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A FRAMEWORK FOR SHAPING THE DEPLOYMENT OF AUTONOMOUS VEHICLES AND ADVANCING EQUITY OUTCOMES

KNIGHT AUTONOMOUS VEHICLE INITIATIVE

URBANISM NEXT CENTER



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The Knight AV Initiative is a multi-year collaborative effort between the Urbanism Next Center at the University of Oregon, Cityfi, the cities of Detroit, Pittsburgh, and San Jose, and Miami-Dade County to pilot and learn about automated mobility technologies today to shape the future of deployment tomorrow. It is generously funded by the Knight Foundation.

This report was written by:

| | |
|----------------------|------------------|
| Becky Steckler, AICP | Urbanism Next/VO |
| Amanda Howell | Urbanism Next/VO |
| Nico Larco, AIA | Urbanism Next/VO |
| Grace Kaplowitz | Urbanism Next/VO |

Graphic design by:

| | |
|---------------|------------------|
| Matthew Stoll | Urbanism Next/VO |
| Matt Kleinman | Urbanism Next/VO |

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Karina Ricks and Erin Clark, City of Pittsburgh
Department of Mobility and Infrastructure

Laura Stuchinsky, Andrea Arjona Amador, and Alexa Diaz*,
City of San Jose Department of Transportation

Mark de La Vergne*, Hind Ourahou, and Stacey Matlen,
City of Detroit, Office of Mobility Innovation

Carlos Cruz-Casas, Irene Soria, PE, and Jarice Rodriguez, PhD
Miami-Dade County Department of Transportation and Public Works

Hana Creger, The Greenlining Institute

**No longer on staff.*

For more about the Knight AV Initiative, visit
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URBANISM NEXT CENTER

The Urbanism Next Center at the University of Oregon conducts research and convenes partners from around the world to understand the impacts of new mobility, e-commerce and urban delivery, and autonomous vehicles on the built environment. Going beyond these emerging technologies, we explore the possible implications on equity, health and safety, the economy, and the environment to inform decision-making that supports community goals. Urbanism Next brings together experts from a wide range of disciplines including planning, design, development, business, and law and works with the public, private, and academic sectors to help create positive outcomes from the impending changes and challenges confronting our cities.

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TABLE OF CONTENTS

| | |
|---|-----------|
| SECTION 1: BACKGROUND + PURPOSE | 02 |
| SECTION 2: ENGAGEMENT & EQUITY | 04 |
| SECTION 3: SHAPING DEPLOYMENT | 12 |
| SECTION 4: CONCLUSIONS | 30 |
| APPENDIX A: RESOURCES AND TOOLS | 32 |
| APPENDIX B: BIBLIOGRAPHY | 34 |



SECTION 1: BACKGROUND + PURPOSE

Just a year or so ago, it seemed that fleets of autonomous vehicles (AVs) would soon be deployed on city streets providing a robo-taxi service like Uber and Lyft—just without a driver. The timeline for commercial deployments of AVs has been significantly delayed by the technological challenges associated with safely deploying driverless vehicles, as well as by the COVID-19 pandemic. Even during the pandemic, however, automakers and technology companies continued to conduct research and test a range of autonomous vehicles—freight trucks on freeways, passenger vehicles on city streets, and smaller vehicles transporting goods on streets, in bike lanes, and on sidewalks—to develop commercial use cases and prepare for deployment.

AV technology has the potential to have major impacts on cities, both positive and negative. AVs could increase safety and help reduce congestion and pollution, but they could very well exacerbate existing inequities if they are simply layered on to the problematic and car-dependent transportation ecosystems that exist today. Chances are that AVs will be deployed eventually, and many states are already enacting legislation that preempts local decision making. As a result, communities across the United States understand that they need to plan for AVs before they arrive in order to maximize the potential benefits. The current moment provides an opportunity for the public sector to be proactive in shaping the deployment, applying lessons learned from the deployment of transportation network companies (TNCs), e-scooters, and other new mobility technologies.

With support from the Knight Foundation, the cities of Detroit, Pittsburgh, San Jose, and Miami-Dade County in Florida—the “cohort”—are actively working to understand how AVs can be deployed in ways that reflect community input and meet local needs. They are working with residents, employees, and business and community leaders to better understand mobility needs and how AV deployment can help achieve community goals.

The Urbanism Next Center at the University of Oregon, with Cityfi, is working with the cohort on the ***Knight AV Initiative*** and collecting important lessons learned throughout the project. A primary goal of the project is to understand how community engagement efforts can shape AV pilot projects taking place in the four cohort communities so that the deployment of AVs advances equitable outcomes. To organize our thinking, Urbanism Next created an ***AV Initiative Framework*** for the project, as shown in Figure 1. In order for AVs to be deployed in ways that advance equity outcomes, we believe there are two areas that the public sector needs to focus on concurrently: *identifying community needs and shaping deployment*. To identify community needs, public sector agencies should engage community members in ways that prioritize the voices of marginalized groups to understand their mobility needs. To shape deployment, the public sector should determine which governmental approach they want to take with private sector companies interested in deploying AVs and understand the tools and levers they have at their disposal to ensure that AV services are deployed in a manner that helps achieve community transportation goals. This white paper outlines our current understanding of community engagement best practices, important AV-related equity topics, different models of governance, and the tools and levers local governments have to shape deployment.

FIGURE 1. AV INITIATIVE FRAMEWORK

IDENTIFYING COMMUNITY NEEDS

PUBLIC ENGAGEMENT

Public sector agencies should engage community members in ways that prioritize the voices of marginalized groups.



EQUITY ISSUES

During engagement, public sector agencies should focus on equity-related issues to understand the community members' needs.



SHAPING DEPLOYMENT

MODELS OF GOVERNANCE

Policy approaches to AV deployment — from laissez faire to interventionist — are shaped by federal, state, and local regulations, investments, and programs and will look different on a state-by-state basis.



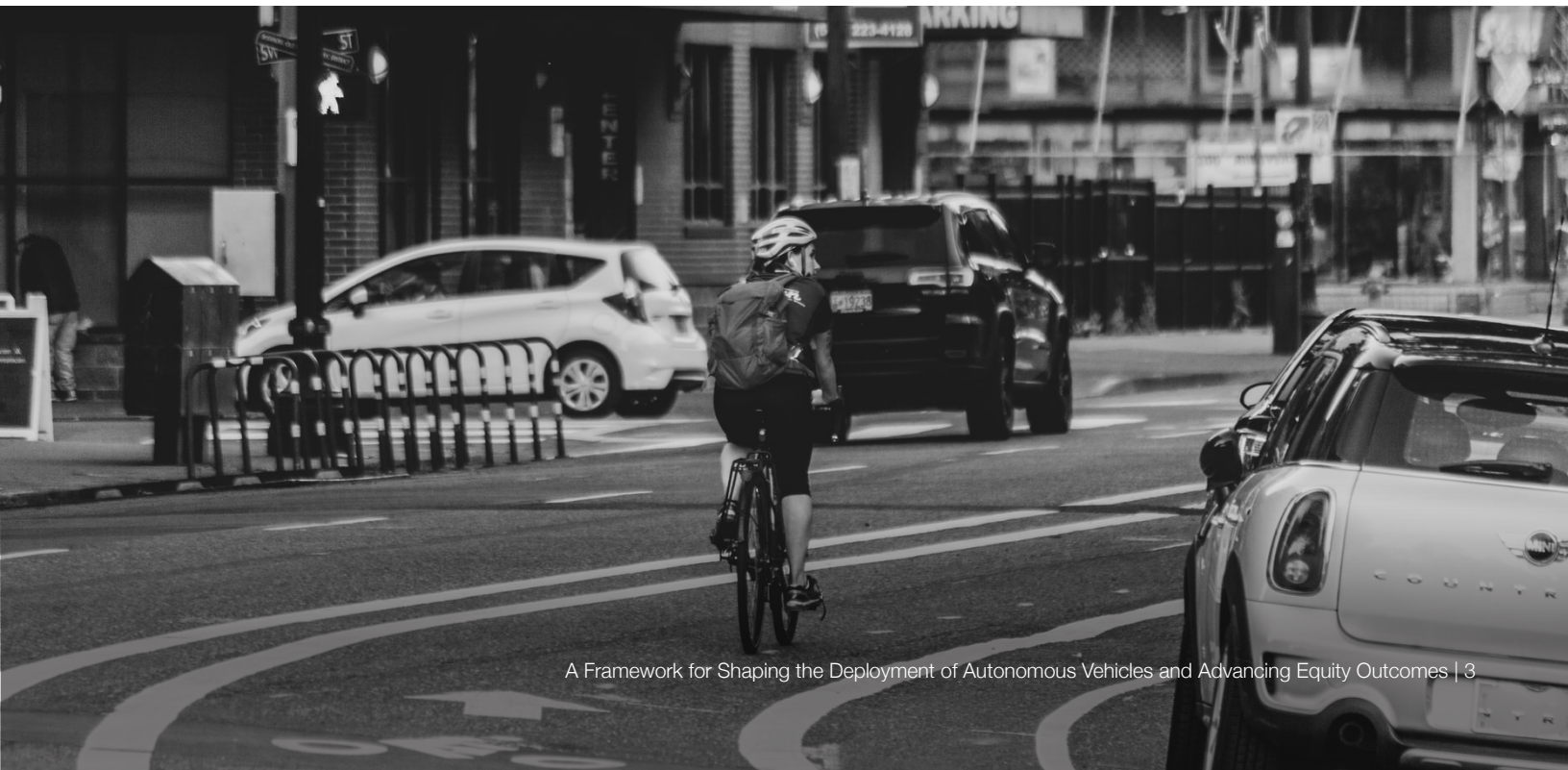
TOOLS AND LEVERS

There are a variety of resources and activities that local governments can leverage when working with AV service providers that can incentivize those providers to address equity issues and help achieve community goals.



Source: Urbanism Next, 2020.

It is important to note that this document is not a comprehensive framework for planning for autonomous vehicles. A number of other organizations have developed robust guidance on planning for AVs, such as NACTO's [Blueprint for Autonomous Urbanism \(Second Edition\)](#), the National League of Cities' [Autonomous Vehicles, A Policy Preparation Guide](#), The Greenlining Institute's [Autonomous Vehicle Heaven or Hell?: Creating a Transportation Revolution That Benefits All](#) and others. Instead, ***the purpose of this white paper is to provide a foundational understanding of the two-pronged public sector approach we believe is necessary for AVs to be deployed in ways that advance equity outcomes.*** While it was drafted specifically for the Knight AV Initiative, this framework can be a guide for local and regional agencies that want to develop strategies and activities to deploy AVs with equity as the guiding principle.



SECTION 2: ENGAGEMENT & EQUITY

This section is split into two parts. The first outlines some of the key aspects of public engagement processes that are essential for **conducting inclusive engagement**, as well as our recommendations for where to begin engagement processes specific to AV pilots/deployment. The second outlines important topics to consider and address with community members during engagement in order to **scope an AV pilot/deployment that advances equity**.

Equity is empowering marginalized communities and eliminating barriers to opportunity through inclusive, accessible, and authentic engagement processes and the creation of programs and policies that result in fair and just distribution of benefits and burdens across all segments of a community, prioritizing those with highest need.¹

PUBLIC ENGAGEMENT PROCESSES

In the context of the COVID-19 pandemic and the Black Lives Matter movement, inequities due to systemic racism have become increasingly acknowledged in mainstream society. The ways in which public engagement have historically been conducted are often exclusive and inadequate even in the best of times. Barriers caused by systemic racism, sexism, ableism, classism, ageism, and homophobia frequently exclude people from engagement processes. Public meetings and other traditional forms of engagement have

privileged those who not only have the time and resources to attend, but also those who feel comfortable and safe in public meeting spaces and who feel empowered to make their voices heard—leaving many people out.

Understanding the range of participation barriers that have historically existed and asking questions specifically aimed at addressing inequities is essential to dismantle these barriers.² Who is and is not engaged in the decision-making process and where decision-making power lies must be examined to understand whose input is and is not being heard, and whose concerns are being addressed. It is essential to acknowledge that participation barriers exist and understand how they have historically excluded people from the process in order to conduct more inclusive engagement moving forward.

Public engagement processes do not follow an either/or model. (E.g., you do engage community members or you do not engage.) Engagement is instead fluid and occurs across a spectrum, as defined by the [International Association for Public Participation](#), with “inform” on one end of the spectrum and “empower” on the other (Figure 2). By using engagement activities to “inform” the public, the convening body is retaining the ultimate decision-making power (IAP2 International Federation, 2018). On the opposite end, the convening agency will implement what the public decides because they are “empowered” to make decisions. Ideally, public agencies will increasingly move towards the empowerment model of public participation.

¹ This working definition of equity is derived from The Greenlining Institute’s and the Urban Sustainability Directors Network’s equity definitions.

² For a list of common barriers, we recommend reviewing “[Barriers to Public Participation](#)” compiled by the Community Engagement Subcommittee of the [Governor’s Interagency Council on Health Disparities in Washington State](#).

FIGURE 2. IAP2 SPECTRUM OF PUBLIC PARTICIPATION



IAP2's Spectrum of Public Participation was designed to assist with the selection of the level of participation that defines the public's role in any public participation process. The Spectrum is used internationally, and it is found in public participation plans around the world.

INCREASING IMPACT ON THE DECISION

| | INFORM | CONSULT | INVOLVE | COLLABORATE | EMPOWER |
|----------------------------------|--|--|---|---|--|
| PUBLIC PARTICIPATION GOAL | To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions. | To obtain public feedback on analysis, alternatives and/or decisions. | To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered. | To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution. | To place final decision making in the hands of the public. |
| PROMISE TO THE PUBLIC | We will keep you informed. | We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision. | We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision. | We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible. | We will implement what you decide. |

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Source: International Association for Public Participation, 2018. www.iap2.org

When it comes to AVs, the public should ultimately decide whether there is a place for these types of vehicles in their communities and, if so, where.³ How can they be used to serve community members? In order to answer that question, the public needs to have a broad understanding of the technology. That is difficult since many people have never seen an autonomous vehicle, let alone been inside one. Furthermore, “AV” is a catch-all phrase that is used to refer to a variety of vehicle types: there are autonomous passenger vehicles, low-speed autonomous shuttles, autonomous trucks, last-mile delivery vehicles, and automated delivery robots. The technology is complex and nuanced with multiple levels of automation⁴, and it is near impossible to ask community members how they might consider using a technology that they have virtually no experience with. To that end, public agencies do have a role to play in helping their residents make sense of the technology by providing them with information, but that does not mean they should just inform the public of what’s happening with the technology. Public agencies need to move towards the empowerment model, and that means empowering community members with the information they need in order to make informed decisions.

3 The reality of preemption at the state or even federal level does complicate the extent to which community members can ultimately choose whether AVs exist on their streets or not. The next section covers preemption and identifies the tools and levers that local agencies have at their disposal to help ensure that the deployment is more reflective of community needs and wishes.

4 SAE International developed the [Levels of Driving Automation](https://www.sae.org/news/2019/01/sae-updates-j3016-automated-driving-graphic), which has been adopted as the industry standard. Level 0 represents no automated driving features, and Level 5 represents completely automated driving. <https://www.sae.org/news/2019/01/sae-updates-j3016-automated-driving-graphic>

ENGAGEMENT BEST PRACTICES

The following section outlines some of the best practices found in the literature regarding inclusive public engagement processes, specifically with the goal of fostering trust and advancing equity.

AMPLIFY THE VOICE OF MARGINALIZED GROUPS

- **Always ask “who is not in the room and why?”** People with barriers to accessing existing transportation systems such as Black, Indigenous, and people of color (BIPOC), people with disabilities, older adults, and low-income community members may benefit from AV technology, but they are often left out of decision-making processes and “typically are the least involved in discussions and initiatives around technological innovations” (Stewart et al., 2019). Their voices should be prioritized, and they should be given decision-making power.
- **Meet people where they are.** It is widely regarded as best practice to meet people where they are to conduct community outreach and engagement. This includes, but is not limited to providing childcare, language translation, and the opportunity to connect at different times of day. In the context of COVID-19, this translates to communicating with people via the platforms they are already using. This might include live streaming public meetings on YouTube/Facebook instead of/in addition to using video conferencing software, providing multiple channels or ways to participate, or calling/texting community members directly, as well as conducting post-meeting follow-through to maintain accountability and transparency (Johnson et al., 2020). Analog methods of engagement, including phone calls and mailers, are also important for conducting inclusive outreach and bridging the digital divide.

BE CLEAR ABOUT THE PURPOSE

- **Clarify the purpose of engagement.** It is essential to define and communicate the purpose of public engagement processes. Why are you talking about autonomous vehicles? What is the purpose of engaging on this topic, and why now? It is common for community members to feel unsatisfied with engagement processes if the purpose of the engagement is not clearly defined and they feel their opinions do not translate into meaningful outcomes. In order to achieve equitable deployment goals, engagement processes must be intentional and inclusive in and of themselves. Public sector agencies should ask themselves what the purpose of the engagement is and what methods are best suited for achieving their intended outcomes.

BUILD TRUST THROUGH TRANSPARENCY, CONSISTENCY, AND COLLABORATION

- **Listen to what participants/community members actually want to talk about, regardless of what the engagement is supposed to be about.** While transportation officials may want to know what people think about AVs, residents might focus on the need for stop signs and speed bumps to slow traffic down. Local officials have the responsibility to both address current needs and work with residents to develop insights on future transportation improvements.
- **Be transparent about both the potential benefits and challenges AVs could bring to communities.** It is too early to definitively say whether AVs can help communities meet equity, environmental, health and safety, or economic goals but it is important for public sector agencies engaging in AV pilots/deployment to acknowledge the potential benefits and challenges this technology could bring.

- **Clarify the decision-making powers that different levels of government have over AVs (see Figure 5 on page 18-19).** The federal government has authority over the design of AVs, but state level decisions may specifically allow or prohibit the testing and deployment of autonomous vehicles. Local governments may have no control over whether a vehicle can operate on public streets, but they may have some control over how it is operated. Building trust requires transparency about decision-making structures and making sure community members know what they have control over.
- **Be willing to step aside and to pay community members/organizations to do the work.** Effectively building trust often requires public agencies to step aside and hire or contract with community members to conduct engagement directly. In a recent interview, [Dr. Destiny Thomas of the Thrivance Group](#) suggested that “cities could fund community health clinics or food banks already serving these neighborhoods to engage residents on what they need from the city at the same time. City departments could also put community residents on staff to do this work.” (Badger, 2020). In order to understand if AVs may be an appropriate fit for a particular mobility need, cities need to first understand what those needs are. Working directly with community-based organizations or hiring community members will yield a better-informed needs assessment.
- **Report back to communities regularly and build relationships that span beyond the engagement period for single projects.** Keep communities in the loop about how their involvement has shaped the project outcomes, and create two-way communication channels that enable community members to connect outside “designated” opportunities. Relationships with community members should be built and fostered to span beyond just the engagement period for one specific project.

RESPECT COMMUNITY MEMBERS’ TIME AND EXPERTISE.

- **Compensate community members.** Regardless of whether municipalities are conducting engagement themselves or contracting with community members/ third party organizations to do so, they should also compensate the participants of the engagement process for their time and expertise.
- **Streamline the engagement process.** Reduce silos between departments and organizations to respect community members’ time and not create engagement fatigue by having multiple departments engage the same communities about different topics or on multiple occasions. Ideally, community members should be able to speak directly to one person (or department) about all of the concerns/ needs that the city/agency/organization may be able to help them address.

The ongoing pandemic is, of course, limiting the ability of agencies to conduct in-person events and activities, and forcing them to rethink their engagement strategies. Hopefully, the challenges of the moment will lead not only to creative ways to engage in the era of physical distancing, but also to more inclusive engagement practices overall. (See the Appendix for a list of tools and resources on conducting equitable engagement generally, as well as resources specific to conducting engagement during COVID-19.)

IMPORTANT CONSIDERATIONS FOR AV DEPLOYMENT

How can we ensure that AVs are deployed in ways that advance equity if and when they become widely available? We can—and should—look at existing new mobility deployment as a proxy for understanding the issues surrounding the future deployment of AVs. There are many lessons learned from the deployment of other new mobility technologies that can be applied to AVs. For instance, bikeshare systems and e-scooter programs have provided important lessons about the inequities of limited service areas. TNCs like Uber and Lyft were initially only available to those who could download the apps *and* link a debit or credit card to their account to pay for rides. They have since worked to address some of these barriers by providing alternative methods for requesting and paying for rides (Uber, 2019). People in wheelchairs have experienced longer wait times for a TNC since many vehicles cannot accommodate them and there is no requirement that all TNC vehicles are accessible (San Francisco Municipal Transportation Agency, 2019). TNCs have also relied solely on contract labor, sparking important debates—and major lawsuits—about fair labor practices. Furthermore, some community members have expressed distrust and skepticism of new mobility technologies, particularly when they feel that new technologies have been deployed without their input. E-scooters in particular have elicited strong emotions, and some members of the public have expressed their frustration by knocking them over, breaking them, and even tossing them into rivers (Grothaus et al., 2019). These are just a few of the examples of important lessons from other new mobility deployments that cities can apply moving forward.

Drawing upon these lessons, we have identified a list of important issues that cities or agencies planning AV pilots should consider. The development of this list has been iterative. We started by reviewing The Greenlining Institute's [Mobility Equity Framework](#) (2018). In their framework, Creger et al. identified three overarching goals and 12 mobility equity indicators connected to those goals (Figure 3).



FIGURE 3. THE GREENLINING INSTITUTE'S MOBILITY EQUITY GOALS AND INDICATORS

| Goal #1 Increase Access to Mobility | Goal #2 Reduce Air Pollution | Goal #3 Enhance Economic Opportunity |
|--|---|--|
| 1. Affordability | 6. Clean Air and Positive Health Benefits | 9. Connectivity to Places of Employment, Education, Services, & Recreation |
| 2. Accessibility | 7. Reduction in Greenhouse Gases | 10. Fair Labor Practices |
| 3. Efficiency | 8. Reduction in Vehicle Miles Traveled | 11. Transportation-Related Employment Opportunities |
| 4. Reliability | | 12. Inclusive Local Business & Economic Activity |
| 5. Safety | | |

Source: The Greenlining Institute, 2018.

Using The Greenlining Institute's equity indicators as a starting point, we created a list of equity issues that we think apply to AVs. We have organized the list below (Table 1) into individual level factors and societal level factors. (This organizational structure grew out of a separate project with AARP and the RAND Corporation.) **Individual level factors** are those that influence whether or not someone may be able to use a service or will feel comfortable doing so. We have grouped individual level factors into the following categories: geographic, financial, trust and comfort, accessibility, and safety and security. **Societal level factors** may not directly impact whether or not an individual person can access a service, but they have positive or negative externalities that impact equity outcomes. (For example, TNCs have contributed to increased levels of congestion, which has negative environmental impacts.) We have grouped these factors into the following categories: transportation outcomes, environmental, and economic.

It is important to note that, as mentioned previously, AVs are not uniform. There are many different types of vehicles being developed, some that are designed for passengers and others that are designed for goods. Some of these factors may not be applicable to all vehicle types (e.g., personal security). It is also worth noting that we largely assume that AVs will be deployed as fleet-based services similar to TNCs and that private ownership will be limited, at least for initial phases of AV deployment. This assumption has informed how we have structured the following list of factors.

TABLE 1. CONSIDERATIONS FOR EQUITABLE AV DEPLOYMENT, 2020

INDIVIDUAL LEVEL FACTORS

| | |
|---------------------------------|--|
| <p>GEOGRAPHIC</p> | <p>TRAVEL OPTIONS FIT USER NEEDS Is the service aligned with community-identified mobility needs? E.g., Does the service facilitate access to job centers, grocery stores, community gathering spaces, etc.?</p> <p>AVAILABILITY OF SERVICE What is the geographic coverage of the service area? If service is limited to particular areas, such as downtown cores, it will significantly limit the people who have access to it.</p> |
| <p>FINANCIAL</p> | <p>SMARTPHONE ACCESS How do people access the service? Does it require the use of a smartphone? Smartphones and accompanying data plans are costly, and services that rely solely on access to smartphones create barriers to use.</p> <p>AFFORDABILITY OF SERVICE Is the service actually affordable to those who need it most? During engagement, it is important to find out what community members can afford.</p> <p>ACCEPTED METHODS OF PAYMENT If the service requires payment, what methods of payment are accepted? Some community members are unbanked/underbanked and do not have access to a debit or credit card. If a service doesn't have a non-credit card option for payment, it may make it difficult (or impossible) for some people to use it.</p> |
| <p>TRUST AND COMFORT</p> | <p>SMARTPHONE FAMILIARITY Does use of the service presuppose a certain level of familiarity with smartphone technology? Comfort levels with smartphones vary and services that limit customer interaction to online platforms create barriers to use.</p> <p>LANGUAGE Is information about the service available in multiple languages? Services that are only available in English pose significant constraints.</p> <p>SENSE OF OWNERSHIP To what extent is there community buy-in and a sense that the service is designed with them in mind? Has the community been involved in service development from the outset? If people don't feel like a service is "for them," they will not be inclined to trust it, understandably.</p> <p>SERVICE CONSISTENCY Is the service reliable? Is it consistently available? If a service cannot be depended upon, it will not be trusted.</p> |
| <p>ACCESSIBILITY</p> | <p>ACCESSIBLE VEHICLES AND ACCOMMODATION OF GOODS OR AIDS Is the vehicle or device (e.g., delivery robot) physically accessible? Can the service accommodate users traveling with goods or aids, including wheelchairs, strollers, walkers, or wheelchairs? Services that cannot accommodate such things create barriers for certain groups.</p> |

SAFETY AND SECURITY**PHYSICAL SAFETY**

Does the service operate safely for vehicle occupants (if applicable) and for those outside the vehicle? E.g., Does the vehicle or device travel at low speeds? Can it correctly identify and react to all objects? Vehicles or devices that create obstructions for pedestrians and other vulnerable road users exacerbate existing inequities.

PERSONAL SECURITY

Does the service require sharing space with other passengers? Does the vehicle have a safety operator on board, if applicable? Bus drivers, for example, not only drive the vehicle but they also provide assistance to passengers and contribute to the overall sense of security. Some community members may not feel comfortable using a service without an onboard operator.

DATA PRIVACY

What kinds of technology does the service require to operate? (And is the underlying technology biased?) Does the service use facial recognition software? Does it take or store video? Vehicles that collect large amounts of data raise serious privacy concerns, and some people particularly vulnerable to being targeted through the misuse of data.

TRANSPORTATION OUTCOMES**GENERAL MOBILITY**

Does the service increase mobility options overall for those that have historically been excluded? Services that primarily increase mobility options for people who are already well-served are only exacerbating existing inequities.

INTEGRATION WITH TRANSIT

To what extent is the service integrated with the existing public transportation network? Does it link to transit? Does it provide first-/last-mile solutions? Does it fill mobility gaps in the network? Services that do not complement existing transit networks or directly compete with transit may contribute to a reduction in mobility options overall.

ENVIRONMENTAL**IMPACTS ON CARBON EMISSIONS**

Does the vehicle or device run on clean energy? Does it help to reduce carbon emissions? Low-income communities have been disproportionately impacted by environmental pollution, so vehicles or devices that do not help to reduce carbon emissions are perpetuating this disparity.

ECONOMIC**JOB CREATION**

Is the service creating fair wage jobs for local community members? Who is benefiting from the new jobs? Is the service competing with or eliminating local driving jobs? Is the service contracting with local businesses? Is the service connecting people to job centers and other economic opportunities?

Source: Urbanism Next Center, 2020. (Elements of this framework have been adapted from Urbanism Next's collaborative efforts with the RAND Corporation on a project for AARP.)

This list of considerations serves as an important starting point for thinking through the potential equity impacts of an AV pilot or deployment. It is intended as a guide to help shape conversations with community members and stakeholders so that they understand the many potential impacts of AVs on equity outcomes. Ultimately, public agencies should conduct community outreach to determine which equity impacts of AVs that they should be assessing, because priorities will be different everywhere.

The following section will explore the ways that public sector agencies can work with the private sector to ensure that many, if not all, of these equity considerations are met.

SECTION 3: SHAPING DEPLOYMENT

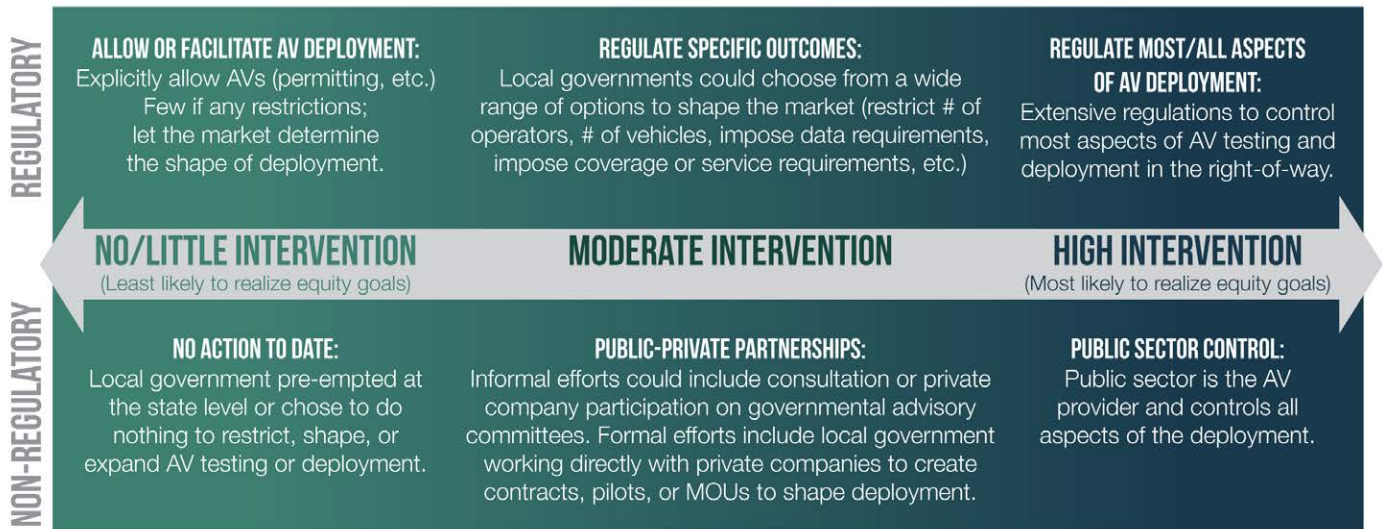
Local governments across the United States and around the globe are grappling with the uncertainty that the deployment of AVs is likely to bring. As more companies test different types of vehicles on city streets, government leaders see an opportunity to better understand impacts and shape public policy to mitigate potentially negative outcomes and take advantage of opportunities. While some local governments are taking a hands off or laissez-faire approach to governance, other local leaders are working directly with their residents, business owners, and other stakeholders, along with the AV service providers, to ensure that the introduction of AVs provides equitable transportation options and helps achieve community goals.

Section 2 described how local governments can have a conversation with residents and stakeholders to understand AV equity-related topics as well as their mobility needs. This section is focused on the ways that local governments can work with private service providers to shape the deployment of AVs. We first describe the **models of governance**, which shows the spectrum of policy and programmatic approaches local governments can take to shape AV deployment in their communities. Secondly, we outline the **tools and levers** that can be used by local governments to achieve equitable outcomes

MODELS OF GOVERNANCE

Many public agencies are taking an active policy role in preparation for AV deployment. At the state level, states like Arizona (Executive Order 2018-04 Advancing Autonomous Vehicle Testing and Operating; Prioritizing Public Safety, 2018) and Florida (Roth, 2019) have passed executive orders or legislation to allow AV testing and deployment by right and pre-empt local governments from regulating AVs. California (California Department of Motor Vehicles, 2020; California Public Utilities Commission, 2018) and Pennsylvania (Pennsylvania Department of Transportation, No date) have created a statewide AV testing permit system. At the local level, public agencies have a wide range of policy options. Figure 4 shows a spectrum of policies that local governments have, or potentially could, adopt. For ease of categorization, we have grouped these options into regulatory and non-regulatory, but the reality on the ground is likely to be much more fluid. Local governments will likely mix-and-match non-regulatory and regulatory elements. Non-regulatory elements can also be incorporated into policies and regulations.

FIGURE 4. SPECTRUM OF LOCAL GOVERNMENT POLICY INTERVENTION FOR AV DEPLOYMENTS



Source: Urbanism Next, 2020.

Note that Figure 4 shows that little to no interventions are the least likely to result in equitable mobility outcomes. Other new mobility services tend to be deployed in the places where they can make the most money, such as e-scooters in downtowns or high density corridors. Government policy was necessary to ensure that e-scooters were placed in low-income neighborhoods, discounted programs were offered for low-income people, and adaptive vehicles were provided in places such as in [Washington, DC](#) and [P.](#) These efforts should be measured and evaluated to ensure that they are effective and increasing access in practice. Moderate to high policy interventions are likely the only approaches that ensure that AV service providers will work with local governments to achieve equitable mobility goals. Policies are not static as government leaders will develop a more nuanced understanding of its challenges and opportunities as they learn more about the technology. Some of the most common policy approaches to date include:

REGULATORY INTERVENTIONS FOR AV DEPLOYMENT

- **Facilitate AV testing and deployment.** Some public agencies – most commonly at the state level – are clearing a path for AV deployment encouraging innovation and creating a business-friendly environment for companies. For example, both Arizona and Florida passed legislation allowing the testing of AVs on public roads (Executive Order 2018-04 Advancing Autonomous Vehicle Testing and Operating; Prioritizing Public Safety, 2018; State Uniform Traffic Control; Autonomous Vehicles; Operation, 2016). This approach clears the path for AV companies and allows the market to determine which companies, how many vehicles, and what services are actually deployed in each community. Many state regulations allow AV deployments and preempt local government regulations, at least to some degree.

- **Regulate specific outcomes.** If the state does not preempt local governments, then local governments can regulate — through permits, licensing, or other actions — testing and deployment of vehicles. For example, the [City of Portland](#) is one city that has an AV testing permit process (note that as of 2020 the State of Oregon has no AV testing system or guidance in place). Due in part to the limited testing and virtually non-existent commercial deployment of AVs in the US, there are very few local governments in the United States that have passed local AV regulations. That said, in a desire to manage congestion and other externalities, local governments could end up regulating AVs like airports regulate TNCs by limiting the number of vehicles allowed in certain areas, managing the demand for curb space, designating specific areas for AV pick-up and drop-off, and charging fees to help manage AV programs and invest in infrastructure.
- **Regulate most/all aspects of AV deployment.** Few governmental agencies have adopted comprehensive AV deployment regulations, though that may change as commercial AV services become more widespread. The closest example is international - the Netherlands is one country that has adopted significant regulatory controls on AV deployment in an effort to avoid conflicts with existing modes (such as extensive bicycle usage) (KPMG International, 2019). Comprehensive regulations would likely control and prescribe which companies can operate, where they can operate, how many vehicles could be on the road, at specific times of day, and prescribe how much they can charge. Comprehensive regulation may be analogous to how most governments regulate utilities.

NON-REGULATORY

- **Do nothing (at least not yet).** Many states, such as Oregon and Washington, have yet to pass extensive AV testing and deployment regulations as the demand for testing is relatively low and/or they are still studying policy approaches. Most places without local AV testing have yet to pass local regulations. Some local governments may never pass regulations as state preemption may not allow many local options. On the other hand, it is also plausible that leaders in some communities may want to leave deployment to the market and not intervene.
- **Public-private partnerships to achieve policy goals.** Some public agencies are working directly with private AV service providers to create partnerships through informal and formal agreements, like MOUs or other contracts. In these cases, public agencies are developing opportunities to learn from pilot projects. There are multiple examples of public-private partnerships. For example, Urbanism Next conducted several case studies of pilot projects in the [Perfecting Policy with Pilots Report](#) (Steckler et al., 2020), including the informal urban delivery pilot project that Miami-Dade County conducted in partnership with Ford and the ELA Autonomous Shuttle Pilot between Pacific Western Transportation and the City of Calgary in Canada. In addition, public-private partnerships can help create the innovations needed to lower barriers to entry and push forward innovation. Significant investments in testing, like the University of Michigan's automated and connected vehicle testing facility [M-City](#) and the [Centre of Excellence for Testing and Research of Autonomous Vehicles at Nanyang Technological University](#) in Singapore are just two examples of significant public-private partnerships to test and develop autonomous vehicles.

Government procurement processes can be slow and bureaucratic, a particular challenge when purchasing technology or technology services as sometimes the technology changes significantly in the time it takes to conduct a traditional procurement process. As a result, state and local governments are trying to find ways of streamlining processes. For example, Los Angeles Metro created the [Office of Extraordinary Innovation](#), which developed a process for accepting [unsolicited proposals and public private partnership opportunities](#). The Minnesota Department of Transportation created a procurement process specifically for the [Minnesota Connected and Automated Vehicle Challenge \(Minnesota Connected and Automated Vehicle Challenge\)](#). The Challenge RFP focuses on innovation, transferability, service, and cost reduction and proposals are reviewed on a rolling basis. The state of California is currently procuring millions of dollars in technology services through an [executive order](#) called the “Innovation Procurement Process.” Many governments are successfully using City Innovate’s STIR services for challenge-based procurement.

- **Public sector control.** Another policy approach is for the public sector to become the mobility or platform provider directly. This may be most likely with public transit agencies purchasing autonomous technology and vehicles and integrating it into the public transit system. Another way to control AV pilots or deployment is to contract directly for the service and dictate all terms of deployment, as [Babcock Ranch](#) has done in Florida. (Babcock Ranch is a planned community that has a low-speed autonomous shuttle operating on grounds.)

Private transportation service companies are for-profit. Services are generally developed and deployed in places where they are most likely to make money targeting customers that are most likely to use the service. In other words, in affluent, high-density locations. Without government intervention, it is unlikely that most AV service providers will provide services to those that are harder to serve in low-income or less dense neighborhoods. Government is positioned to ensure community needs are addressed by partnering with its communities in the design and development of services. In addition, public agencies have and should ensure that private companies operate under fair labor practices and provide quality jobs to local residents rather than relying on exploitive labor practices to turn a profit.



FIGURE 5. REGULATION AT THE FEDERAL, STATE, AND LOCAL LEVEL

While this white paper provides an overview of how different models of governance and tools and levers can be used to achieve community goals, it is important to understand how federal and state regulations shape deployment at the local level. Here, using the cohort communities and the states they are in as examples, we briefly describe state and local AV regulations and policies. To date, none of the statewide regulations have an equity component or require companies to consider the needs of local residents. Most focus on enabling legislation, liability, and insurance requirements that allows AVs to drive legally on public roads. The map shows which states allow AVs to operate on public roads, permit vehicle testing/pilots, or expressly allow personal delivery devices on sidewalks.

California

California's technology dominance has made it a leader in autonomous vehicle development and testing. The headquarters or offices of over 25 AV related technology companies and the desire of companies to test close to home, means that the San Francisco Bay area has a high concentration of companies working on AV projects.

The California Department of Motor Vehicles (DMV) regulates AV testing and has issued 62 AV permits (California Department of Motor Vehicles, 2020). California's regulations limit the number of vehicles tested to 10, vehicles must be registered in the State of California and must report any collisions that result in property damage, bodily damage, or death. In addition, permit holders must report disengagements annually. California added driverless permits (where no safety driver is in the driver's seat in the vehicle) in 2018 and currently three companies have this type of permit: Waymo, Nuro, and AutoX Technologies. Testing is allowed on any public road in California.

In 2018, the California Public Utility Commission began accepting permits for testing AV passenger service (California Public Utilities Commission, 2018). Permit holders must also have an AV permit from the DMV and comply with all permit regulations. They are also prohibited from charging for rides.

San Jose

The City of San Jose has not adopted any specific AV policies or regulations. In 2017, the city issued an Request for Information (RFI) for autonomous vehicle technology. Conducting an RFI process allowed San Jose considerable flexibility in designing partnerships with the private sector and resulted in an AV pilot with Mercedes Benz and a planned, but not executed to date, pilot with AutoX and San Jose State University.

Florida

According to the Florida Chamber of Commerce (Autonomous Florida), Florida is known for its pro-business regulatory climate, four years of \$10+ billion funding towards state DOT, and welcoming AV public-private partnerships. AVs have been lawfully allowed on Florida's highways since 2012 and legislation passed in 2019 allows AVs to operate without a human safety operator. In addition, the 2019 bill prohibits local governments from imposing taxes or fees only on AVs (except for airports and seaports). The bill also treats AV companies as they do transportation network companies (TNC) – they must comply with all state laws governing the operations of TNCs (Roth, 2019).

Federal Guidance (Washington, DC)

As of 2020, the federal government has not adopted AV regulations and instead the US Department of Transportation and the National Science and Technology Council issued the fourth edition of voluntary federal guidance on AVs (National Science & Technology Council and U.S. Department of Transportation, 2020). This document focuses on how to protect users and communities, promote efficient markets, and facilitate coordinated efforts of AV testing and deployment.

States are taking a more proactive role in regulating AVs and as of August 2020, 37 states have adopted regulations regarding AVs and/or governors have issued executive orders on topics ranging from studying AVs to allowing testing or commercial service of passenger, freight, and/or goods delivery AVs.



Miami-Dade County

Miami-Dade MPO has a Connected and Autonomous Vehicle Task Force. The Role of the TF is to (1) build community awareness of CAV technology, (2) support pilot project implementation, and (3) Identify other potential CAV Projects.

Michigan

Michigan was one of the first states to allow AVs on public roads and given the concentration of automotive companies in Michigan, there is a high concentration of companies developing AV technology. Public Acts 231 and 251 (2013) regulated testing of autonomous vehicles on public roads. These regulations were updated in 2016 and allow connected and autonomous vehicles for testing and deployment, and on-demand automated networks (michigan.gov, p1). In addition, there is a “Michigan Council on Future Mobility” (2019 Annual Report) that is tasked to make policy recommendations annually to the legislature. In 2017, the state adopted the Connected and Autonomous Vehicle Program Strategic Plan.

Michigan is home to car manufacturers including Ford and GM and the University of Michigan’s M-City, a 32-acre advanced mobility research and development center. Also home to the American Center for Mobility with 500 acres to test technology and conduct studies and the GM Mobility Research Center. In August 2020, the state announced an ambitious plan to build 40 miles of connected and autonomous roadway between Detroit and Ann Arbor.

Detroit

According to the Michigan Council on Future Mobility, “Detroit put the world on wheels and the Detroit region is still the densest cluster of automotive design, engineering, R&D and manufacturing on the planet. Detroit and Michigan continue to be the center of the North American industry, with 17 automakers, 11 assembly plants, 23% of U.S. auto production, 96 of the 100 top suppliers to North America (1,772 total suppliers), and 76% of U.S. auto R&D investment (\$10 Billion annually) all existing within this area.” (Michigan Mobility Collaborative, 2019). While there is significant AV testing in Michigan, the City of Detroit has not yet adopted specific AV policies or regulations.

Pennsylvania

The state of Pennsylvania Department of Transportation (PennDOT) has taken a leadership role to build upon the strength of the robotics research and development at Carnegie Mellon University to become a leader in highly autonomous vehicles. The state issued 2.0 Guidance for AV testers that expands upon an established AV permit system. While permits are not technically required in the state, the seven AV testers operating in Pittsburgh have acquired a state permit.

Pittsburgh

Home to Carnegie Mellon University’s robotics lab that is the source of many of the employees working in the autonomous technology industry in Pittsburgh.

The City of Pittsburgh issued an executive order on March 4, 2019 for the objectives and expectations of testing AVs in the city. The order described the Pittsburgh Principles that include:

- “Instituting transparent lines of communication between the City and partners testing autonomous vehicles, and annual reports on the implementation of AV policies
- Promoting automated driving systems that encourage high vehicle occupancy with lower or no emissions, and lower cost and equitable transportation options
- Engaging industry leaders and community stakeholders to collaboratively facilitate the further development and deployment of self-driving technology.” (City of Pittsburgh, na)

Companies that want to test AVs in Pittsburgh must submit a Notice of Testing to PennDOT and the City. Companies must also have business licenses in the state, county, and city. The city’s requirements also include acknowledgement of the “Shared + Autonomous Mobility Principles” and a “commitment to dialogue: with the Autonomous Policy Partners group organized and facilitated by the city. (Department of Mobility & Infrastructure, City of Pittsburgh, No date)

State AV Regulations



Operation on Public Roads



Vehicle Testing/ Pilots



PDD Operation on sidewalks



Source: Map from FreeVectorMaps.com edited by Urbanism Next. Map data from IHS and statecapitallobbyist.com.

TOOLS AND LEVERS TO ACHIEVE EQUITABLE OUTCOMES THROUGH AV DEPLOYMENT

Communities understand that they need to do more to address the mobility needs of residents to ensure that automated services provide equitable outcomes. Building on public engagement outreach and activities to explore equity issues (discussed in Section 2), local governments can then determine the model of governance they want to adopt and consider the tools and levers they can use to shape AV deployment. Table 2 lists a range of available tools and levers and the remainder of this section describes them and their relationship to potential equity outcomes. Some of these tools and levers involve assistance governments can offer transportation companies (and can leverage for equitable outcomes) while others directly shape transportation company operations to reach those equitable outcomes.

TABLE 2. SUMMARY OF TOOLS AND LEVERS FOR EQUITABLE AV OUTCOMES

**ALLOWING, SHAPING, ASSISTING, EDUCATION AND
AND PROVIDING AV SERVICES COORDINATION**

| | |
|--|--|
| PUBLIC EDUCATION AND OUTREACH | <ul style="list-style-type: none"> EMPOWER COMMUNITIES WITH KNOWLEDGE ABOUT OPTIONS CONDUCT PUBLIC AV PROJECT AND MOBILITY NEEDS OUTREACH |
| STAKEHOLDER COORDINATION | <ul style="list-style-type: none"> PROVIDE POLITICAL ASSISTANCE DEVELOP TRUST BETWEEN PARTNERS CREATE AND COORDINATE AV WORKING GROUPS COORDINATE WITH BUSINESSES ASSIST IN CROSS AGENCY COORDINATION |
| ALLOW AV PILOTS OR DEPLOYMENT | <ul style="list-style-type: none"> MODIFY LAWS TO ALLOW VEHICLES IN THE RIGHT-OF-WAY (ROW) CLARIFY LIABILITY AND RESPONSIBILITIES |
| SHAPE THE MARKET | <ul style="list-style-type: none"> LIMIT THE NUMBER OF OPERATORS LIMIT THE NUMBER OF VEHICLES REDUCE BARRIERS TO ENTRY ENSURE COMPLIANCE WITH EXISTING REGULATIONS AND AGREEMENTS |
| OPERATIONAL LIMITS, REQUIREMENTS, AND TOOLS | <ul style="list-style-type: none"> REQUIRE OPERATING OR BUSINESS PERMITS (OR OTHER REGULATION THAT ALLOWS FOR OPERATION) REQUIRE VEHICLE OCCUPANCY MINIMUMS AND VMT MAXIMUMS CHARGE FEES OR TAXES |

**ALLOWING, SHAPING, ASSISTING,
AND PROVIDING AV SERVICES (CONT.)**

**INVESTMENTS AND
INFRASTRUCTURE**

**OPERATIONAL LIMITS,
REQUIREMENTS,
AND TOOLS (CONT.)**

REQUIRE EQUITABLE ACCESS PROGRAMS. THESE PROGRAMS COULD:

- Require communication/offers in multiple languages
- Create a service coverage area and wait time minimums
- Require vehicle accessibility
- Require multiple forms of ride reservation and payment (not only smart phone based)
- Require low-income fares
- Require local hiring and fair labor practices

REQUIRE OR INCENTIVIZE ACTIVITIES/VEHICLES THAT REDUCE GHG EMISSIONS

ENSURE SAFETY BETWEEN PASSENGERS, AS WELL AS VEHICLES, PEDESTRIANS, AND BICYCLES

**PROCESS
ASSISTANCE**

FACILITATE PROCUREMENT

ALLOCATE STAFF TIME AND RESOURCES TO AV PILOTS AND DEPLOYMENT

ALLOW VARIANCES TO FACILITATE AV PILOTS AND DEPLOYMENT

**PURCHASING OR
SUBSIDIZING AV
SERVICES**

PROVIDE DIRECT FINANCIAL ASSISTANCE

DIRECTLY PURCHASE AV SERVICES

**TECHNOLOGY
AND DATA
INVESTMENTS**

SET STANDARDS FOR DATA AND PLATFORMS

REQUIRE DATA SHARING AND REPORTING

CREATE TECHNOLOGY RESOURCES

SHARE INFORMATION (SUCH AS CONSTRUCTION, DELAYS, OR USE PERMITS) REGARDING CHANGES IN THE ROW

DEVELOP AND/OR SUPPORT MAAS

PROVIDE A FRAMEWORK AND STANDARDS FOR INTEGRATED PAYMENT AND BOOKING

**PHYSICAL
INFRASTRUCTURE
INVESTMENTS AND
MANAGEMENT**

LIMIT OR PRIORITIZE AV ACCESS TO INFRASTRUCTURE

MANAGE TRAVEL-LANE ACCESS FOR AVS

DESIGNATE AND MANAGE CURBSIDE ACCESS

INVEST IN TECH-READY TRANSPORTATION INFRASTRUCTURE

INVEST IN INFRASTRUCTURE IMPROVEMENTS FOR CONGESTION MANAGEMENT AND/OR AV DEPLOYMENT

Source: Urbanism Next Center, 2020. (Elements of this framework have been adapted from Urbanism Next's collaborative efforts with the RAND Corporation on a project for AARP.)

EDUCATION AND COORDINATION: FOSTERING RELATIONSHIPS AND BUILDING TRUST

One of the most important roles of local government is to provide public goods to the people that live and work within the jurisdiction, which includes access to mobility. A key aspect is building trust – between government agencies and leaders, residents, and business owners. Relationships between all of these actors is critical for successful AV pilot projects and eventual deployment. Below is a list of ways that the public sector can conduct outreach with the public, business owners, and other public agencies to address issues that can come up with AV pilots and deployment. In return, public agencies can request (or require) that AV service providers incorporate equity considerations into their AV pilots and deployment.

The rest of this section describes the tools and levers (left-hand column) and the relationship of the tool or lever to equity (right-hand column). The relationship to equity also describes how the tool or lever can be an incentive for AV service providers for equitable outcomes.

PUBLIC EDUCATION AND OUTREACH

Conduct public education activities.

Public education activities should describe what AVs are, how the technology works, and the opportunities and barriers related to AV use for the public. AV technology is complex, and public agencies do have a role to play in helping people make sense of the technology so that community members are empowered with the information they need to make decisions. This information should provide a foundation for engagement activities.

Relationship to equity.

Education activities should be designed to increase transparency and trust. They can help communities think through and define the equity-based benefits and challenges AV deployment might bring them, making them more informed stakeholders in AV deployment discussions. ‘Touch and feel’ educational opportunities can reduce trust barriers with the technology and can help communities better understand AV-related future scenarios. Materials should be in languages spoken by the community, in multiple formats and outlets.

Conduct public AV project and mobility needs outreach.

Public outreach often includes not just information about the project, but also collecting information about needs and preferences. Local governments can consider a variety of outreach activities (keeping Section 2 best practices in mind) such as surveys, hiring outreach staff to work directly in communities, public workshops and forums, etc.

Relationship to equity.

Conducting interactive outreach that asks people what they need is the best way to identify and incorporate those needs into AV pilots and deployments. Understanding these needs can be helpful to AV companies as a way to better understand potential users and can be used by government agencies to leverage other desired equitable outcomes.

STAKEHOLDER COORDINATION

Provide political assistance.

The introduction of new technologies and services into a community is fraught with political pitfalls. A champion that can help navigate the political and bureaucratic process can help address issues and build legitimacy through partnerships.

Relationship to equity.

Governments can leverage this political assistance to advocate for equity components important to the community.

Develop trust between partners.

By working closely with all of the stakeholders — from advocacy organizations, to business groups, to AV testers and developers — local governments can act as neutral parties, facilitate conversations, and address issues before they become significant problems.

Relationship to equity.

Productive relationships require trust. Local governments can help develop that trust between key stakeholders, a benefit to AV service providers that can be leveraged to request other equity outcomes. This development of trust also assists government agencies in communicating with and understanding community needs.

Create and coordinate AV working groups.

Local government can coordinate directly with Chambers of Commerce, Business Improvement Districts (BIDs), downtown or neighborhood business associations, or large local employers and can be a conduit for AV service providers to these groups.

Relationship to equity.

By developing relationships with local organizations and groups, AV service providers are more likely to have an understanding of what local needs exist than if they rely solely on relationships with city- or state-level staff.

Assist in cross agency coordination.

AV testing and pilots have implications for a wide range of governmental agencies. City transportation departments are often the lead agency, though that responsibility may be shared with a transit agency or a county transportation department, depending on the project. Some agencies have taken that leadership role to coordinate with public works, parks departments, and emergency response agencies. In addition, they may also coordinate across jurisdictions that are impacted, for example, with the city, county, state, and transit agencies.

Relationship to equity.

Coordination among multiple agencies can ensure that each agency is working on common equity goals together. That could result in more equitable outcomes across a region, especially if or when the AV service provider expands services. Coordination across agencies can benefit AV service providers by facilitating deployment, helping to avoid pitfalls and conflicts before they arise.

ALLOWING, SHAPING, ASSISTING, AND PROVIDING AV SERVICES

Government agencies, either at the state or local level, can expressly allow AV pilots and deployment, and depending on the regulations and political will, can then impose requirements that shape the AV market, subject operational limits, require data and information, as well as require equitable service design, coverage, cash payment, and more.

ALLOW AV PILOTS OR DEPLOYMENT

Modify laws to allow vehicles in the right-of-way (ROW).

Regulations allowing AVs to legally operate are most commonly passed at the state level. In the absence of state regulations, some local governments are adopting laws to expressly allow autonomous vehicles in the right-of-way. It directly benefits AV service providers that want to provide AV services.

Relationship to equity.

For jurisdictions that do not currently allow AV deployment, this is an opportunity to require equity components or outcomes as a condition of passing AV enabling legislation.

Clarify liability and responsibilities.

Local (and again, often state) governments may define and require insurance, identify liability, and assign responsibilities to the autonomous vehicle service providers.

Relationship to equity.

For jurisdictions that do not currently allow AV deployment, this is an opportunity for requiring equity components or outcomes as a condition of passing AV enabling legislation. Clarifying liability issues can reduce risk for AV companies, effectively reducing costs and facilitating deployment and can be a negotiating point for local governments.

SHAPE THE MARKET

Limit the number of operators.

Limiting the number of operators in a region could increase viability of company success and increase public sector opportunity to influence deployment/operation models.

Relationship to equity.

Provides leverage to local governments for requesting equity-related activities and outcomes.

Limit the number of vehicles.

Limiting the number of vehicles allowed to operate in a region can reduce congestion.

Relationship to equity.

Some jurisdictions have incentivized equity outcomes (such as increasing service areas or successful implementation of low-income programs) when implementing e-scooter pilots and deployment by tying successful implementation to an increase in the number of allowed vehicles. This same strategy may be effective in increasing equitable outcomes with AV deployment

SHAPE THE MARKET (CONT.)

Reduce barriers to entry.

For example, public agencies can reduce requirements for AV service providers, help with outreach, limit competition, prohibit monopolies or walled gardens, etc. when these efforts are coupled with equity outcomes from AV service provider actions.

Relationship to equity.

Provides leverage to municipalities for requesting equity related components. Also avoids monopolies where a single company has sufficient power to diminish equity related requests.

Ensure compliance with existing regulations or agreements.

Compliance helps to avoid “a race to the bottom” and protects against a competitive advantage of non-compliant AV service providers. The most effective regulations will include compliance and accountability mechanisms to ensure a level playing field among all AV service providers that may be conducting pilots or deploying services. Penalties can include fees, reduction of vehicles, or suspension of service.

Relationship to equity.

Enforcement of regulations, especially equity outcomes, is critical to ensure AV services deliver what they promise to lower-income and other populations. Compliance efforts can result in incentives paid out (for companies that comply) to penalties and even suspension of operation if an AV company does not comply with equity requirements.

OPERATIONAL LIMITS, REQUIREMENTS, AND TOOLS

Require operating or business permits (or other regulation that allows for operation).

Creating minimum standards for allowing deployment in a region can help to ensure equity outcomes.

Relationship to equity.

May include requirements that services are provided in low-income areas, in multiple languages, local hiring and fair labor practices, and include accessible vehicles (see below).

Require vehicle occupancy minimums and VMT maximums.

These operational limits can be used to incentivize pooled rides and minimizing empty vehicle miles travelled and congestion.

Relationship to equity.

By requiring shared vehicles, local governments can ensure there are lower-cost options for passenger services.

Charge fees or taxes.

Charging fees or taxes (such as operation or business fees or VMT, empty seat, empty vehicle, or other taxes) generates revenue to run programs, ensure compliance, and invest in infrastructure.

Relationship to equity.

Taxes and fees can help shape AV company behavior, can be a source of funding for equity programs and can be discounted for activities that provide equitable outcomes.

OPERATIONAL LIMITS, REQUIREMENTS, AND TOOLS (CONT.)

Require equitable access programs.

A needs assessment and engagement with affected communities are the best way to develop equitable access programs and incorporate elements that will address systemic inequities with respect and dignity. Some components of equitable access programs are:

- ***Require communication/offerings in multiple languages.***

The languages offered should reflect the languages spoken in the community.

- ***Create a service coverage area and wait time minimums.***

AV services should be offered beyond downtowns. Local governments may need to require service coverage in lower-income neighborhoods and make sure that wait times are not significantly longer than the average for the region.

- ***Requiring vehicle accessibility.***

Ensure that people of all abilities can ride in passenger AV vehicles or use AV delivery services.

- ***Require multiple forms of ride reservation and payment (not only smart-phone based).***

By providing for cash and other non-credit card payments, local governments can ensure the unbanked can access rides. Allowing telephone or computer reservations increases access for those that don't have a smartphone.

- ***Require low-income fares.***

Local governments can make AV services more affordable by working with AV service providers to create low-income fare programs.

- ***Require local hiring and fair labor practices.***

Local governments can include requirements to hire or contract locally, include fair labor practices, partner with workforce development organizations, to increase employment of local residents.

Relationship to equity.

The most direct way to ensure that the deployment of AV services provide equitable outcomes is to require or incentivize them. Other local governments have successfully used incentives (such as increasing the total number of vehicles deployed) for equity outcomes.

OPERATIONAL LIMITS, REQUIREMENTS, AND TOOLS (CONT.)

Require or incentivize activities/ vehicles that reduce GHG emissions.

There is a lot that is still unknown about how AVs will impact GHG emissions. However, if AVs result in more vehicles driving more miles, resulting in increased congestion for both AVs and conventional vehicles (at least in the short term), then that could increase GHG emissions. To mitigate that possibility, local governments could

require or incentivize electric or hybrid AVs through fees or access to infrastructure. Other strategies could include congestion pricing on roads or at the curb.

Relationship to equity.

Decreasing GHG emissions can also correspond with decreased air pollution, improving public health.

Ensure safety between passengers, as well as vehicles, pedestrians, and bicyclists.

While vehicle safety requirements will likely be regulated at the federal level, local governments may need to work with AV service providers to ensure safety between passengers sharing AV rides. In addition, local governments should monitor and address issues to ensure that AVs do not injure pedestrians or bicyclists.

Relationship to equity.

Many individuals may feel unsafe when riding a passenger AV, especially if there is no attendant onboard. Local governments and AV service providers should ensure that AVs are safe for all passengers.

PROCESS ASSISTANCE

Facilitate procurement.

Local governments can make it easier for new services and pilots to be tested in a region by creating flexible procurement processes that allow for innovation and unforeseen opportunities.

Relationship to equity.

An efficient and effective procurement process may result in a better designed equity program. Facilitating procurement can incentivize innovation and partnerships with AV service providers.

Allocate staff time and resources to AV pilots and deployment.

Simply giving attention and being responsive to AV service providers builds trust and makes it easier to address equity issues. Streamlining the process can help overcome political hurdles.

Relationship to equity.

Agency staff can address issues that come up for AV service providers and ensure that they are addressing equity issues. Having a champion within the community is beneficial to AV service providers and can lead to conversations and coordination on equitable outcomes.

Allow variances to facilitate AV pilots and deployment.

Given the evolving nature of the technology and processes, there may be repeated needs for small changes to regulations to facilitate deployment or specific aspects of AV services. Variances are one way to test some of these changes.

Relationship to equity.

Local governments that are nimble and flexible may have more room to negotiate on equity issues with AV service providers.

PURCHASING OR SUBSIDIZING AV SERVICES

Provide direct financial assistance.

Governments can provide financial assistance to cover delivery fees or other service fees for public goods pilots or deployment, or to address other equity issues.

Relationship to equity.

By including public subsidies, governments have more leverage in shaping deployment towards equitable outcomes (such as paying for rides or deliveries for essential goods, like medicine or groceries). Government subsidies can provide gap funding needed for pilot deployment while producing a public good. This type of funding is also beneficial in that it signals strong partnerships with local governments, potentially helping AV service providers to secure additional funding.

Directly purchase AV services.

Municipality could be a ‘franchisee’ that purchases services in an area — guaranteeing service and control.

Relationship to equity.

Can be used to address equity issues or market failures — for instance, to directly purchase AV services for lower income areas. Local governments eliminate some risk for AV service providers by directly purchasing their services.



INVESTMENTS AND INFRASTRUCTURE

Local governments need information to make data-based decisions. To best understand the impact of AV services on the local transportation system, they need to require and collect information from AV service providers and other sources. This information can help them prioritize infrastructure investments and manage AVs in the street and at the curb.

TECHNOLOGY AND DATA INVESTMENTS

Set standards for data and platforms.

Establishment of data standards and platforms (such as the mobility data specification (MDS)) can ensure that all AV service providers use a single format.

Relationship to equity.

Uniform standards are the first building-block of data reporting. This reporting is fundamental to enforcement and the tracking of equity outcomes. AV service providers benefit from standards that are consistent across jurisdictions, which in turn may lead to faster expansion of services across a region.

Require data sharing and reporting.

Local governments need operational data to understand if companies are complying with permits or regulations and what is happening in real-time, analytical data to understand who is using the service when and where, and finally, as they evaluate and update programs, they need to understand the outcomes. While much of this data can be obtained from AV service providers through Mobility Data Specification or other reporting, the community may need to collect information from health departments, transit agencies, and employment departments to augment company data regarding the impacts on health and safety, transit, and jobs.

Relationship to equity.

Data reporting helps in understanding usage over time, who is being served, how many people are taking advantage of low-income programs or adaptive vehicles, etc. Real-time data reporting can help local governments course correct quickly and to implement incentive structures that support equitable actions.

Create technology resources.

Local governments can provide services that will facilitate deployment, overcome group barriers to entry, etc (for instance, providing city wide mapping (San Jose) or develop a routing app/algorithm (Antwerp)).

Relationship to equity.

Detailed mapping of the ROW is critical for successful AV deployment. An up-to-date map provided by a city may be a bargaining chip with AV service providers and increase their willingness to address equity issues.

TECHNOLOGY AND DATA INVESTMENTS (CONT.)

Share information (such as construction, delays, or use permits) regarding changes in the ROW.

AV service providers need a predictable environment in which to test and deploy. Activities that happen in the ROW often need a permit — from road construction and development activity, to parades or pandemic slow streets to promote walking and biking, to moving dining and retail activities into on-street parking spaces. AV service providers are likely to highly value information about temporary or permanent changes in the ROW that will impact their service.

Relationship to equity.

Detailed information about changes in the ROW is critical for successful AV deployment. Access to use, construction, and other permit data may be a bargaining chip with AV service providers and increase their willingness to address equity issues.

Develop and/or support MaaS.

Public agencies can work with the private sector to develop a MaaS platform that helps people plan the most direct route, regardless of mode. Coupling the planning components of MaaS with a payment system increases the opportunities for local governments to subsidize trips. [Portland's Transportation Wallet](#) is one example of how agencies can bundle transportation and payment services to reduce auto dependency.

Relationship to equity.

Communities across the country are offering subsidies to lower-income residents to discourage single-occupancy vehicle use. Development of MaaS with low-income program payment options can reduce the friction between users and multiple services. Subsidies can also improve access to a wide range of mobility options.

Provide a framework and standards for integrated payment and booking.

Providing a framework and standards can help to facilitate use across multiple platforms and services and for data reporting.

Relationship to equity.

Local governments and transit agencies have successfully worked with private companies to integrate payments into platforms already used by residents. Consistent processes across platforms reduces confusion among users.

PHYSICAL INFRASTRUCTURE INVESTMENTS AND MANAGEMENT

Manage travel-lane access for AVs.

Depending on the AV service, local governments may want to allow it, limit it, give priority to some modes, or give exclusive access to other modes. In addition, local governments may want to designate ROW space for AV operations, in the roadway and/or at the curb.

Relationship to equity.

Like a carpool lane, AV-only lanes may increase speed and throughput, especially when designed to provide services to low-income passengers. Local governments should prioritize and leverage AV services that benefit from this prioritization and support equity goals.

Designate and manage curbside access.

AV service providers need designated spots for pick-up and drop-off of passengers and goods. This is space that is controlled by local governments. Local governments can designate space outright and ensure it is safe for users of all abilities by installing curb cuts for wheelchairs and other mobility devices. In addition, they can create and run programs to ensure space at the curb is available when needed. For example, [Washington, DC](#) and [Omaha, Neb.](#) are piloting paid reservation systems for loading zones for commercial delivery, systems that could work well for AV delivery.

Relationship to equity.

Designating space for AVs in the ROW can be used to incentivize the service providers to address equity issues. In addition, local governments should ensure that pickup and dropoff locations are equitably chosen (are they available in all neighborhoods), safely and accessibly designed, convenient for other modes of transportation (transit, e-scooters, bikeshare, adjacent to sidewalks, etc.). This benefits AV service providers because it provides easy access to pick-up and drop-off locations and shortens the time for loading and unloading of vehicles.

Invest in tech-ready transportation infrastructure.

Local governments can invest in striping, intersection design, V2I, etc. to make AV deployment easier.

Relationship to equity.

Investments in infrastructure can be leveraged for equitable outcomes.

Invest in infrastructure improvements for congestion management and/or for AV deployment.

Real-time data from AVs can provide information about congestion. Local governments can use that information to lengthen light signal times to clear traffic queues and develop other vehicle-to-infrastructure (V2I) technology to improve mobility.

Relationship to equity.

Local governments should consider how they can make sure that transportation is efficient, reliable, pleasant, and comfortable for all users, not just those that are the most affluent. This is a benefit to AV service providers as it speeds up trips and can directly decrease costs and potentially increase revenue.

SECTION 4: CONCLUSIONS

Urbanism Next acknowledges that it is challenging to identify exactly how AV services can fully achieve equitable outcomes or serve all people/meet the needs of all community members due to numerous factors including limited testing/deployment, technological hurdles that must still be overcome, the instability of the potential AV market, and the desire for AV service providers to test and deploy in different communities. With this in mind, we recommend beginning engagement processes with the purpose of building shared understandings of the nature of AV pilots/deployments in one's community and what the local jurisdiction does/does not have influence over. Once there is a shared understanding among the community about the current state of AVs and the potential benefits *and* problems they could bring, and the community has selected and approved AVs on their streets, public sector agencies can begin to focus on collaboratively shaping the engagement to meet the equitable outcomes/goals/needs/priorities identified by the communities they are trying to serve.

As we have seen with the recent deployments of TNCs and micromobility devices, if equity is not a central part of the conversation and decision-making from the onset of the piloting/deployment of emerging technologies, it is incredibly difficult to retroactively make a transportation system equitable. This is why it is essential that transportation sector agencies begin planning for how AV deployment can meet community needs and equitable outcomes now, even though the technology may take years to come. Along these lines, public sector agencies and municipalities should be aware of the equity implications AVs may bring and the barriers to engagement and usability of services faced by underserved communities. This white paper outlines the importance of focusing on building trust in public engagement processes and highlighted best practices for equitable engagement, AV specific engagement, and virtual engagement (in the context of COVID-19) as well as considerations for overcoming equity barriers in the usability/engagement regarding AV pilots and deployments.

Given the quickly evolving nature of emerging technologies, one of the most important things that local governments can do is to monitor and evaluate AV pilots and deployments once they are implemented, and iterate and update regulations and programs to address deficiencies and take advantage of new opportunities. Long-term plans may be a thing of the past as short-term (one to two year) deployments, evaluations, and then updated services becomes the norm.



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APPENDIX A: RESOURCES AND TOOLS

CONDUCTING ENGAGEMENT DURING COVID-19

[Principles for Equitable Public Outreach & Engagement During COVID-19 & Beyond](#)

Naomi Doerner, Yanisa Techagumthorn

Nelson\Nygaard (2020)

Two-page guide describing 10 principles for equitable outreach and engagement, specific to the context of Covid-19.

[Virtual Engagement During COVID-19: MnDOT's Success Story](#)

Sierra Saunders

Alta Planning + Design (2020)

This brief blog post describes the strategies that contributed to the success of the MnDOT Virtual SRTS Meet Up, an engagement event that drew over 100 participants. In addition to the virtual event, they conducted online surveys, one-on-one phone interviews, and facilitated virtual listening sessions.

[Public Engagement Tools for a Remote Environment](#)

Katie Selin

Alta Planning + Design (2020)

This blog post provides examples of virtual public engagement tools such as interactive maps, story maps, surveys, and a virtual open house. It also includes a list of additional resources for online public engagement during COVID-19.

[Best Practices For Engagement in the Time of Covid](#)

Elizabeth Buehler, Christianna Johnson, Kyle Strayer, Ronnie Button

Salt Lake City Civic Engagement Team (2020)

This report includes resources for online and adapted traditional engagement methods. It includes many tips for holding online meetings, equity considerations, and outreach platforms and methods. It also describes the digital divide and provides resources for bridging it as well as COVID-19 resources.

CONDUCTING EQUITABLE ENGAGEMENT GENERALLY

[Suggested Design and Management Techniques for Enhancing Public Engagement in Transportation Policymaking](#)

Kathryn Quick & Zhirong Zhao

University of Minnesota Center for Transportation Studies (2011)

This document outlines a four step process including deciding the purpose of the public engagement effort, considering moving beyond participation in engagement, selecting techniques for managing engagement, and evaluating the public engagement efforts.

[ParticipateDB: The Digital Engagement Catalogue](#)

Center for Applied Community Engagement LLC (2020)

This is a collaboratively maintained directory of digital engagement tools that includes 396 tools, 327 projects, and 276 references.

[Strategies for Equitable Engagement](#)

Seattle Neighborhoods

City of Seattle

This link leads to a short Word document download explaining what equitable engagement is, why it is valuable, and best practices for conducting equitable engagement and overcoming potential barriers.

[Community Engagement](#)

Racial Equity Tools

This webpage includes a list of additional resources on community engagement.

[Equitable Community Engagement Blueprint](#)

Neighborhood Improvement Services

City of Durham (2018)

This blueprint is a draft/working document that was designed to guide City staff in equitably engaging community members while developing and completing City initiatives. It includes foundations of equitable community engagement, five steps to build an equitable engagement plan, implementation strategies, and resources.

[Community Engagement Toolkit](#)

Paul Schmitz

Leading Inside Out, Collective Impact Forum (2017)

This toolkit includes a fillable worksheet with background information and prompts to help readers create effective community engagement plans.

UNDERSTANDING MOBILITY EQUITY

[Mobility Equity Framework: How to Make Transportation Work for People](#)

Hana Creger, Joel Espino, Alvaro S Sanchez

The Greenlining Institute

Greenlining's Mobility Equity Framework is a comprehensive guiding document outlining principles and tools for elevating equity and community power to address structural inequities and meet the mobility needs of low-income communities of color.

[Making Equity Real in Mobility Pilots](#)

Hana Creger, Joel Espino, Alvaro S Sanchez

The Greenlining Institute

This is a companion toolkit to the report above. It is designed to operationalize the steps laid out in the report and guides users through a worksheet, in addition to providing important resources.

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