Wait, Who's Driving This Thing?

Bringing the Public to the Autonomous Vehicle Table

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Pittsburghers for Public Transit

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Pittsburghers for Public Transit (PPT) is a grassroots, member-driven organization of transit riders and operators. We operate from the belief that transit and mobility is a human right, and our guiding principles around accessibility, equity, environmental sustainability and labor justice are enshrined in our Transit Bill of Rights. We are committed to empowering leadership from within the community, and in fostering transparency and accountability within our own organization and in our region's public agencies.

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Charting a New Course for Urban Mobility

by Anita Cozart, Senior Director at PolicyLink

Everyone deserves to live in a healthy, safe and inclusive community with affordable and accessible transportation that connects them to jobs, schools, health care, grocery stores, and more. Over the past few years, private sector leaders and some local officials in Pittsburgh and other cities have championed the idea of autonomous vehicle technology as a means to deliver on that vision.

The history and the future of our nation tells us that, as we consider integrating such technology into their transportation systems, community members must be at the table. Our historic transportation policies and investments, fueled by structural racism, have saddled communities of color with burdens including longer travel times, higher costs, environmental damage and illness. And, as we move toward a future in which by 2040, the U.S. will be a majority people of color nation, in order to realize a vision of healthy communities and shared prosperity, we must ensure that community has voice and agency in shaping the way we move through our neighborhoods, cities and regions.

The findings from Wait, who's Driving this Thing? are a reminder that when it comes to transportation, we should embrace the "curb-cut effect"[1]. Curb cuts in sidewalks were originally developed to accommodate people in wheelchairs, but they benefit a broad swath of people. This concept can be applied in other areas of infrastructure (or the built environment): the most vulnerable transportation users should be the focus for the plans that are developed to integrate autonomous vehicle technology in cities. Simply put, the priorities of the most vulnerable communities should drive transportation policy and planning in our cities.

A national coalition of more than 100 groups dedicated to advancing racial equity into transportation policy, the Transportation Equity Caucus has developed a set of principles that can be used to consider the benefits and harms of automated vehicle (AV) deployment:

Create affordable transportation options for all people. The cost of using AV for daily travel must be accessible for all incomes, particularly if they are to be an extension of the public transportation system.

Ensure fair access to quality jobs, workforce development and contracting opportunities in the transportation industry. Jobs and contracts that come from the growth of AV must be accessible to workers and firms who have historically been shut out, namely people of color and people with disabilities. Economic security and new work opportunities should be prioritized for people working in sectors that will be eliminated due to AV deployment.

Promote, healthy, safe and inclusive communities. Just like there are food deserts, there are transportation innovation deserts. Many communities of color are the last ones to have access to on demand rides, bikes and scooters. As AV are deployed, it is important to assess the spatial distributions of affordable transportation options using a racial equity lens.

Invest equitably and focus on results. It is important to ensure that bias is not embedded in the computer algorithms that drive automated vehicle technology, and that rigorous data privacy regulations, which are currently lacking[2], are put in place. To ensure equitable outcomes, people of color and people with disabilities must be co-designers of the deployment of AV in cities.

Let's take the wisdom from this report and chart a new course for urban mobility that is centered on ensuring that our most vulnerable in society can benefit from transportation innovation.

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Abstract

The advent of autonomous vehicles (AV) proposes to radically transform our urban environment. Pittsburghers for Public Transit (PPT) conducted a literature review to identify impacts of AV related to jobs, equity, public transit, the environment, and safety. In doing so, we contrast claims made by AV companies with concerns discussed in AV literature. For instance, researchers predict that autonomous buses will decrease the number of transit operator jobs, and proponents of the technology claim that this would create a cost savings for transit agencies that may be reapportioned to extend transit service. Missing from this discussion, however, is the impact on present transit drivers whose age and educational background may inhibit their likelihood of finding jobs with comparable pay. Moreover, the purported increases in transit access for underserved groups (including children, older adults, and persons with disabilities) might not be realized in the absence of transit drivers, since those workers often go beyond operating vehicles to interact with and help transit riders in a multitude of ways. Potential changes in land use patterns may also decrease public transit ridership and fare revenue, and result in service cuts that disproportionately affect transit-dependent individuals.

Realizing the proposed environmental and safety benefits of AV would require several conditions to be met, and some of that necessary infrastructure would be built using public resources that could otherwise support proven climate change and pedestrian safety interventions. The projected environmental and safety benefits will also not be realized in the best scenario until decades in the future. Finally, while AV may increase the safety of over-road travel after this technology has evolved, sufficient evidence does not yet exist to substantiate such claims.

As public transit advocates, we believe the public must be at the center of the dialogue about the adoption of AV technology and that they must be given the tools to evaluate AV impacts in a holistic way. City residents and stakeholders should identify the ways in which AV is projected to support or impede our goals for creating environmentally sustainable, safe and equitable cities, to evaluate whether this technology should be prioritized over other known safety and mobility solutions. Moreover, particular attention must be paid to the effects of driverless vehicles on already marginalized people—low-income residents, older adults and people with disabilities, black and brown communities—to evaluate whether AV is likely to exacerbate existing inequities. Only once we have weighed these prospective impacts can the public begin to craft the policy framework to regulate AV, and decide whether public resources should be allocated to support their testing and deployment.

Introduction

Pittsburghers for Public Transit (PPT) is a grassroots organization of transit riders and workers who advocate for mobility as a human right. Everyday, we see autonomous vehicles (AV) drive down the street in front of our office, and we read stories in our local papers about their deployment in our neighborhoods. Five companies have begun test-driving operations in our city over the past three years[1], and tens of millions of taxpayer dollars have been earmarked to support their deployment[2]. Yet, in that time, our local government has not hosted a single conversation about how our communities will be affected by AV, nor held any public discussion about why public resources should be allocated to facilitating this technology over other proven mobility and pedestrian safety interventions.

Policy decisions over the last several years have had huge implications for transit riders in Allegheny County[3]. Some of these decisions include a proposal to introduce armed transit police to check fares on our trolley lines[4] and severe bus service cuts proposed as part of the regional Downtown to Oakland Bus Rapid Transit (BRT) plan[5]. PPT helped educate and mobilize riders to prevent this fare enforcement policy from being enacted[6] and to stop cuts in critical transit service[7]. Despite PPT's success in influencing the Port Authority of Allegheny County, policy decisions beyond the realm of our public transit agency also threaten residents' access to transportation and subsequent connections to critical amenities.

At present, the vast majority of information about AV comes from private companies currently developing or testing AV technology; this promotes a deeply lopsided public understanding of the implications of automating vehicles. Without balanced information, residents of Allegheny County—particularly its marginalized communities—cannot critically analyze AV impacts, which in turn limits their ability to influence policy decisions.

AV in Pittsburgh

The City of Pittsburgh[8], like many other cities and states around the United States[9], promotes the testing of self-driving cars (or AV). Although the benefits of AV remain ambiguous, five companies actively test AV on Pittsburgh streets[1]. Furthermore, the City of Pittsburgh itself has proposed piloting an AV shuttle as a public transit solution for underserved neighborhoods in the heart of the City[10]. Policymakers often arrive at such decisions with little to no public involvement, thanks to lobbying by testing companies[11]. Most recently, the City of Pittsburgh published a statement of "Pittsburgh Principles" for AV developed in cooperation with private AV companies[12]. By neglecting to meaningfully engage a varied community of stakeholders, the city failed to articulate why AV presents an equitable and holistic solution for residents' needs, and instead simply created a series of suggested guidelines for AV companies that lack any enforcement mechanism.

We at PPT regularly work with communities burdened by the limitations of our current transit network and whose mobility is limited by inadequate pedestrian safety measures. Moreover, our region is plagued by some of the worst air quality and economic inequities in the country[13,14]. Within this context, the introduction of AV is presented as a panacea to our transportation, environmental and economic woes.

However, based on an extensive review of AV literature, we remain deeply skeptical about the role that AV will play in advancing social good. In this position paper, we address claims related to jobs, greater mobility for underserved populations, the environment, safety, and privacy. In our analysis, we have put greater emphasis on the implications of automating public transit vehicles because it has become apparent that public transit—along with rail and truck delivery—are at the forefront of vehicle automation in the U.S. **None of the impacts of AV technology will happen in isolation, so in order to have a meaningful conversation, the public must be given the tools to weigh them as a whole.** Additional concerns related to ethics, liability, and public health highlight the urgency around promoting a broader, more informed public discourse concerning AV. We hope this paper will be a catalyst for such discussions.

Jobs

Claim *Autonomous vehicles will lead to economic development through new job opportunities, and the impact of driver displacement can be successfully mitigated*[15].

Our Key Concern *About 10 million jobs that include driving as a significant component of the work will be affected. Of those, between 3.8 and 4.5 million jobs where driving is the principal task (e.g., freight delivery driver, taxi, public transit operator) are directly threatened*[16].

"Primary driving jobs" transport persons and goods as their primary activity. Some proponents of automation suggest the possibility of a "just transition" of these more than 3.8 million drivers into occupations supporting the AV industry. Such roles purportedly include mechanics, warehouse workers to load and off-load vehicles, AV truck inspectors, and manufacturing workers creating AV-specific parts. However, given the demographics of those working primary driving jobs, they are unlikely to transition into new careers: the average education attainment of those workers is low, at 7.6% with bachelor's degree or higher (compared to 33.4% for all occupations), and the average age of drivers is high, on average 52 years old[16].

Furthermore, within the U.S. there exist few examples of successful and just transitions for workers being displaced by automation. Locally, we witnessed this play out with the loss of steel industry jobs in the 1970s and 1980s, and many Pittsburgh area communities failed to see new economic opportunities arise from the devastation.

Other proponents of AV suggest public transit workers are particularly well suited to transition into customer service positions on buses for wayfinding purposes, or for helping older adults and riders with disabilities[17]. However, those same proponents also tout the labor cost savings for transit agencies of transitioning to autonomous vehicles. This implies that either the proposal for the just transitioning of public transit employees lacks sincerity, or that these drivers would see a significant wage reduction in their new position. The loss of public transit jobs particularly affects women and people of color as they are highly represented in bus operator positions[18]. The compensation provided by stable public transit jobs, many of which are unionized and pay living wages, have historically been important for advancing social and economic mobility for women and minorities.

The term "on-the-job drivers" encompasses the 5.5-6.2 million U.S. workers whose primary work task is not driving, but whose jobs require a significant amount of driving, such as home care nurses, mail carriers, and sanitation workers[16]. Wage depression for these on-the-job drivers exists as a serious concern, because a substantial portion of their work will be eliminated with automation[16,19]. In some cases, like with package delivery or sanitation work, this catalyzes further discussions about how those positions may experience complete automation[20].

Finally, these negative employment impacts extend to the loss of tax revenue. On average, $1 billion investment in public transit generates 21,800 jobs and $432 million in tax revenue[21]. This includes $140 million in local, state, and federal government personal income tax[21].

We at PPT reject any proposition that trading hundreds of thousands of good transit jobs for reducing the cost of transit service is equitable. Moreover, in the following sections, we raise doubts about claims that cost savings from driver elimination will extend mobility access for underserved populations or lead to increased transit service overall.

Mobility

Claim *Autonomous vehicle technology increases opportunity/mobility for older adults and riders with disabilities*[22].

Our Key Concern *Transit operators perform many essential support functions that allow older adults and paratransit riders to access transit and are not replicated by AV.*

Supporters allege AV present a mobility solution for older adults and riders with disabilities by decreasing their dependence on others to drive them. However, eliminating a bus operator position seriously impacts the quality of service provided to vulnerable riders. Drivers assist riders who have limited mobility and other disabilities, including helping passengers with wheelchairs board the vehicle, use safety restraints, and navigate to their destination[23]. Paratransit drivers also ensure passengers get through their doors, and not simply to the curb[24]. AV technology by itself cannot replicate these functions.

AV companies like Uber and Lyft, which currently test AV on roads, lack good records when it comes to prioritizing riders with disabilities. They even fail to manage basic compliance with the Americans with Disabilities Act (ADA), as highlighted by lawsuits filed in states across the U.S.[25].

The social value of driver-and-rider interactions must not be overlooked. A driver's presence on a bus provides a level of safety to the passengers, as well as the capacity and flexibility to address emergencies as they arise[26]. Moreover, building connections between riders and drivers plays an important role in helping address the issue of isolation among our older adult population[26].

PPT supports greater mobility options for all, and particularly for riders with disabilities. To achieve this end, however, cities may look to existing available non-AV technologies that improve the match between paratransit rider needs and vehicle type[27,28]. Additionally, simply providing more transit service and investing in making safer and more accessible pedestrian connections to transit goes a long way toward expanding mobility options[29]. We believe that on-board drivers perform crucial functions, and must not be replaced because their absence leaves our most vulnerable riders behind.

Public Transit

Claim *Autonomous vehicle technology will increase first-mile last-mile connectivity[30] and make available increased financial resources for public transit[31].*

Our Key Concerns *Changes in land use resulting from AV can further worsen the situation by creating a vicious cycle of lower transit fare revenues and cut bus routes.*

Many communities located in U.S. cities experience poor access to public transit. Researchers are actively exploring the potential for microtransit, on-demand shared AV to increase first-mile last-mile connectivity[32]. Because these projects are speculative, there does not exist data to evaluate how effective they will be. However, their closest analogues—non-autonomous, shared, on-demand microtransit vehicles deployed as a first-last mile solution—have consistently been failures. In the U.S., these pilot projects saw unsustainably high costs per rider[33] and low ridership (less than four boardings an hour)[34]. Moreover, investments in these types of micro-transit projects can divert resources from fixed-route services that riders are more likely to use (at least 15 boardings an hour)[35]. In fact, simply increasing traditional fixed route public transit coverage has been shown to yield better ridership[36], as demonstrated in many cities in Canada[37], than deploying expensive technology.

Other concerns with shared on-demand AV relate to increased congestion and overall vehicle miles traveled (VMT) as seen with current on-demand shared mobility options[38], and predicted costs that are higher than current public transit options[39]. All these potentialities make it harder to close the equity gaps in access to transportation and create the possibility of new forms of social segregation[40].

AV proponents claim that incorporating autonomous technology reduces the cost of labor by eliminating the need for bus drivers[31]. These proponents claim the cost savings derived from eliminating the driver could be reapportioned to expand the transit network[31]. However, contrasting research posits the opposite may occur[41]. Unregulated AV adoption potentially worsens urban sprawl and increases consumer appetite for personal transportation[42]. This leads to decreased public transit use[41,43], which in turn brings lower fare revenues and ultimately results in service reductions[41]. Any public transit cuts disproportionately affect those reliant on public transit, especially low-income families and underserved groups[44]. Since these individuals might not be able to afford higher-level AV technology at currently predicted costs[42], they will experience a decrease rather than an increase in transportation options, fragmenting communities based on their ability to purchase AV[44].

Transit deserts in urban/suburban areas occur not because those communities could not be well served by conventional public transit, but rather because some funding and policy decision-makers have elected not to provide conventional public transit to those regions. We remain deeply skeptical that labor cost savings allow for expansion of service, because the lack of transit in underserved communities often results primarily from a lack of political will to prioritize mobility solutions for

underserved areas. Adoption of a new technology does not change the prioritization of funding. Additional transit operating savings may instead go toward other non-transit political priorities—or, if a private AV company partners with a transit agency to provide this service, those savings may instead roll into corporate profits. Transit contracting automatically does not lead to cost savings and better quality; contracting is most effective when strong labor protections are in place[45].

Environment

Claim *Autonomous vehicle technology will decrease the environmental impacts of transportation[46].*

Our Key Concerns *AV's ability to realize positive environmental outcomes is speculative and may only occur within a rigid regulatory framework. AV fail to present a timely response to climate concerns—and, in the absence of thoughtful regulation, AV can be environmentally destructive.*

Transportation emissions now exceed energy production as the largest single contributor to greenhouse gas emissions in the U.S.[47]. Arguments alleging the adoption of AV supports a healthier environment involve many conditionalities. High penetration of AV, decreased emphasis on performance, powertrain resizing, vehicle rightsizing, AV-specific infrastructure, increased ridesharing, and no changes in travel behavior and land use patterns are prerequisites to ensure that AV help rather than hinder environmental efforts[48]. Furthermore, the predicted timeline for large scale adoption of AV exists on the order of three decades, if not more[49].

There are a lot of "ifs" as to the ability of AV to effectively address environmental concerns.

On the other hand, research also predicts AV may increase vehicle use as the opportunity costs associated with driving decrease[42]. This path of development promotes urban sprawl and actually increases vehicle miles traveled[42]. In addition, AV may introduce empty vehicle travel, which further increases vehicle miles traveled[50]. Congestion increases are anticipated to disproportionately affect low-income and communities of color, making it more difficult for residents of these neighborhoods to move around and exposing them to elevated levels of local air pollution[51]. We must keep in mind that many proven options for reducing transit energy consumption exist—and these options do not require the introduction of AV. Federal, state, or city governments can mandate the installation of communicative vehicle technology to generate benefits of platooning[52], impose speed limits[53], mandate eco-driving training programs for drivers[53], promote non-motorized transport[53], collect fees for utilizing congested roadways and certain areas[53], place requirements for employers to reduce single-occupancy-vehicle trips[53], provide tax incentives car or van pooling[53], and increase funding for public transit[53]. Without behavioral changes[54], regulations[53], and infrastructure investments[48], AV will likely exacerbate energy consumption, vehicle miles traveled, and greenhouse gas emissions.

We see AV as a costly and inefficient way to address our current environmental crisis. Creating a more resilient world requires a radical shift in our transportation practices away from reliance on personal vehicles, which AV technology does not inherently do, and could potentially worsen. Moreover, allocation of public resources towards necessary AV-specific infrastructure takes resources away from pedestrian-, bicycle-, and transit-specific infrastructure, all of which possess clear and proven environmental benefits[55].

Pedestrian and Bicyclist Safety

Claim *AV technology will increase the safety of our public streets for drivers, cyclists, and pedestrians[8,56-58].*

Our Key Concern *The safety benefits of AV technology have not been sufficiently proven, and full autonomy is not necessary to achieve the purported benefits.*

Ninety-four percent of traffic accidents result from human error[59], and so AV companies present the elimination of the human element as a key benefit of their technology. Over the past year, companies testing self-driving technologies continued to reduce the frequency of intervention by human driver monitors. The highest reported performer, Waymo (the self-driving unit of Google parent Alphabet), intervened at a rate

of once every 11,017 miles during testing in 2018[60]. However, current data indicates AV crash more frequently than vehicles with human operators[61]. Across all other companies currently reporting AV test results, humans intervene on average every 10 miles[60].

In fact, making the purported safety benefits a reality requires high market penetration, the production of low-cost sensors capable of responding to a variety of road conditions, and connected vehicle technology[62]. Present technology must evolve further to allow AV platforms to function across a wide variety of use conditions. Currently, AV lose visibility in poor weather conditions, and their capabilities may be severely compromised by the quality of road signs and pavement marking[63]. Addressing many of these operational concerns will require significant investments in the construction of AV-friendly infrastructure—most likely through allocations from public funds[64].

We see this borne out in Pittsburgh, where $23 million dollars has been allocated by the City Department of Mobility and Infrastructure for a "mobility trail" designed to support proposed testing and deployment of an autonomous microtransit shuttle[2]. In these same communities, residents have called for better sidewalks, crosswalks, dedicated bus and bike infrastructure and expanded transit service to encourage safe and accessible transportation[65,66]. Given this, advancing AV deployment should not be a priority for our taxpayer money allocation.

In addition, AV struggle to read and interpret the behaviors of drivers, pedestrians, and cyclists[67]. Humans communicate informally in traffic all the time, and—at least as of now—AV technology is unable to respond to the full range of on-road communication used by humans[67]. In order for self-driving cars to be effective, companies will need to additionally accommodate the local driving customs of geographically disparate regions[68]. Finally, communities of color, older adults and low-income residents should have the most important voices in the discussion around AV impacts on pedestrian safety, because they are disproportionately the victims of fatal traffic crashes[69].

We believe in the urgency of addressing pedestrian safety, and readily-available technology can be deployed in service of that goal[70]. Safety benefits may be realized by requiring the installation of car-to-car and car-to-infrastructure (e.g., traffic signals) communications[70]. Lower speed limits in cities, sidewalk bumpouts to shorten pedestrian crossing distances, and protected bike and bus infrastructure all exist as proven solutions for enhancing human safety. Simply prioritizing buses over private vehicles as the form of mobility promoted by our infrastructure is an effective strategy to reduce the number of accidents on our roads[71].

Data Privacy

Our Key Concern *The privacy of passengers can be not only compromised but also monetized.*

Increasing vehicle automation and connectivity introduces vulnerabilities to malicious technology seeking to breach private user data[72]. The detailed behavior information collected by AV allow companies to not only suggest, but shape consumer habits[73]. Anticipating the high cost of in-vehicle sponsored advertisements, AV may exclude small and local businesses from capturing consumer attention. Additionally, AV make it possible to construct a highly personalized profile of a rider's lifestyle based on their location history[72]. Car, health, and home insurance providers could more readily take into account factors such as crime rates in the places where an individual travels, the frequency of trips to fitness centers, and someone's preferred recreational activities to craft hyper-personalized risk profiles and premiums[72]. Finally, with questions of data ownership left unanswered, one must remain wary of the potential surveillance abuses made possible by AV[72]. Already, telecom companies in the United States provide call and text log information to national intelligence agencies to comply with surveillance requests[74]. One must consider the consequences if AV companies are asked or compelled to share rider information[72], as the data collection capabilities of AV may far exceed those of consumer telecom networks.

This technology creates another opportunity for corporations to own and monetize lived experiences, including route data and destinations[72]. Moreover, because no data regulations currently exist, this technology invites the possibility of state surveillance[72] and data sharing with ICE and Homeland Security, among other state and federal agencies.

Conclusion

Policy decisions in relation to AV technology must be made in consultation with stakeholders so that it results in a genuine increase in mobility equity. After our literature review, it has become apparent that any proposed benefits of AV to mobility, safety, and the environment will be realized far in the future under a very specific, impractical framework. Absent that framework, the impacts of AV will likely be harmful. As a society, we cannot wait 30 or 40 years for AV benefits to be realized. Nor do we have the luxury of simply hoping for the best outcomes when it is far more likely that AV will exacerbate existing problems, particularly for already marginalized communities.

In this time of multiple, pressing needs, we do not have the public resources to finance such uncertainty. Moreover, we have both a moral and legal obligation under Title VI to use tax money to invest in transit solutions that uplift all our residents[75,76]. Our collective resources are finite, and with every decision to invest in supporting AV development and deployment, we miss opportunities to put our money and attention on inarguable and equitable improvements—including more public transit service; better sidewalks and dedicated bike and bus lanes; and good technology, like vehicle to traffic signal communications and electric vehicle charging infrastructure.

We at PPT fundamentally believe in the capacity of residents and transit-riders to grapple with complex funding and planning decisions. Failing to educate and empower the public to lead policy decision-making has perpetuated historical disparities in transportation access, which in turn has impacted community health outcomes, upward economic mobility, housing affordability and more. With the right tools, our community's most marginalized residents are the people most capable of designing solutions to address their needs for mobility, for jobs, for safety, for our environment— and they continue to have the most at stake. This paper is a starting point for appreciating and considering the scope of how AV technology will transform our cities— for better and for worse— and to insist that our communal investments prioritize people over profit.

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