to conduct public education and engagement, how to leverage governmental roles in the shaping of the AV market, how best to develop relationships with private sector AV service providers, how to mitigate

externalities such as potential congestion on roads and at the curb, and how to establish a healthy AV ecosystem.

Local governments and states also need guidance on how to create tools and incentives to support equitable deployment through mechanisms such as vehicle accessibility requirements, service coverage requirements, and ride reservation and payment options. Cities and states are also interested in how best to utilize fees, taxes, vehicle occupancy requirements, and vehicle miles traveled maximums to achieve community goals. Additionally, cities and states need assistance with setting data standards and data sharing protocols, addressing curbside management, and understanding what infrastructure investments are most beneficial to their communities. (See the attached 'Summary of Tools and Levers for Shaping AV Outcomes' table. This table is adapted from Urbanism Next's report with Cityfi, funded by the Knight Foundation, which includes a more expansive discussion of regulatory issues around AV deployment).[xvii]

4. **Organize and Lead a National Dialogue on AV Impacts and Community Needs** – In our work with federal, state, and municipal governments, private sector companies, and research, professional, and advocacy groups, we hear a consistent desire for forums to organize and share research and best practices on the many aspects of AV deployment. There is a general understanding that the successful deployment of AVs, in both a societal sense and a business sense, will require the cooperation of the public, private, advocacy, and academic/research sectors. The federal government and particularly the USDOT, HUD, EPA, and DOL are all well positioned to partner with national organizations to lead this type of effort.

   As an example of helping create a national dialogue, Urbanism Next has held an annual conference since 2018 focused on the cascading impacts of technologies such as AVs. We have done this in partnership with the American Planning Association (APA), the Urban Land Institute (ULI), the American Institute of Architects (AIA), the Oregon Chapter of the American Society of Landscape Architects (ASLA), and numerous other private and public sector partners. This last year – with support from NUMO and in partnership with POLIS and TNO, the conference expanded to Europe. There is widespread interest in better understanding the impacts of AV deployment.

   Urbanism Next, also with funding from NUMO, has also developed the NEXUS (https://www.urbanismnext.org/the-nexus) – a one-stop resource for communities, elected officials, private sector companies, researchers, and other stakeholders interested in learning about the cascading impacts of AV deployment. As an example of the interest in these topics, the site has been visited over 100,000 times in the last year alone.

   Contrary to what may have been the landscape a few years ago, many private sector companies are interested in engaging in these topics and see developing alignment between their goals and community goals as a benefit to their business models. We

need to help develop these conversations and build trust so that the best aspects of emerging AV technologies are the outcomes we ultimately attain in our communities.

In closing, we believe we stand at this moment in a situation not dissimilar to where our country stood when the first automobiles were rolling onto our streets over a century ago. Imagine if, at that moment, we had the foresight to consider how automobiles would be used throughout the country, the benefits they could deliver, and also the problems they might create. Imagine if we could shape early deployment and the eventual design of our cities and streets to help reduce congestion, increase accessibility, limit sprawl, and increase equity.

Our AV future is not preordained, it is ours to shape. But we can only adequately shape the future if we understand not only the technical requirements of AVs or the regulations enabling deployment, but also the cascading impacts AVs will have on our communities, and the regulations, tools, and levers we can use to shape deployment to support community goals.

This testimony was prepared by Nico Larco, Becky Steckler, and Amanda Howell of the Urbanism Next Center at the University of Oregon.

Urbanism Next Center - http://urbanismnext.org/

References:

[i] Bruce Schaller, "The New Automobility: Lyft, Uber, and the Future of American Cities" (Schaller Consulting, July 25, 2018), http://www.schallerconsult.com/rideservices/automobility.htm.

[ii] Melissa Balding et al., "Estimated TNC Share of VMT in Six US Metropolitan Regions (Revision 1)" (Fehr and Peers, August 6, 2019), https://drive.google.com/file/d/1FIUskVkj9lsAnWJQ6kLhAhNoVLjfFdx3/view.

[iii] Erhardt Gregory D. et al., "Do Transportation Network Companies Decrease or Increase Congestion?," *Science Advances* 5, no. 5 (n.d.): eaau2670, https://doi.org/10.1126/sciadv.aau2670.

[iv] Tom Cohen and Clémence Cavoli, "Automated Vehicles: Exploring Possible Consequences of Government (Non)Intervention for Congestion and Accessibility," *Transport Reviews* 39, no. 1 (January 2, 2019): 129–51, https://doi.org/10.1080/01441647.2018.1524401.

[v] Wenwen Zhang and Subhrajit Guhathakurta, "Parking Spaces in the Age of Shared Autonomous Vehicles: How Much Parking Will We Need and Where?," *Transportation Research Record* 2651, no. 1 (2017): 80–91.

[vi] Transportation Research Board and Engineering National Academies of Sciences and Medicine, *Rethinking Airport Parking Facilities to Protect and Enhance Non-Aeronautical Revenues* (Washington, DC: The National Academies Press, 2021), https://doi.org/10.17226/26091.

[vii] Donald Shoup, *The High Cost of Free Parking*, Revised edition (Planners Press, 2011).

[viii] MacPherson Hughes-Cromwick and Matthew Dickens, "2019 Public Transportation Fact Book" (Washington D.C.: American Public Transportation Association, April 2019), http://apta.com/wp-content/uploads/APTA_Fact-Book-2019_FINAL.pdf.

[ix] Todd Litman, "Autonomous Vehicle Implementation Predictions: Implications for Transport Planning" (Victoria Transport Policy Institute, December 17, 2021), https://www.vtpi.org/avip.pdf; Ashley Nunes and Kristen D. Hernandez, "Autonomous Taxis & Public Health: High Cost or High Opportunity Cost?," *Transportation Research Part A: Policy and Practice* 138 (August 1, 2020): 28–36, https://doi.org/10.1016/j.tra.2020.05.011; Bureau of Labor Statistics, "Per-Mile Costs of Owning and Operating an Automobile (Current Dollars) | Bureau of Transportation Statistics," 2020, https://www.bts.dot.gov/content/mile-costs-owning-and-operating-automobile; Junia Compostella et al., "Near- (2020) and Long-Term (2030–2035) Costs of Automated, Electrified, and Shared Mobility in the United States," *Transport Policy* 85 (January 1, 2020): 54–66, https://doi.org/10.1016/j.tranpol.2019.10.001.

[x] Amanda Howell et al., "Multilevel Impacts of Emerging Technologies on City Form and Development" (Portland, OR: Urbanism Next Center, January 2020), https://www.urbanismnext.org/resources/multilevel-impacts-of-emerging-technologies-on-city-form-and-development.

[xi] Charlynn Burd, Michael Burrows, and Brian McKenzie, "Travel Time to Work in the United States: 2019," *American Community Survey Reports, United States Census Bureau* 2 (2021): 2021.

[xii] Benjamin Clark, Nico Larco, and Roberta F. Mann, "The Impacts of Autonomous Vehicles and E-Commerce on Local Government Budgeting and Finance" (University of Oregon, August 2017).

[xiii] Rebecca Lewis and Benjamin Y. Clark, "Retooling Local Transportation Financing in a New Mobility Future," *Transportation Research Interdisciplinary Perspectives* 10 (June 1, 2021): 100388, https://doi.org/10.1016/j.trip.2021.100388.

[xiv] Pantelis Kopelias et al., "Connected & Autonomous Vehicles – Environmental Impacts – A Review," *Science of The Total Environment* 712 (April 10, 2020): 135237, https://doi.org/10.1016/j.scitotenv.2019.135237.

[xv] Robert B. Noland, Nicholas J. Klein, and Nicholas K. Tulach, "Do Lower Income Areas Have More Pedestrian Casualties?," *Accident Analysis & Prevention* 59 (October 1, 2013): 337–45, https://doi.org/10.1016/j.aap.2013.06.009; Sam Harper, Thomas J. Charters, and Erin C. Strumpf, "Trends in Socioeconomic Inequalities in Motor Vehicle Accident Deaths in the United States, 1995–2010," *American Journal of Epidemiology* 182, no. 7 (October 1, 2015): 606–14, https://doi.org/10.1093/aje/kwv099.

[xvi] Laura Fraade-Blanar et al., "Older Adults, New Mobility, and Automated Vehicles" (Portland, OR: Urbanism Next Center, RAND Corporation, and AARP, February 2021), https://www.urbanismnext.org/resources/older-adults-new-mobility-and-automated-vehicles.

[xvii] Becky Steckler et al., "A Framework for Shaping the Deployment of Autonomous Vehicles and Advancing Equity Outcomes" (Portland, OR: Urbanism Next Center, January 2021), https://www.urbanismnext.org/resources/a-framework-for-shaping-the-deployment-of-autonomous-vehicles-and-advancing-equity-outcomes.