

COMMUNITY ENGAGEMENT IN AUTONOMOUS VEHICLE PILOT PROJECTS: LESSONS LEARNED

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 UNIVERSITY OF
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URBANISM NEXT CENTER

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The Knight Autonomous Vehicle (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 José**, 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.

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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, urban delivery, and autonomous vehicles on the built environment. Going beyond these emerging technologies, we explore the possible implications on equity, health, 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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INTRODUCTION:

Transportation resources, opportunities, and burdens are currently spread unevenly across communities. New technologies in transportation, including autonomous vehicles (AVs) present opportunities to rectify current inequities; but they could also perpetuate the existing divide in access to opportunities or negative externalities such as added road congestion and emissions. Community engagement is critical to the deployment of autonomous vehicle technology to ensure that new technologies are leveraged to realize positive and equitable outcomes that advance city goals.

In the last decade, US cities have piloted AV technologies across a range of contexts and program designs. Experiences from these pilots offer critical lessons for other cities seeking to effectively engage communities in future AV pilots. The hyper-dynamic nature of current technological developments requires unique considerations for communities engaging in AV pilot projects. One of the best ways to learn about these considerations in this quickly changing landscape is through distilling key lessons from AV pilots and community engagement, and sharing them widely.

WHO IS THIS REPORT FOR?

This report is primarily intended for local governmental staff seeking to pilot AV technologies and wanting to better understand how best to engage their communities in these pilots. Lessons may, however, be equally of interest to AV technology providers, community organizations, state or federal governments, or other partner organizations involved in AV pilot or demonstration projects.



PUBLIC STAKEHOLDERS
looking to more effectively engage in autonomous vehicle policy development



AV DEVELOPERS & OPERATORS
looking to better understand how to work with cities and align with city goals



STATE & FEDERAL GOVERNMENTS
looking to better understand how to meaningfully collaborate with cities on AV policy and governance



NON-PROFIT ORGANIZATIONS
and academic institutions looking to support city preparedness for AVs and other future disruptive technologies

Adapted From Autonomous Vehicles: A Guide for Cities

WHERE DO THE LESSONS LEARNED COME FROM?

The Knight Autonomous Vehicle (AV) Initiative has been a multi-year collaborative effort between the Urbanism Next Center at the University of Oregon, Cityfi, the cities of Detroit, Pittsburgh, and San José, and Miami-Dade County to pilot and learn about automated mobility technologies today to shape the future of deployment tomorrow. This collaboration included personal delivery device (PDD) pilots in all four cities, AV shuttle pilots in Miami Dade County, an AV pilot in Detroit, outreach efforts for these pilots and for general AV awareness across all cities, and ongoing conversations and knowledge sharing between the cities and the private sector. A strong focus of this work was to engage with local communities to ensure that AV deployment benefits all residents and furthers community goals.

This work has yielded a deeper understanding of the opportunities and challenges of AV deployment and the strong need for coordinated and forward thinking engagement with communities around AV testing and eventual full scale deployment. In addition to this report, work funded by the Knight Foundations AV Initiative has produced the following reports:

A Framework for Shaping the Deployment of Autonomous Vehicles and Advancing Equity Outcomes (2021)

<https://www.urbanismnext.org/resources/a-framework-for-shaping-the-deployment-of-autonomous-vehicles-and-advancing-equity-outcomes>

Piloting Sidewalk Delivery Robots in Pittsburgh, Miami-Dade county, Detroit, and San Jose (2022)

<https://www.urbanismnext.org/resources/piloting-sidewalk-delivery-robots-in-pittsburg-miami-dade-county-detroit-and-san-jose>

Autonomous Vehicles: A Guide For Cities (2023) - with Cityfi

<https://www.urbanismnext.org/resources/autonomous-vehicles-a-guide-for-cities>

GOALS OF THIS REPORT

Successfully and effectively engaging communities in pilot programs requires a deliberate process of internal preparation and project management, close engagement with technology providers, understanding community needs, and bi-directional learning process between the community and city staff.

This report provides concrete guidance across multiple topics and considerations that communities, governments, and AV-related companies should weigh during AV pilot projects, with particular emphasis on the role that community engagement and equity play in pilot program design, implementation, and evaluation. The report offers succinct and digestible lessons learned alongside examples, concrete action items, and more detailed “case study pull-out boxes” to operationalize lessons into practice. It aims to provide a simplified overview suitable even for small-scale projects with limited scopes and budgets.

KEY LESSON FOCUSES:

Lessons are presented across five topic areas including:

- 1) Institutional Knowledge
- 2) Equity
- 3) Community Context
- 4) Community Engagement
- 5) City-Operator Relationship



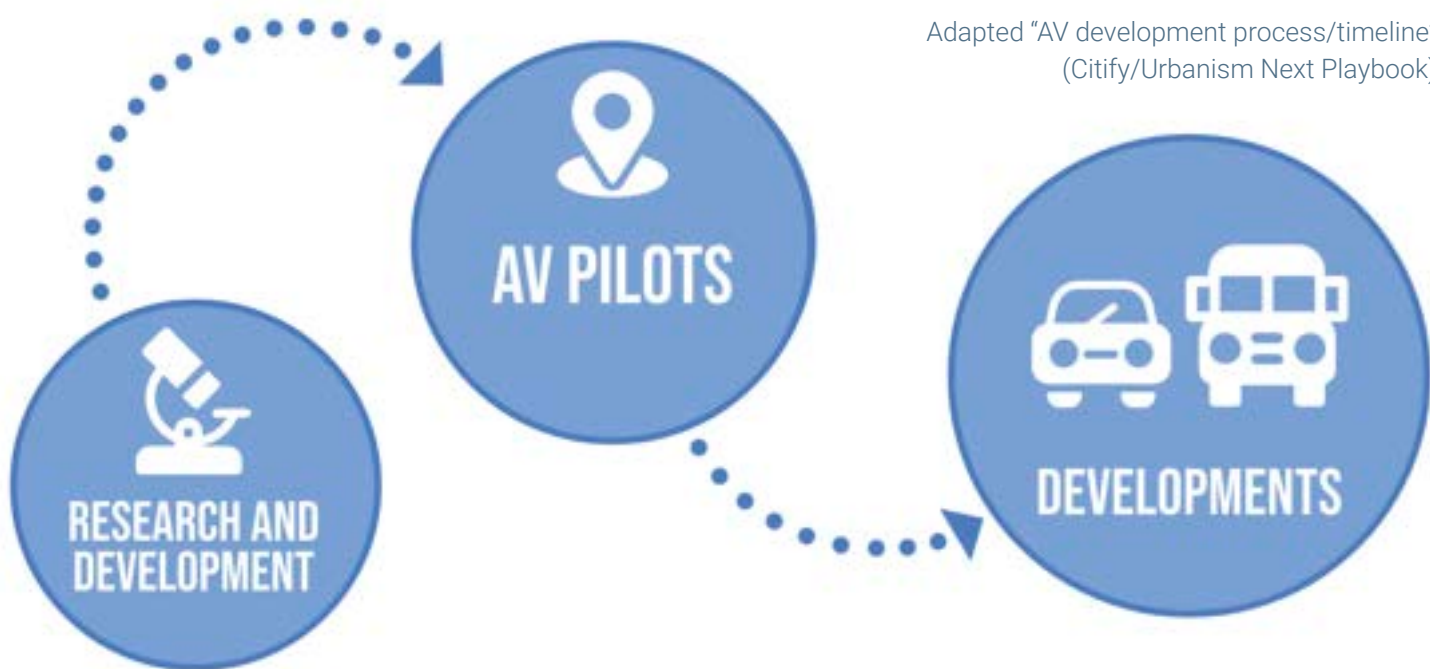
Planning for AV technology and community engagement are tightly interlinked activities which contribute to progress (optimization) through numerous iterations.



THE ROLE OF PILOTS IN AV DEVELOPMENT & DEPLOYMENT

Pilot or demonstration projects typically aim to test developed technologies in real world settings. Pilots are especially important and helpful with emerging technologies where full-scale deployment holds a large number of unknowns around operations, user uptake, and a wide range of secondary impacts. Pilots are typically more constrained in scale, scope, and time compared to full-scale technology deployment and offer learning opportunities around feasibility, cost, operational needs, and use, among others. While pilots ideally inform subsequent full-scale deployment, distinctions between research, demonstration, and deployment are not always clear cut. Continual technological

advances shift the landscape of possible pilot programs, operations, and deployment, requiring adaptation and iteration over time. Similarly, pilot projects may be mistaken as a full-deployment of AV technology by users or cities alike, challenging perceptions and expectations that do not align with the experimental nature and learning intent fostered by pilots. Early stages of large scale deployment(s) of AVs may appear similar to simply piloting at a larger scale. The blurry lines between research and development, demonstrations, and full-scale deployments can pose particular challenges in communication, expectation management, and evaluation of pilot projects.



LESSONS FOR COMMUNITY-CENTERED AV PILOT PROJECTS

Lessons for community-centered AV pilot projects are presented across five key themes, which should be approached simultaneously throughout a pilot project:



01 | KNOWLEDGE

Building institutional knowledge and mutual understanding including developing common language and aligning pilot project design with city goals, technological vision, and current technological availability.



02 | EQUITY

Centering equity in AV pilots to ensure all community members are benefiting from AV deployment.



03 | CONTEXT & NEEDS

Understanding community context and needs requires gathering data about the community context to inform the pilot project including setting goals, designing pilot operations, guiding community engagement activities, and establishing project evaluation metrics and parameters.



04 | PILOT ENGAGEMENT

Engaging communities in AV pilots to consult and collaborate with those who might use and might be affected by AV services.



05 | CITIES & OPERATORS

Navigating city and operator relationships and clarifying the questions cities should be asking and how cities can effectively coordinate with AV technology operators/providers.

These five themes are closely interlinked through feedback loops, requiring pilot goals and activities to be regularly reviewed and revised based on community inputs and insights gained through the pilot process. It is important to note that community engagement should therefore be conducted early and consistently alongside other project activities rather than constrained to a single project phase. It should be iterative and should be actively used to shape AV deployment.

01

BUILDING INSTITUTIONAL KNOWLEDGE & MUTUAL UNDERSTANDING

BUILDING INSTITUTIONAL KNOWLEDGE & MUTUAL UNDERSTANDING

AV pilot projects typically involve a diverse range of actors, including city staff, community stakeholders, AV service providers, and consultants or research institutions. Work areas span from engineering and information technology, to urban planning and transportation management, to communication and community engagement activities. The diversity of actors and actions can present challenges for project management. A critical first step in any pilot project is to define the playing field and shape a common understanding

of the purpose of the pilot project among all collaborators. To ensure clear communication between all pilot project partners, project teams should establish a mutual understanding of key concepts, adopt common terminology, and set realistic goals aligned to pilot activities. Note that throughout this report the term “goals” is used loosely to apply to aims, objectives, or activities in the sense of “defining sufficiently specified intentions to which the project team can hold itself accountable”.

1.01 IDENTIFY PROJECT TEAM & INTERNAL PROJECT LIAISONS

An AV pilot project may touch upon several domains within city administration. While the core project team may be small, it should systematically identify contacts within the city administration that may be consulted, informed, or involved in aspects or phases of the project.

For example lists of potential internal liaisons see [Worksheet 1](#).

ACTION ITEMS:

- ☐ **Select project team:** Set up the project team and define core responsibilities and decision-making structure.
- ☐ **Identify internal liaisons:** Identify departments and agencies within the city administration; define the scope and timeline for each liaison’s involvement.



WORKSHEET 1 | IDENTIFY INTERNAL PARTNERS & OUTSIDE STAKEHOLDERS

Examples for departments and agencies within or close to a city administration who may serve as liaisons to the pilot project:

- ☐ **Transportation Department**
 - ☐ Traffic Engineering Division
 - ☐ Public Transit Agency
 - ☐ Bicycle and Pedestrian coordinator
 - ☐ Traffic safety
 - ☐ Parking manager
- ☐ **Urban Planning Department**
 - ☐ Transportation Planning Division
 - ☐ Community Development Division
- ☐ **Public Works Department**
 - ☐ Street Maintenance Division
 - ☐ Traffic Operations Division
- ☐ **Community Engagement Department**
 - ☐ Community Outreach Team
 - ☐ Public Information Office
- ☐ **Legal Department**
 - ☐ Transportation Regulation Division
 - ☐ Title VI officer
- ☐ **Environmental Services Department**
 - ☐ Sustainability Division
- ☐ **Public Safety Department**
 - ☐ Police Department
 - ☐ Emergency Management Division
- ☐ **Information Technology Department**
 - ☐ IT Infrastructure Division
 - ☐ Data and Statistics Division
 - ☐ Cybersecurity Division
- ☐ **Local Government Officials**
 - ☐ Mayor's office
 - ☐ City Council or Legislative Body
 - ☐ AV Task Force, Subcommittee, or similar
- ☐ **Regulatory Agencies:** Government bodies responsible for regulating transportation, safety, and technology standards.
- ☐ **Innovation Office, Smart City Division, or similar.**
- ☐ **Law Enforcement:** Police department, traffic enforcement agencies.
- ☐ **Emergency Services:** Fire department, ambulance services, hospitals, and emergency response teams.

1.02 IDENTIFY TARGET POPULATION GROUPS & INDIRECTLY AFFECTED POPULATIONS

Project teams should be proactive in distinguishing between population groups who may use the AV pilot and those who will not use the service but may still be impacted by it. Clear and early identification of groups will help align community engagement efforts with the goals of the pilot and inform efforts to reach various population groups. These groups should be explicitly considered in data collection and community engagement efforts.

Later sections on [Equity](#) discuss identifying population groups of equity concerns.

[Worksheet 2](#) includes examples of target populations and indirectly affected populations.

ACTION ITEMS:

- ☐ **Identify target populations:** who may benefit from or be negatively affected by the AV service? Who is expected to use the AV service and who may be impacted indirectly?
- ☐ **Identify representation:** who can best represent the interests and concerns of these populations?

WORKSHEET 2 | IDENTIFY TARGET POPULATIONS & INDIRECTLY AFFECTED GROUPS

Examples of categories of potential AV service users:

- ☐ Racial/ethnic groups
- ☐ Seniors, minors/parents/families (i.e., by age group)
- ☐ People with disabilities
- ☐ Transit users, pedestrians, cyclists, drivers (i.e., by primary mode of travel)
- ☐ Commuters, shoppers, patients, tourists (i.e., by trip purpose)
- ☐ People with limited technological access (e.g., no smartphone, limited data plans)
- ☐ People with limited financial resources (i.e., earning low incomes)

Examples of population segments potentially indirectly impacted by the AV service:

- ☐ Residents, local businesses, and workers within the service area
- ☐ Vulnerable road users (e.g., people with disabilities, seniors, children)
- ☐ Transit users, pedestrians, cyclists, drivers (i.e., by primary mode of travel)
- ☐ Commuters, shoppers, patients, tourists (i.e., by trip purpose)

1.03 IDENTIFY STAKEHOLDERS

In addition to the identification of internal liaisons, pilot projects should identify outside stakeholder liaisons: people and organizations with interests in the project, or who can provide support to the pilot. To do this, the pilot project should ensure that stakeholder engagement reflects target populations including groups that may benefit from or be negatively affected by the service.

Worksheet 3 lists examples of potential stakeholder liaisons.

ACTION ITEMS:

- ☐ **Identify external stakeholder liaisons**, such as private mobility providers, transportation advocacy groups, research institutions, and community organizations.

CONNECTION:

- Initiative / Non-profit board
- Community members
- Stakeholders
- Local government agencies

INTEGRATION:

- Access and power in decision-making
- Project co-design
- Project co-implementation
- Community mobilization and capacity building

DEVELOPMENT:

- Trainings
- Individual goals
- One-on-one support and supervision
- Building long-term champions for change



Adapted from the
Community Liaison
Framework of the UHP

COMMUNITY LIAISON FRAMEWORK



Photo via Wikimedia Commons

The Community Liaison Framework aims to better integrate resident voices into decision-making and programmatic efforts. Miami Dade County was provided technical assistance, supervision, training and engagement support by Urban Health Partnerships (UHP) to guide and assist these processes as part of their New Mobility Initiative.

UHP's Community Liaison (CL) Framework emphasizes the need for system changes to increase community engagement and integration in decision making processes. It strengthens community networks to positively affect and improve the health and overall well-being of community members.

As a social justice strategy, CLs are community members who are paid for their time, as resident expertise should be honored and valued as much as technical knowledge. One cannot assume or expect that individuals have the financial ability to volunteer their time for such efforts, or that volunteering would result in equitable representation of the community. As such, CLs present professional and personal development opportunities available to everyone.

As part of the New Mobility Initiative Miami Dade County worked with 16 community liaisons to explore the public's vision for AVs, how they could best benefit their neighborhoods, and which aspects of this new technology raised concerns.

LIAISON MODEL, MIAMI DADE COUNTY

Miami-Dade County is piloting delivery robots and autonomous shuttles, focusing on how they could be used to improve accessibility and mobility equity throughout the County.

WORKSHEET 3 | IDENTIFY STAKEHOLDERS

Examples for potential liaisons outside a city administration who may represent stakeholders to the pilot project:

- ☐ Community Members:
 - ☐ Residents living in the area including homeowners and renters
 - ☐ Local businesses, shops, restaurants
 - ☐ Large employers, schools, hospitals, or other major groups of potential AV users
- ☐ Community Organizations and Advocacy Groups:
 - ☐ Neighborhood associations
 - ☐ NGOs focused on transportation or urban development.
 - ☐ Organizations concerned with the environmental impact of transportation.
 - ☐ Accessibility advocates representing individuals with disabilities or seniors
 - ☐ Tourism boards or agencies promoting tourism
- ☐ Educational and Research Institutions:
 - ☐ Local schools, colleges, universities interested in research or partnerships related to AV technology.
 - ☐ Academic institutions conducting research on autonomous vehicles or urban mobility.
- ☐ Private Partners:
 - ☐ Companies involved in the development, manufacturing, or deployment of AV technology.
 - ☐ Technology Providers: Companies providing infrastructure or technology support for AV deployment (e.g., charging stations, data analytics).
 - ☐ Transportation Network Companies (TNCs): Companies like Uber or Lyft that may be interested in integrating AVs into their services.
 - ☐ Insurance Companies: Providers interested in the implications of AV technology on insurance policies and liability.
 - ☐ Urban Planners: Professionals involved in city planning and development, interested in the impact of AVs on urban infrastructure.
 - ☐ Real Estate Developers: Companies or organizations involved in urban development projects affected by AV deployment.

1.04 DEVELOP A COMMON LANGUAGE (PROJECT GLOSSARY)

New technologies come with new terminology, creating challenges for communication and outreach efforts. A glossary of the most commonly used technical terms and jargon can aid in both internal as well as external communications, and make pilot materials more accessible to collaborators and the public. For an example glossary for an AV pilot project see [Glossary](#) at the end of this report.

ACTION ITEMS:

- ☐ Create a glossary website
- ☐ Avoid jargon in internal and external communications
- ☐ Explain jargon when it is needed

1.05 OUTLINE AVS' POTENTIAL IMPACTS ON TRANSPORTATION & BEYOND

AVs can directly and indirectly affect a wide range of outcomes both within and beyond transportation. Developing a conceptual understanding or visual representation of both the potential direct and indirect effects of AVs – including positive, negative, and any unintended effects – can help shape and contextualize aspects of the pilot, including: defining goals, informing data collection and project evaluation, identifying equity concerns, and shaping community engagement activities.



Examples of how AV services may impact transportation and other outcomes:

- AVs may affect public transit budgets through reduced operational (labor) costs, increased vehicle (capital) costs, and potential impacts on transit ridership.
- The lack of drivers on board of AV transit vehicles may require employing assistance or safety personnel.
- AVs may improve mobility and access for people without access to a personal car, such as people with disabilities, children, and people who can't afford to own a car.
- AVs may improve traffic safety but could also pose risks for vulnerable road users like pedestrians and cyclists.
- AVs may replace vehicles which are more polluting (e.g. diesel burning buses) or less space efficient (e.g. last mile delivery vehicles).
- Alternatively, they could shift travelers from active transportation modes and transit to AVs.
- AVs could reduce the costs of travel and induce additional car travel, exacerbating vehicle miles traveled, congestion, and urban sprawl while increasing energy use.



For examples of positive and negative impacts of AVs see [Worksheet 4](#).

ACTION ITEMS:

- ❑ **Identify potential positive, negative, and unintended impacts** you expect the AV service to yield for both project outputs and broader impacts

WORKSHEET 4 | IDENTIFY IMPACTS OF AVS IN KEY DOMAINS

Examples of potential positive and negative impacts of autonomous vehicle (AV) technology:

□ Urban Mobility and Congestion Management:

- + AVs have the potential to reduce traffic congestion by optimizing routes and enabling efficient ride-sharing, leading to smoother traffic flows and reduced travel times.
- An influx of AVs could increase vehicle miles traveled (VMT) if people opt for more solo rides and longer commutes, potentially exacerbating congestion in some areas.

□ Environmental Sustainability and Decarbonization:

- + Shared and electric AVs would reduce greenhouse gas emissions and improve air quality, aligning with sustainability and decarbonization goals.
- Increased VMT alongside the manufacturing and energy needs to construct AV vehicles and infrastructure could negate accrued benefits.

□ Accessibility and Social Equity:

- + AVs have the potential to enhance transportation accessibility, particularly for older adults, people with disabilities, travelers without cars, and those in underserved communities, promoting social equity.
- Without proactive policies, AV deployment could be unevenly distributed or too expensive for some travelers to access, exacerbate existing disparities.

□ Traffic Safety:

- + AVs have the potential to significantly reduce traffic collisions and fatalities by eliminating human error, thus improving overall transportation safety.
- Without proactive policies, AV deployment could be unevenly distributed or too expensive for some travelers to access, exacerbate existing disparities.

□ Public Health:

- + AVs may boost walking and cycling through road safety improvements, and more space-efficient travel that frees space for bicycle and pedestrian infrastructure and through improved transit.
- AVs could replace trips currently taken by active modes and transit, reducing physical activity.

□ Urban Land Use and Infrastructure Planning:

- + AVs could reshape urban landscapes by reducing the need for parking spaces and altering transportation infrastructure requirements, potentially enabling more efficient land use and urban development.
- Increased utility of being driven by an AV could lead to higher tolerance for longer travel distances, and therefore contribute to urban sprawl.

□ Economic Boost and/or Disruption:

- + Increased efficiency in people and goods transportation, leading to monetary and time savings, including increased productivity while on the go. Creation of new jobs associated with new production and operation industries.
- Displacement of jobs in industries reliant on human-operated vehicles, leading to economic hardship and social disruption in affected communities (e.g., taxi drivers, bus drivers, truck drivers). Business failures among traditional transportation providers unable to compete with AV services, potentially exacerbating income inequality.

1.06 ALIGN LONG-TERM VISION OF AV SERVICES WITH BROADER CITY GOALS

Long-term goals for AV deployments should support a city's wider goals and strategic planning efforts.

Long-term goals for an AV service may be defined prior to (e.g. as part of long-term transportation plan) or as part of the pilot project. Setting broad goals for long-term AV deployment prior to pilot implementation is critical to ensure that pilot structure, operations, and evaluation will generate the knowledge and understanding needed to foster future full-scale deployment.

Long-term deployment goals for the piloted AV service should align with general visions or principles for AV technology.

DO LONG-TERM AV DEPLOYMENT GOALS ...



ACTION ITEMS:

- ☐ **Develop long-term goals** for full AV deployment in your city.

... SUPPORT BROADER COMMUNITY GOALS?



Communities may pursue AVs for different reasons - to boost their economy, to provide new transportation options, or to improve road safety. It is important to note that early AV pilots are typically more exploratory and smaller in scale and therefore may not be able to directly or measurably contribute to broader community goals. That said, they can still provide critical steps towards understanding the technology, operations, impacts, and uptake, which will eventually impact these broader goals. It is important to be clear and realistic about the expected outcomes and learnings, and how they relate to broader community goals.

For examples of long-term goals see [Worksheet 5](#).

Additional resources include NACTO's [Policy Statement on AVs](#) and the American Planning Association's [10 Principles for Managing AVs on City Streets](#).

WORKSHEET 5 | DEVELOP LONG-TERM GOALS FOR THE FULL-SCALE AV DEPLOYMENT

Example goals for a long-term, large-scale, real-world deployment of AV services:

- ☐ Reduce transportation costs
- ☐ Increase transportation accessibility
- ☐ Provide more equitable access to transportation services
- ☐ Enhance mobility options for underserved communities
- ☐ Offer inclusive design for people with disabilities
- ☐ Reduce dependence on personal vehicle ownership
- ☐ Integrate with existing public transit systems
- ☐ Enhance first and last mile connectivity
- ☐ Enhance user experience and convenience
- ☐ Reduce traffic congestion
- ☐ Enhance safety for passengers and pedestrians
- ☐ Support active transportation and non-motorized modes
- ☐ Improve resiliency in disruptions and emergency situations
- ☐ Make more efficient use of urban space
- ☐ Improve air quality and reduced emissions
- ☐ Support sustainable urban development
- ☐ Mitigate transportation-related social and environmental disparities
- ☐ Engage community and build public trust
- ☐ Create jobs and economic opportunities
- ☐ Enhance data sharing and integration with city planning

1.07 SET PILOT GOALS TO SUPPORT LONG-TERM VISION FOR AV DEPLOYMENT

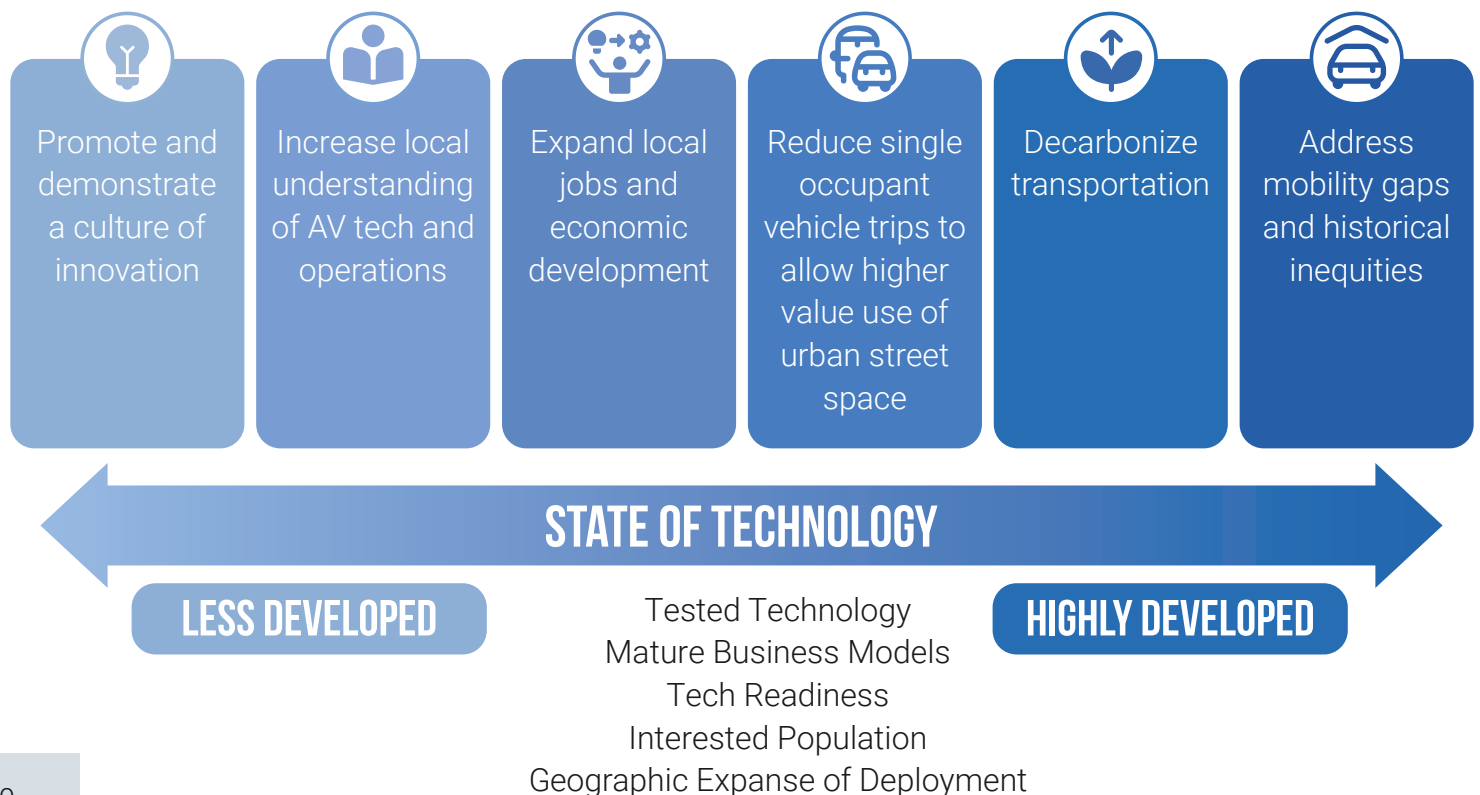
By design, pilot goals should reflect the more limited and short-term structure of a demonstration project. Pilot goals should adhere to the SMART criteria: specific, measurable, achievable, relevant, and time-bound. They should guide pilot design and community engagement, and motivate data collection and evaluation approaches.

Pilot projects should be specific about what learning topics they are focused on, understanding that these may be different from broader community goals. These learnings can be critical to shaping future, large-scale deployment to assist with community goals and to increasing public sector, private sector, and community stakeholder expertise.

For example, pilots might support learning across one or various dimensions of AV services:

- OPERATIONS:** Operation of AVs, maintenance needs and challenges, emergency services interaction, and weather impacts, etc.
- PROCESS:** Public/private sector relationships, regulatory barriers, community response, communication, etc.
- PERFORMANCE:** Quantifiable metrics including number of trips provided, total passengers transported, service quality (e.g., reliability, wait times), and user descriptives including passenger demographics, service satisfaction, etc.
- OUTCOMES:** Alignment with broader community goals such as reducing emissions or increasing equity.

Potential learnings from AV pilots need to be calibrated with the size of the deployment, the state of the technology, the riders served, and the maturity of business models. (See [AVs: A Guide for Cities](#) (2023) for a more detailed discussion)



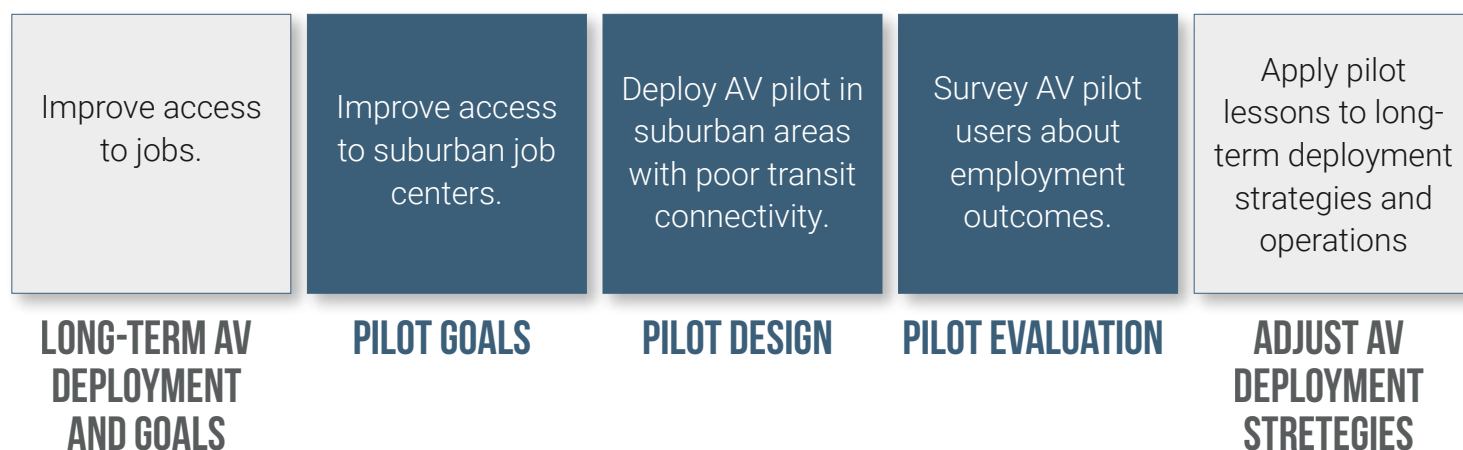
SMART GOAL CRITERIA:

S	SPECIFIC Clearly define the goal with specific details to avoid ambiguity.
M	MEASURABLE Establish concrete criteria for measuring progress and determining when the goal is achieved.
A	ACHIEVABLE Ensure that the goal is realistic and attainable, considering available resources and constraints.
R	RELEVANT Ensure that the goal is aligned with the overall objectives and purpose of the project or organization.
T	TIME-BOUND Set a specific timeframe or deadline for achieving the goal to provide a sense of urgency and accountability.

ACTION ITEMS:

- ☐ **Define SMART goals for the pilot project** that compliment and support long-term goals
- ☐ **Use goals to shape the pilot design, data collection, and evaluation.**

Example of pilot goals vis-a-vis long-term deployment goals for the AV service:



1.08 ACKNOWLEDGE PILOT LIMITATIONS TO INFORM LONG-TERM DEPLOYMENTS OF AV SERVICES

A pilot project is a smaller, simplified version of the envisioned long-term, full-scale deployment. While such simplifications make it easier to answer certain questions, they impose clear limitations with regards to drawing conclusions for the full-scale deployment. They can also create grounds for misinterpretation and confusion and should therefore be addressed in communication efforts and internal project design.

Examples for common limitations of pilots:

Scale and size constraints: Pilots may serve a much smaller area, deploy fewer vehicles, and/or run less frequently than is envisioned for the long term deployment.

Short timeframes: Pilots, by definition, exist for a shorter term than continual deployments.

Financial model: Service fees or fares may not reflect later, steady-state business models or potential economies of scale achieved with larger deployment.

Technological limitations: AVs may still employ a safety driver, or limit service to daylight hours.

Energy and emissions models: Pilot AVs may run on gasoline while long-term deployments envision electric vehicles.

Because of such limitations, pilots may not be able to assess:

Financial viability or the business model of a long-term AV service. AV pilots often provide trips at no cost to passengers or include a heavily reduced and subsidized charge for trips, whereas both the long-term costs of AV operations and corresponding price of AV trips are difficult to predict.

User preferences under real-world conditions, particularly around travel cost and perceived safety. These may shift substantially as the technology keeps evolving.

Future demand for the service. Demand (i.e., mode choice) is the complex result of numerous factors, first and foremost price, but also convenience and access to alternatives, which cannot be easily assessed within a pilot framework.

Impacts on traffic safety, the environment, or transportation equity. Such “secondary effects” can often be extrapolated or predicted based on assumptions derived from insights from the pilot (e.g. demand development, emission reductions), but can typically not be observed directly during the pilot (e.g. reduction in air pollution levels). may still employ a safety driver, or limit service to daylight hours.

Successfully managing “discrepancies” between pilot and future deployment needs to be factored in thoroughly in the evaluation plans for the pilot (goals, data collection and analysis). They can also necessitate additional requirements on the communication between partners, the technology knowledge of partners, and the project management to come up with contingency plans in case things do not work out as originally planned. Additionally, technological limitations and evolutions have implications on which use cases can be supported, how the pilot service and its features are presented to the public, how it is perceived by users, and which lessons can be drawn with regards to the long-term deployment.

ACTION ITEMS:

- ☐ **Identify technological capability and limitations** at the beginning of the project
- ☐ **Identify potential technological developments/improvements** anticipated throughout the project
- ☐ **Identify discrepancies between pilot AV capabilities and expectations for full-scale deployment**
- ☐ **Develop communication strategies** related to the “state of technology”, in particular to limitations
- ☐ **Account for limitations and potential developments or improvements** in goal setting, evaluation concept, and communications

1.09 ALIGN GOALS, PILOT DESIGN, DATA COLLECTION, & EVALUATION

Project goals are only useful if they are evaluated against levels of achievement. Planning for factors such as sampling strategies, data collection, and evaluation scale are crucial to derive lessons to inform full-scale AV deployment. This can be done at varying levels of sophistication:

For operational or process learning goals, evaluation may be somewhat informal and mostly qualitative. For performance goals, identifying key performance indicators (KPIs), and ensuring adequate data collection and analysis/monitoring processes are key to gain the desired insights. While data collection and evaluation for some indicators may be straightforward (e.g., tracking the number of AV trips), other indicators may require the development of custom data collection tools such as surveys to assess rider satisfaction with the AV service.

Evaluating equity and outcome goals can introduce additional logistical and evaluation complexities. Indicators of long term goals (e.g., congestion reduction) often prove difficult to measure and may be influenced by confounding factors such as concurrent events. Additionally, short pilot time horizons alongside limited scale deployments suggest that quantifiable pilot projects effects will likely be small. Combined, such factors pose an increased burden on the accuracy, scale (sample sizes) and design (timing, frequency, recruitment methods) of evaluation efforts.

Depending on pilot objectives, evaluation may prove a challenging endeavor which deserves a dedicated workstream and dedicated resource allocation. Cities should consider the feasibility of evaluation within the scope of their projects. Robust evaluations of fewer indicators may be preferable over a large number of evaluation questions which may yield cursory and inconclusive results. More involved evaluation efforts may require partnering with external partners who specialize in quantitative or qualitative evaluation methods.

Performance indicators can help track progress towards pilot goals and pilot learnings. For examples of AV pilot project performance indicators see **Worksheet 6**.

ACTION ITEMS:

- ☐ **Develop an evaluation concept** defining key indicators, data collection and evaluation methods

WORKSHEET 6 | DEVELOP PERFORMANCE INDICATORS FOR LIMITED-SCALE AV PILOT PROJECTS

Goals relate to the AV technology, the level of mobility provided, and the user experience and satisfaction with the service. The example language mirrors SMART principles; numbers are provided as examples and should be adapted to specific pilot contexts and objectives.

Sample performance indicators related to AV technology:

- ☐ AV fleet operational for at least 99% of the time during the pilot period.
- ☐ Reduce AV response time to passenger requests by 50% compared to traditional paratransit services.
- ☐ Decrease energy consumption of AV fleet by 20% annually.
- ☐ Use 100% electric vehicles by the end of the pilot.
- ☐ Ensure 100% compliance with regulatory standards and safety protocols for AV operations.
- ☐ Implement real-time monitoring systems to detect and address technical issues within 30 minutes of occurrence.
- ☐ Achieve 99% accuracy in AV navigation and routing within urban environments.
- ☐ Conduct monthly software updates to enhance AV performance and address user feedback.
- ☐ Reduce vehicle idle time by 25% through efficient dispatching and routing algorithms.
- ☐ Implement a robust cybersecurity framework to protect AV systems and passenger data.
- ☐ Gain insights on interactions with public safety personnel in emergency situations.

Worksheet 6 continued on the next page →

Worksheet 6 continued

Sample performance indicators related to AV mobility:

- ☐ AV pilot serves at least 90% of urban areas within the pilot project's geographical scope.
- ☐ Achieve a minimum of 99% trip completion rate for AV trips, ensuring reliable service availability.
- ☐ Transport a minimum of 10,000 passengers within the pilot project's duration, demonstrating demand scalability.
- ☐ Maintain an average occupancy rate of at least 2 passengers per AV trip, optimizing vehicle utilization and resource efficiency.
- ☐ Offer flexible ride-sharing options to passengers, resulting in at least 30% of trips being shared rides.
- ☐ Provide seamless intermodal connections with existing public transit services, facilitating smooth transfers for passengers.
- ☐ Ensure equitable distribution of AV services across diverse neighborhoods, with a focus on underserved areas.
- ☐ Implement dynamic pricing strategies to optimize service availability and affordability based on demand patterns.
- ☐ Reduce average trip duration by 15% compared to personal cars through efficient routing and congestion avoidance strategies.

Sample performance indicators related to AV mobility:

- ☐ Achieve overall passenger satisfaction rating to 4.5 out of 5 stars by the end of the pilot period.
- ☐ Achieve a minimum of 90% positive feedback from passengers regarding safety and comfort of AV rides.
- ☐ Achieve average wait time for AV pickups of under 5 minutes during peak hours.
- ☐ Ensure 95% of passengers feel adequately informed about AV technology and safety features.
- ☐ Maintain a fleet of AVs with an average cleanliness rating of 4 out of 5 stars, as rated by passengers.
- ☐ Maintain competitive service quality for wheelchair accessible vehicles (WAVs), with WAV wait times no more than 20% longer than pilot-wide averages.
- ☐ Achieve a minimum of 85% user retention rate throughout the pilot project duration.
- ☐ Conduct monthly user surveys to gather feedback and identify areas for improvement.
- ☐ Provide multilingual app and website support to accommodate diverse user needs.
- ☐ Implement a transparent fare structure and billing system, ensuring accuracy and accountability for passengers.

1.10 SPECIFY PILOT SERVICE MODEL, USE CASES, & OPERATIONS

This report distinguishes between:



SERVICE MODELS

The type of AV service such as: on-demand or point-to-point service, public transit, paratransit, shuttle, private car, goods delivery, etc.



USE CASES

How AVs serve mobility needs and travel scenarios; describe interactions between AVs and users and lists the most important functional requirements to meet use cases and needs.



OPERATIONAL SPECIFICATIONS

AV service characteristics, including area of deployment and functional and technical requirements must be defined for a successful implementation.

Most pilots select the service model prior to launch. Defining use cases, however, is refined throughout the project based on community engagement activities, what potential AV riders need, and other insights gained. Clear use cases are critical to align the service with long term goals, as well as to define operational specifications.

For examples of parameters to be defined under the three categories see [Worksheet 7](#).

ACTION ITEMS:

- ☐ **Select a service model** prior to project start.
- ☐ **Define and refine use cases** throughout the project based on community engagement activities and other insights.
- ☐ **Determine and adapt operational specifications** throughout the project duration.



PILOT USE-CASE: ELDERLY RIDERS

Use Cases in a Pilot for an AV Shuttle for Elderly Riders, Detroit

The **Detroit Accessibili-D** pilot project offered an AV shuttle service for older adults and disabled riders and worked with focus groups and community events to identify use cases. Use cases described various categories of trips for older adults and people with disabilities within Detroit.

Use case overviews were compiled to differentiate key needs such as service frequency, route type, and number of passengers per vehicle, plus a brief narrative about the main function or purpose of the use case. More detailed descriptions of each use case explored the value created for individuals and the community, breaking points (i.e., essential requirements to assure user acceptance), open questions for the project team, quotes of community members, as well as illustrations such as maps.

The identified use cases guided the project work throughout the pilot duration, informing both operational specifications and community engagement activities.

WORKSHEET 7 | SERVICE MODEL, USE CASE, & OPERATIONAL SPECIFICATIONS

Example: AV Service Models

Types of *services* may also be referred to as *service modalities* or *service models* and reflect the different types of transportation services that AVs provide.

- ❑ **Taxi/Ride-Hail/Ride-Sharing Services:** AVs operating as on-demand, point-to-point transportation services for individual passengers or small groups, similar to current ride-hailing services like Uber or Lyft.
- ❑ **Public Transportation Enhancement:** Autonomous shuttles and buses offered along fixed routes or with dynamic route adjustments based on real-time demand and traffic conditions.
- ❑ **Airport, Campus, Parking Lot Shuttles:** Autonomous shuttles carry people on fixed routes within airports, parking lots, and large business or university campuses.
- ❑ **Last-Mile Delivery:** Autonomous vehicles facilitate the efficient and timely delivery of goods in urban areas.
- ❑ **Long-Distance Goods Delivery:** Autonomous trucks facilitate long distance delivery of goods.

Worksheet 7 continued on the next page →



Example: AV Use Case Parameters

In the context of AVs, a “use case” refers to a specific scenario or application in which AV technology is employed to meet particular transportation needs or solve specific problems. Each use case outlines how AVs are utilized, the conditions under which they operate, the target users, and the objectives they aim to achieve, or similar.

Below are examples of key elements that define a use case in the AV context:

- ❑ **Scenario Description:** A detailed narrative of the situation in which the AV is used, including the setting, the nature of the transportation service provided, and the typical operational conditions.
 - ❑ Example: *An AV providing last-mile delivery services in a dense urban area, navigating sidewalks and pedestrian zones to deliver packages.*
- ❑ **Objectives and Goals:** The primary goals that the AV use case aims to achieve, such as improving convenience, reducing transportation costs, enhancing safety, or increasing operational efficiency.
 - ❑ Example: *A parking lot shuttle service designed to reduce the time and effort required for passengers to get from a remote parking area to the airport terminal.*
- ❑ **Target Users:** Different AV service modalities may target specific user groups.
 - ❑ Commuters: *AV services designed for daily commuting, either individually or as part of a carpool.*
 - ❑ Tourists: *Shuttles and buses for tourists, often providing guided tours or transportation between tourist attractions.*
 - ❑ Business and Industrial Users: *AVs used in industrial settings or for corporate transportation needs, such as moving employees within large campuses or transporting goods between facilities.*
- ❑ **Operational Environment:** The physical and regulatory conditions under which the AV operates, including road types, traffic conditions, weather, and local laws. This should include issues such as an understanding of what roads vehicles will be able to use, number of miles of road that will be mapped and available for service, number of pick-up/drop-off points that will be used (if they are limited), if pick-up/drop-off can happen on private property or only on public roads, and how riders with varying mobility needs will be accommodated.
 - ❑ Example: *An autonomous bus operating on fixed routes in a city with designated bus lanes and traffic signals that communicate with the vehicle.*
- ❑ **Technology Requirements:** The specific technological capabilities and components required to support the use case, such as sensors, navigation systems, communication interfaces, and safety features.
 - ❑ Example: *A goods transportation AV equipped with advanced LiDAR and GPS systems to navigate highways and urban streets efficiently.*
- ❑ **Benefits and Challenges:** The anticipated benefits of the use case, such as increased accessibility or reduced emissions, as well as potential challenges or limitations, such as technical hurdles, cost, or user acceptance.
 - ❑ Example: *Benefits of an autonomous delivery robot include reduced delivery times and lower costs, while challenges include navigating crowded sidewalks and ensuring package security.*

Example: AV Operational Specifications

Operational Specifications encompass detailed technical, regulatory, logistical, and user experience aspects necessary for the effective and safe deployment of AVs.

Below are examples organized into relevant subsections:

☐ Operational Characteristics:

- ☐ **Service Frequency and Scheduling:** Defines whether the service operates on a fixed schedule, or responds to on-demand requests, possibly in real-time.
- ☐ **Passenger Capacity:** The number of passengers the AV can carry, ranging from single-rider vehicles to large buses.
- ☐ **Route Flexibility:** Describes the degree to which the vehicle follows fixed routes versus dynamically changing routes based on real-time data and passenger demand.

☐ Operational Logistics:

- ☐ **Deployment Strategy:** Plans for how and where AVs will be introduced, including pilot testing phases, geographic coverage areas, and scaling strategies.
- ☐ **Fleet Management:** Systems to monitor, manage, and maintain a fleet of AVs, including scheduling, dispatching, and real-time tracking.
- ☐ **Service Maintenance:** Regular maintenance schedules, troubleshooting procedures, and technical support frameworks to ensure the AVs remain operational and reliable.

☐ User Experience:

- ☐ **User Interface Design:** The design of the user interface for interacting with the AV service, including booking, navigation, and communication features.
- ☐ **Accessibility Features:** Ensuring the service is accessible to all users, including those with disabilities, by incorporating features like universal web and app design, wheelchair access, and audio-visual aids.
- ☐ **Customer Support:** Systems for providing customer support, including help centers, feedback mechanisms, and issue resolution processes.

☐ Technical Specifications:

- ☐ **Hardware Requirements:** Details about the physical components needed, such as sensors, cameras, LiDAR, GPS, and computing units.
- ☐ **Software Requirements:** Specifications for the software systems, including navigation algorithms, machine learning models, user interfaces, and connectivity solutions.
- ☐ **Integration Protocols:** Standards and protocols for integrating AV systems with existing infrastructure, such as traffic management systems and communication networks.

☐ Safety and Compliance

- ☐ **Regulatory Compliance:** Ensuring that the AV service adheres to local, state, and federal regulations, including vehicle safety standards, data privacy laws, and operational permits.
- ☐ **Safety Protocols:** Procedures for ensuring passenger and pedestrian safety, such as emergency response systems, fail-safe mechanisms, and regular maintenance schedules.

1.11 PROJECT MANAGEMENT

AV pilot projects are inherently complex due to the diverse range of stakeholders involved, each with varying levels of familiarity with AV technology, distinct work methods, areas of expertise, and different decision-making structures. This complexity presents unique project management challenges. The examples in **Worksheet 8** represent a range of strategies aimed to help anticipate and tackle some of the project management challenges experienced in previous pilot programs.

ACTION ITEMS:

- ☐ Set up project management structures and tools

WORKSHEET 8 | PROJECT MANAGEMENT CHECKLIST

- ☐ **Strategic and adaptive planning**
 - ☐ Develop a strategic plan that is flexible and adaptive to technological advancements and regulatory changes. This should include a clear rollout strategy.
- ☐ **Comprehensive logistics planning and project timeline development**
 - ☐ Break the project into manageable phases, with clear milestones and deliverables for each stage.
 - ☐ Establish a clear and detailed project schedule that accounts for each phase of the AV pilot, from initial planning to deployment and evaluation.
 - ☐ Map out the linkages between community feedback and pilot design, implementation, and operation and the iterative nature of these relationships. Include contingencies for unexpected delays.
 - ☐ Set realistic timelines that consider the complexity of AV technology and regulatory approvals, ensuring ample time for testing and adjustments.
 - ☐ Prepare for the start/stop nature of AV development and deployment by building flexibility into the project timeline.
 - ☐ Ensure that equipment, personnel, and funds are allocated appropriately and are flexible enough to adapt to changing project needs.

Worksheet 8 continued on the next page →

❑ Effective communication and project management tools

- ❑ Consider a centralized communication tool to streamline communication among all stakeholders.
- ❑ Consider advanced project management software that integrates all aspects of the project, including task assignments, timelines, and communication tools.
- ❑ Schedule regular update meetings and progress reports to keep all team members informed and engaged.

❑ Community engagement and expectation management

- ❑ Create a comprehensive community engagement plan that includes regular updates, public consultations, and feedback mechanisms.
- ❑ Clearly communicate the goals, benefits, and potential challenges of the AV pilot to the public to build trust, address concerns, and mitigate resistance.

❑ Legal and regulatory preparedness

- ❑ Ensure compliance with all local, state, and federal regulations related to AV deployment. Stay updated on regulatory changes and prepare to adapt the project accordingly.
- ❑ Develop detailed contracts that clearly outline the responsibilities, expectations, and deliverables of all involved parties, including AV technology providers and service operators.
- ❑ Obtain adequate insurance coverage in case of collisions or incidents
- ❑ Understand legal liabilities and ethical dilemmas in situations where AV decisions impact human safety (e.g., choosing between minimizing harm to passengers or pedestrians).
- ❑ Identify and address inconsistent or inadequate regulations governing AV deployment, leading to uncertainty, legal disputes, and delays in implementation.
- ❑ Identify and address potential conflicts between federal, state, and local regulations, hindering interoperability and uniform safety standards.

❑ Data management and privacy

- ❑ Establish strict data handling protocols to ensure data integrity, security, and privacy. This includes anonymizing data where necessary and complying with data protection regulations.
- ❑ Be transparent about how data will be used, stored, and shared, and obtain necessary consents from users.

❑ Continuous evaluation

- ❑ Implement continuous evaluation processes to assess progress, identify issues early, and make necessary adjustments to keep the project on track.

❑ Holistic approach to challenges

- ❑ Form multi-disciplinary teams that include experts in technology, urban planning, transportation, legal affairs, and community engagement.
- ❑ Leverage lessons learned from other cities and organizations that have implemented AV pilots.

02

CENTERING EQUITY IN AV PILOTS

CENTERING EQUITY IN AV PILOTS

Access to transportation services (including public transit, personal cars, shared micromobility), infrastructure (such as roadways, sidewalks, and bike lanes), and resources (including income, smartphone and data plan access) have been inequitably distributed across space and population groups. For decades, such inequities have created transportation systems of mobility haves and have-nots and led to disparities in access to jobs, education opportunities, healthy foods, and extracurricular activities for children. Transportation equity issues are particularly acute for vulnerable road users or people with mobility constraints such as older adults and people with disabilities, and have grown over time as the population ages and suburbanizes. If leveraged effectively and if AV trips are offered at lower costs, AV technology may offer new opportunities to make transportation services – and therefore access to opportunities – more equitable. However, without a clear understanding of the conditions of AV deployment, particularly the cost of AV trips, it is impossible to know if AVs will actually increase or decrease equity.



Equity refers to fairness and impartiality, ensuring that everyone has access to similar opportunities and resources, regardless of differences or circumstances.

Transportation projects often consider dimensions of equity related to process (e.g., community engagement), opportunity (e.g., distribution of services or vehicles) and outcomes (e.g., distribution of trips/demand). Similarly, equity can be assessed between groups (e.g., high vs. low-income) or within groups (e.g., comparing transit riders to one another). Equity-oriented policies typically distinguish marginalized, underserved, or more vulnerable population groups, instead of treating the population or community as a single homogenous group.

Operationalizing equity within AV pilot projects is an iterative process that should, at a minimum, realize five steps:

- 1 Identify equity target groups within the pilot service area
- 2 Collaborate with equity target groups during community engagement efforts to co-create a community-centered and context-specific AV pilot
- 3 Embed equity considerations and outcomes within pilot goals
- 4 Identify possible (in)equity implications of the AV pilot, as well as the data needed to evaluate such implications
- 5 Measure and evaluate equity-based outcomes and iterate pilot structure based on the findings

The ultimate goal of a pilot program should be to observe, document, communicate and improve how the AV-service affects identified equity population groups, for example through data analysis stratified by target equity groups.

2.01 IDENTIFY EQUITY-RELATED TARGET GROUPS

Equity efforts typically focus on groups who face limited mobility opportunities either due to personal, systemic, or resource-based constraints. Transportation equity programs and studies typically focus on groups such as people living in low-income households, households without a personal vehicle, people of color (race/ethnicity), or people for whom English is not their primary language, among others.

Worksheet 9 includes additional examples.

Identified groups should be reflected in the goals, data collection efforts, evaluation, and iteration of pilot programs. Pilot assessments should aim to assess both overarching outcomes as well as how pilot performance metrics vary across defined equity populations. For instance, in addition to accounting for the entire community in terms of how did the cost of commuting change or how many people attended an outreach event, the project could also account for these topics among people who belonged to the lowest income quartile and/or were youth or older adults?

ACTION ITEMS:

- ☐ Identify equity target groups

**Consider space needs:**

Different size and weight items might include luggage, mobility devices, groceries, etc.

This risk of ignoring accessibility needs is particularly pronounced in AV designs which build on passenger car models, which typically don't accommodate wheelchairs. AV's massive sensor technology retrofits further increase the cost of these vehicles.

Public transit vehicles (including AV shuttles), on the other hand, are more often designed from scratch. Clearly, these should aim for state-of-the-art accommodations for wheelchairs and people with difficulty walking (stepping onto a vehicle).

Aside from the physical engineering, the lack of a human driver may impose additional challenges for accessibility. Without a driver, for example, what is the protocol to assist a wheelchair user who struggles to board, be secured within, or disembark the vehicle on their own?

Pilot projects should prioritize inclusive vehicle designs to ensure access across a range of mobility needs.

ACCESSIBILITY: MOBILITY FOR ALL

Accessibility is a key concern for mobility services. AVs offer potential for major improvements, such as enhanced traffic safety and potentially lower cost wheelchair accessible vehicle (WAV) travel; yet they also present the risk of sustaining historical neglect of accessibility provisions, which continue to impede access to both private and public transportation.

WORKSHEET 9 | EQUITY TARGET GROUPS

Examples of equity target groups:

- ☐ People living in households earning low-incomes
- ☐ People of color
- ☐ People for whom English is not their primary language
- ☐ Older adults
- ☐ Women
- ☐ Households without cars
- ☐ Transit riders
- ☐ People without smartphones or with limited data plans
- ☐ People without credit cards
- ☐ People without bank accounts
- ☐ Residents within particular geographic areas, neighborhoods, streets (e.g., with limited or no access to transit; or exposed to high level of air or noise pollution)

2.02 IDENTIFY POTENTIAL EQUITY IMPLICATIONS

AV services can have broad implications for transportation and beyond. Identifying potential equity considerations can guide pilot design, data collection, and evaluation approaches. Equity implications typically consider previously-identified equity target groups or neighborhoods within a city and may include service affordability, service accessibility, or technological barriers, environmental or health effects, or safety considerations (see [Worksheet 10](#)).

ACTION ITEMS:

- ☐ **Identify potential equity implications** of the pilot program.

WORKSHEET 10 | IDENTIFY EQUITY IMPLICATIONS

Examples of equity target groups:

☐ **Geographic accessibility:**

- ☐ What areas are served?
- ☐ How does trip-making and service quality (e.g., wait times, cancellation rates) vary across space?

☐ **Service Affordability:**

- ☐ How much does the service cost?
- ☐ How affordable is it for different population groups?

☐ **Equitable access and mobility:**

- ☐ How does service use and trip-making frequency vary across population groups?
- ☐ How does the pilot fill gaps in existing transportation services?
- ☐ How do wheelchair accessible vehicle (WAV) services perform (cancellation rates, wait times) relative to non-WAV services?
- ☐ How does the service accommodate users faced with limited mobility; low-vision or blind; deafness; cognitive disabilities; and language barriers?

☐ **Technological barriers:**

- ☐ What technologies are needed to access services (e.g., smartphone, data plan, bank account)?

☐ **Environmental and health effects:**

- ☐ What are the effects on localized transportation emissions (air pollution, noise)?

☐ **Safety considerations:**

- ☐ What is the perceived and realized safety of services?
- ☐ How does this vary across population groups and times of day?

2.03 SET EQUITY RELATED GOALS FOR THE AV SERVICE

After identifying equity target groups, pilot goals should be adapted or added to reflect equity aims. Goals should reflect different stages in the pilot process including community engagement, operations, outcomes, data collection, evaluation, and iteration. During community engagement efforts, failure to reach population groups of greatest equity concern, or overrepresentation of non-equity target groups, may undermine intentions to improve equity. See the section on community engagement for how to overcome participation barriers.

For examples of equity related goals, see [Worksheet 11](#).

ACTION ITEMS:

- ☐ **Define specific equity related goals** for the pilot.

WORKSHEET 11 | SETTING EQUITY GOALS

Examples of goals related to equity:

- ❑ **Ensure Accessible Service for Underrepresented Groups:** Design the pilot to prioritize access for communities historically marginalized in transportation planning, such as low-income neighborhoods, communities of color, and individuals with disabilities.
- ❑ **Provide Affordable Fare Structures:** Implement a fare model that is equitable and affordable, offering tiered pricing or subsidies for low-income users to ensure the AV service is financially accessible to all residents.
- ❑ **Incorporate Community-Driven Design:** Engage with local community groups and stakeholders throughout the planning, implementation, and evaluation phases to ensure the service reflects the needs and priorities of underserved populations.
- ❑ **Enhance Mobility for Non-Drivers and Transit-Dependent Residents:** Focus on expanding mobility options for those without access to a private vehicle or who rely on public transit, particularly in transit deserts or areas with limited transportation alternatives.
- ❑ **Ensure Culturally Competent Outreach and Education:** Develop outreach strategies and educational materials in multiple languages and formats to effectively reach diverse populations, ensuring they are informed and can easily access and use the AV service.





03

ENGAGING COMMUNITIES &
LEVERAGING DATA IN AV PILOTS

ENGAGING COMMUNITIES & LEVERAGING DATA IN AV PILOTS

Clearly documenting the community context and needs through engagement and data analysis helps ensure a context-sensitive pilot that reflects the unique needs and opportunities within the pilot area, and can maximize use and benefit among target populations.

A mixture of existing and original quantitative and qualitative data collection are best suited to designing a pilot project that fits the local context and traveler needs. The following sections review practices to assess community needs and risks, as well as existing data to contextualize the pilot within the population and current transportation ecosystem.



3.01 CONDUCTING MEANINGFUL COMMUNITY ENGAGEMENT

Community engagement efforts occur along a continuum with each successive level giving more agency and power to communities. These levels are summarized below adapting the [IAP2 Spectrum of Public Participation to AV pilots](#) as seen on the following page.

- **Inform** the community about AV-technology in general, and about the specific project.
- **Consult** with the community to obtain feedback, identify concerns, inform decisions.
- **Involve** the community to help shape the project and the AV-service in a way that is most beneficial to the community.
- **Collaborate** with the community to develop solutions for particular problems and aspects of decision making.
- **Empower** the community, or community organizations and representatives in aspects of co-designing and implementing the service (Co-lead and build power).

Community engagement efforts require different approaches. Some aspects of the project may focus on familiarizing the public with AV technology, while others may call for idea co-creation and identifying what the community needs. Which approach is best suited and feasible for a pilot project requires careful consideration, and will differ across various objectives of the project.

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.

Adapted from source: International Association for Public Participation, 2018. www.iap2.org

3.02 SET COMMUNITY ENGAGEMENT OBJECTIVES

Successful community engagement requires clear and transparent communication between the pilot project team and the community about the project objectives, the scope, and the limits of the what aspects of the pilot the community will be able to affect. In particular, it is important to reach a mutual understanding with the community about which AV pilot elements are fixed and why, as well as how community engagement could impact program design or operations. By contrast, the city may also seek community involvement, collaboration, and empowerment to learn from the community and identify solutions collaboratively to shape the pilot program.

For examples for objectives related to community engagement activities, see **Worksheet 12**.

ACTION ITEMS:

- ☐ Set SMART objectives for informing the community
- ☐ Set SMART objectives for consulting, involving, collaborating, or empowering community

WORKSHEET 12 | DEVELOP OBJECTIVES FOR COMMUNITY ENGAGEMENT ACTIVITIES

Community engagement should consist of outcomes (what should be learned from these activities) and activities (different type, number, and scope of activities that should be conducted).

Example Community Engagement Outcomes: What Should be Learned?

- ❑ **Perceptions and attitudes:** Assess changes in community perception and attitudes towards AV technology and its potential impact on transportation, safety, and quality of life through surveys and focus groups.
- ❑ **Equity and inclusivity:** Evaluate the effectiveness of community engagement efforts in reaching diverse demographics, including underserved communities and marginalized populations, and address any disparities in participation.
- ❑ **Feedback and concerns:** Compile and analyze feedback from community engagement activities to identify common concerns, misconceptions, and areas of interest, informing project adjustments and communications strategies.
- ❑ **Behavioral insights:** Capture insights into how community members perceive and interact with AVs, including willingness to use the service, preferred modes of transportation, and potential behavioral changes.
- ❑ **Trust and transparency:** Assess levels of trust and confidence in the AV project among community members, identifying factors that contribute to trust-building and areas for improvement in transparency and communication.

Example Community Engagement Activities: What Should be Done?:

- ❑ **Stakeholder outreach:** Conduct outreach to diverse stakeholders, including residents, businesses, community organizations, and local government officials, to raise awareness about the AV pilot project.
- ❑ **Public workshops and forums:** Organize public workshops, town hall meetings, and community forums to gather feedback, address concerns, and solicit input on the project's goals, benefits, and potential impacts.
- ❑ **Educational campaigns:** Develop educational materials and campaigns to inform the community about AV technology, safety features, and anticipated changes to transportation infrastructure and services.
- ❑ **Demonstration events:** Host demonstration events or ride-along opportunities for community members to experience AV technology firsthand and ask questions to project stakeholders.
- ❑ **Partnerships with local organizations:** Forge partnerships with local schools, libraries, and community centers to disseminate information about the AV project and engage with residents in accessible and familiar settings.



ENGAGEMENT TOOLS: DETROIT

[Detroit's Accessibili-D](#) pilot project used a diverse set of engagement tools, each with its own particular objectives. The project combined an online survey to gain insights on general attitudes and perceptions of AV technology with in-depth interviews to explore detailed travel needs. [Community liaisons](#) were established to represent four specific target groups (youth, parents, older and disabled people), and to identify focus groups, which were convened to discuss user experiences in depth.

Community events were used to inform the community, recruit riders for the program, and offer the public ride-along opportunities prior to service launch. An interactive web presence (CoUrbanize) was also set up, but later phased out due to low engagement.



3.03 COMMUNITY ENGAGEMENT CHANNELS

Communication through multiple channels and venues is critical to engage a range of community members who use different media sources, have different technology access, and different lived experiences. This process should also regularly update stakeholders, including press releases and messaging to avoid misunderstandings and ensure consistent information is shared.

For some standard outreach strategies, see [Worksheet 13](#). Standard strategies can be complemented with more custom-designed outreach at community events, setting up information booths in public spaces, “touch-and-feel” events where people get to see or ride in AV vehicles, etc.

ACTION ITEMS:

- ☐ **Identify outreach channels**
- ☐ **Consider how outreach channels reach different groups**, particularly equity target populations
- ☐ **Establish a collaborative and transparent communication process**

WORKSHEET 13 | IDENTIFY OUTREACH CHANNELS TO ENGAGE THE COMMUNITY

☐ **Social Media:**

- ☐ Create a video post
- ☐ Share project-related posts
- ☐ Use hashtags
- ☐ Find others' relevant posts to interact with in comments
- ☐ Sponsored ads
- ☐ Social media flash mob (post the same thing simultaneously on various social media platforms)

☐ **Virtual:**

- ☐ Whatsapp groups— existing or creating new ones
- ☐ Nextdoor app/website
- ☐ Facebook groups or pages
- ☐ Reddit subreddits (ex. r/miami, r/hialeah)
- ☐ Dotmocracy (in-person or virtual)
- ☐ Jam board
- ☐ Lead your own virtual meet-ups on Zoom
- ☐ Mass text/regular text

☐ **Newsletter:**

- ☐ E-newsletters
- ☐ Requesting partners to share in their e-newsletters
- ☐ Requesting people to sign-up to the mailing list
- ☐ Conferences/Forums with mailing list

☐ **Print:**

- ☐ Mail postcards
- ☐ Flyers
- ☐ Community-printed newspapers
- ☐ Posters
- ☐ Banners
- ☐ Advertisements

☐ **Flyers:**

- ☐ School backpack inserts, bulletin boards
- ☐ Bus shelters
- ☐ Churches
- ☐ Salons
- ☐ Cafeterias
- ☐ Gyms
- ☐ Libraries
- ☐ Community centers
- ☐ Senior centers

☐ **Printed Ads:**

- ☐ Restaurant menus with ads
- ☐ Conference programs
- ☐ Local magazines or newspapers
- ☐ Bus shelter/ bench ads

☐ **In-Person:**

- ☐ Community events
- ☐ Partner meetings
- ☐ Canvassing door-to-door
- ☐ Canvassing at public location
- ☐ Impromptu (grocery, gas station, etc.)
- ☐ Visiting “third places”

☐ **Partnering with Others:**

- ☐ Nonprofits
- ☐ Musicians/artists
- ☐ Businesses
- ☐ Government agencies
- ☐ Media outlets

☐ **Swag:**

- ☐ Hats
- ☐ Pens
- ☐ Masks
- ☐ Stickers
- ☐ Collapsible fans

3.04 IDENTIFY & REMOVE PARTICIPATION BARRIERS TO ENSURE EQUITABLE COMMUNITY ENGAGEMENT

Participation barriers including technological, language, meeting times and places, and transportation can impede participation by target population groups or the overall community. AV projects that seek to expand transportation access should be particularly aware of how accessible meeting locations are for households without personal vehicles.

Additionally, systemic racism, sexism, ableism, classism, ageism, and homophobia may exclude people from engagement processes. For example, public meetings often cater to those who not only have the time and resources to attend, but also who feel comfortable and safe in public meeting spaces and who feel empowered to make their voices heard.

Worksheet 14 outlines engagement best practices.

ACTION ITEMS:

☐ **Follow best practices to remove barriers for inclusive engagement**

- ☐ Amplify the voice of marginalized/underrepresented groups
- ☐ Always ask “who is not in the room and why?”
- ☐ Meet people where they are (in terms of location and in terms of comfort)
- ☐ Conduct outreach in accessible ways, considering childcare, language translation, and digital platforms

Need a Ride?
Check out the free self-driving Accessibili-D pilot!

This service is open to older persons and people of all ages living with a disability.

Free rides start Summer 2024!
View the map to see if you live in the service area!

RIDE WITH US
✓ Older Adult (62+) OR ✓ Person with a Disability

LEARN MORE:
<https://bit.ly/DetroitAccessibili-D>

Scan or visit us online to sign-up!

CONTACT US FOR MORE INFO!
313-583-6396 | accessibili-D@detroitmi.gov | bit.ly/signupADS

Promotional materials via Bagley Community Council
for City of Detroit

RIDER RECRUITMENT, DETROIT ACCESSIBILI-D

In contrast to a full-scale deployment of an AV service, a pilot project may seek to serve select populations and limit the scale of participation. Decisions may relate to limited pilot capacity alongside objectives to learn from pilot users to inform future improvements to a full-scale deployment. Given limited time frames, pilots often seek to achieve targeted ridership numbers as early as possible. A dedicated rider recruitment strategy may help target the number and demographics of riders the pilot seeks to engage.

In [Detroit's Accessibili-D project](#), an initial recruitment phase asked community members to fill out an expression of interest form, which allowed the project team to follow-up with these individuals prior to pilot launch. Forms were collected through various outreach channels, mainly during community engagement events.

After filtering for inclusion criteria such as age and/or disabilities, as well as approximate home location within the service area, interested individuals were invited to sign-up for the pilot through an online service dashboard.

Recruitment progress was closely monitored and efforts were tailored to achieve their goal of enrolled riders prior to the pilot launch.

WORKSHEET 14 | ENGAGEMENT BEST PRACTICES

- ☐ Amplify the voice of marginalized groups
 - ☐ Always ask “who is not in the room and why?”
 - ☐ Prioritize voices of marginalized groups, providing decision-making power.
 - ☐ Meet people where they are: Conduct outreach in accessible ways, considering childcare, meals, language translation, and digital platforms.
- ☐ Be clear about the purpose of community engagement to ensure mutual expectations
- ☐ Build trust through transparency, consistency, and collaboration
 - ☐ Listen to what participants/community members actually want to talk about
 - ☐ Address current needs while developing insights for future improvements.
 - ☐ Be transparent and acknowledge both the potential benefits and challenges AVs could bring.
 - ☐ Clarify the decision-making powers that different levels of government have over AVs
 - ☐ Provide transparency about decision-making structures and community control.
 - ☐ Be willing to step aside and to pay community members/organizations to do the work
 - ☐ Hire community members or organizations to conduct engagement directly.
 - ☐ Report back to communities regularly and build relationships
 - ☐ Keep communities informed about project outcomes and maintain two-way communication.
 - ☐ Understand that if pilots fail or if pilot service does not meet expectations (regardless of the cause) trust will need to be rebuilt with the community.
- ☐ Respect community members' time and expertise
 - ☐ Compensate community members for participating in engagement events and giving their time and expertise.
 - ☐ Streamline the engagement process to reduce silos between departments and organizations to avoid engagement fatigue.

Adapted from “A Framework for Shaping the Deployment of Autonomous Vehicles and Advancing Equity Outcomes”

3.05 DEVELOP YOUR COMMUNICATIONS STRATEGY

AV pilots often present new terms, concepts, or ideas to the public, necessitating a clear and coherent communications strategy to foster effective public engagement throughout the project. A communications strategy should include strategic planning, define clear communication roles, articulate communication principles, and document communication efforts, among other aspects.

(For a more detailed list, see [Worksheet 15](#))

Communications strategies should be shaped to address complex issues raised by the community to avoid inconsistent or contradictory communications.

Example topics and questions the community may ask in an AV pilot include:

- ❑ **Framing project motivations:** An AV pilot can bring together many different interests, each with either complementary or, at times, conflicting goals. For example, some may wish to attract federal funding to test AV technologies; others may wish to implement known solutions to tackle identified issues. Transparent communication about motives for initiating a project—including attracting federal funding, testing new solutions, etc.—are key to building community trust. While not always possible, ideal projects will combine community needs with technology testing. Questions to help frame a project include:
 - ❑ “How are we balancing advancing AV technology alongside community goals?”
 - ❑ “Have the proposed use cases been developed from stated community needs?”
- ❑ **AV acceptance and deployment:** New technology can be met with skepticism, and sometimes high development and testing costs associated with AV-technology can be difficult to put in perspective. Be prepared for communities to ask questions about the tradeoffs of working with this emerging technology and the roles of the public and private sector in this pilot.
 - ❑ “Why was AV technology chosen for this pilot?”
 - ❑ “Why aren’t we looking at other innovative technologies or at providing more sidewalks or bike lanes?”
 - ❑ “Is the city in charge of this project, or is the private sector/AV-service provider dictating the terms?”
 - ❑ “How is this technology aligning with or competing for the city’s time and funding compared to other transportation priorities like improving transit, or pedestrian safety?”
- ❑ **Technology reliability and trust:** As exciting as AV-technology may be to some, the reality of a pilot project is that not everything will work as planned. The project team needs to identify and transparently communicate clear “Plan Bs” related to potential technology failures, particularly those with safety implications.
 - ❑ “Can I feel safe riding in this AV, or am I a human guinea pig?”
 - ❑ “How will the AV respond in a potential crash scenario?”
 - ❑ “Is it always possible to exit the vehicle if it stalls due to some technology failure?”
 - ❑ “Can I rely on the AV service to arrive at my appointment in time? What will happen if it is delayed or runs into technical difficulties?”

- ❑ Operational capability: AVs may offer improvements over current transportation modes, but their full potential may not yet be realized. While features such as real-time arrival information, Estimated Time of Arrival (ETA), maps of the vehicle's location, among others, may appeal to many riders, possible operational limitations during pilot testing should be clearly communicated to manage user expectations.
 - ❑ "Why is this vehicle driving so slowly?"
 - ❑ "Why is this bus yielding to other vehicles?"

ACTION ITEMS:

- ❑ **Identify complex, recurring communication topics** that are critical for successful communication and community engagement
- ❑ **Develop a communications strategy**

WORKSHEET 15 | COMMUNICATION STRATEGY

Communication Strategy Checklist:

A communications strategy may address the following aspects, among others:

- ❑ Be clear about the purpose of community engagement to ensure mutual expectations
 - ❑ Rollout strategy
 - ❑ Communication work plan
 - ❑ Communication roadmap
 - ❑ Identify target audiences
 - ❑ Develop initiative name
 - ❑ Communication team integration into the project
 - ❑ Define Clear Communication and Roles: in a multi-stakeholder environment
(*Example: Avoid confusion around roles and the distinction between city officials and for example those working for the mayor's office*)
- ❑ Communication principles:
 - ❑ Transparent communication as a risk mitigation strategy
 - ❑ Address smaller glitches and learnings
 - ❑ Communicate about problems and how they are being addressed
 - ❑ Invest in trust-building
 - ❑ Emphasize clear and effective communication about the AV service:
 - ❑ Avoid unnecessary jargon or define as needed
 - ❑ Frame the service in terms of goals and objectives rather than solely emphasizing the autonomous vehicle technology.
- ❑ Document communication efforts:
 - ❑ Compile impact summaries
 - ❑ Track media activity

3.06 INFORM THE COMMUNITY

AV pilot/demonstration projects often represent new experiences for communities; informing communities about project goals, operations, and beyond can generate knowledge, excitement, build trust, and ultimately empower communities to participate in engagement activities and shape pilot operations.

Communicate pilot background and basics

Project information and background should be easily accessible and disseminated on project websites and other channels including social media, community events, and local community organizations or locations.

Worksheet 16 includes examples of AV pilot information to share with the public such as basic facts about AV technology, the long term vision for AVs, and specific plans for the pilot project.

ACTION ITEMS:

- ☐ **Set up a project website**
- ☐ **Compile project information** into formats suitable for selected outreach channels (press release templates, one pagers, social media posts, etc.)
- ☐ **Set up a community engagement plan/ events calendar.** This should consider:
 - ☐ Type and frequency of information activities
 - ☐ Type and frequency of collaboration activities

WORKSHEET 16 | IDENTIFY CONTENT TO SHARE WITH THE COMMUNITY

- ☐ AV technology fact sheets:
 - ☐ What is an AV?
 - ☐ What do the vehicles look like?
 - ☐ What an AV can *and* cannot do.
- ☐ Vision for the long term, full-scale vision for the piloted AV service
 - ☐ How does it compare to the service piloted?
 - ☐ Which broader policy goals does it aim to achieve?
- ☐ About the pilot project
 - ☐ What are the project goals?
 - ☐ What is the pilot timeline?
 - ☐ Duration of the pilot
 - ☐ Service phasing if applicable
 - ☐ How does it align with the longer-term timeline for full-scale deployment
 - ☐ Project scope and limitations/constraints
 - ☐ Use cases: as initially proposed and updated as needed
 - ☐ Budget and funding sources
 - ☐ Location of deployment
 - ☐ Anticipated challenges (e.g., potential service disruptions and backup plans)
 - ☐ Project lead, team, partners
- ☐ Frequently Asked Questions updated as needed
- ☐ Glossary of AV terms
- ☐ Staff contact information



3.07 LEARN FROM THE COMMUNITY

Learning directly from community stakeholders is key to project success, and methods for involving the public should be diverse, and identified early. Developing liaisons, “getting the word out”, and gaining community buy-in require a steady effort and a continuous openness to shifts in pilot design and operation to better serve the community’s needs. Understand that the community members who may gain the most from a pilot may still be hesitant or cautious about it.

Aim for a diversity of involvement formats and acknowledge the importance of providing virtual and physical attendance options for community events, recognizing that some potential users may prefer or require different engagement formats. Set realistic expectations for what can be offered, how much pilots can be modified based on community feedback, and what the learning objectives are for the pilot.

Examples for how to consult with the community may include:

- ❑ **Liaison model:** identifies individuals (liaisons) from the community who represent stakeholder populations or interest groups. Liaison are compensated to help facilitate communication with the community, build trust, and make sure the community members’ voices are heard.
- ❑ **Focus groups:** Help gain a more in depth understanding about the “what”, “why” and “how” of mobility experiences.
- ❑ **Community Engagement Events:** Facilitate a conversation between community members and project staff, as well as among community members.

For examples of additional community consultation approaches see [Worksheet 17](#).

ACTION ITEMS:

- ❑ **Integrate collaboration activities into the community engagement plan/events calendar.**

This should consider:

- ❑ Type of engagement
- ❑ Frequency of engagements (e.g. at least quarterly)
- ❑ Follow-up activities and engagement over time
- ❑ Diversity of formats
- ❑ Targeted population groups

3.07A TOPICS FOR COMMUNITY CONSULTATION & COLLABORATION

To make AV pilots a reality, organizers and stakeholders will need to understand a wide range of technical needs and limitations, user needs and limitations, environmental constraints, and operational details. This goes well beyond the technical operation of the vehicle itself and should include users' expectations and how they will interact with all aspects of the service, including the booking of trips, or informing themselves about the service. Community engagement should focus on answering these questions, creating two-way communication between the community and the city, AV service provider, and other key stakeholders. Outcomes of this engagement should directly shape the pilot design.

For detailed example topics to explore in community consultation and collaboration efforts across the following topic areas see [Worksheet 17](#).

ACTION ITEMS:

- ☐ Identify key topics to learn about in community consultation activities
- ☐ Define a checklist of use case attributes to refine in community collaboration activities

WORKSHEET 17 | IDENTIFY APPROACHES TO CONSULT WITH THE COMMUNITY

- ☐ Community liaison model
- ☐ Focus groups
- ☐ Interviews
- ☐ Community Engagement Events
 - ☐ Dedicated community meetings
 - ☐ Events built on existing community events
 - ☐ "Touch and feel" events with AVs present
 - ☐ Webinars
 - ☐ Ride-along events (allows community to experience vehicle in action)
- ☐ Online feedback/input strategies
 - ☐ Interactive maps
 - ☐ SMS surveys/forms/polls
 - ☐ Community-focused websites/web surveys
- ☐ Custom approaches:
 - ☐ Vehicle design art competition, e.g. in collaboration with schools
 - ☐ Service naming competition

WORKSHEET 18 | COMMUNITY CONSULTATION & COLLABORATION TOPICS

Detailed topics to explore in community engagement activities will vary by pilot project. Community consultation and collaboration can inform initial development of use cases and operational specifications, or refinements of initial proposals. The two lists below distinguish topics that focus on the AV users and the AV service:

About the Users: Understanding AV user needs and preferences

- ☐ Travel needs (purposes/use cases)
 - ☐ Commute
 - ☐ Everyday needs
 - ☐ Appointments
 - ☐ Periodic access to public services
- ☐ Interest/acceptability of shared rides (with strangers)
- ☐ Acceptable walking distance (if any) from destination and origins to pick-up/drop-off areas
- ☐ How people want to get updates about vehicle location and what they would want to know (e.g., real time arrival map, on its way, delayed, etc.)
- ☐ Acceptable/preferable waiting (pick up) area characteristics (safety, lighting, seating, signage, etc).
- ☐ Hours of operation
- ☐ Language needs
- ☐ Scheduling needs
 - ☐ Acceptable variation in pick-up/drop-off times (important for appointments)
 - ☐ Acceptable wait times (how does this change in regards to time of day, season, pre-booked/on-demand)
 - ☐ How long should the vehicle have to wait for a rider (how long before it leaves to pick up someone else?)
 - ☐ What happens if the vehicle is early?
 - ☐ How will vehicles communicate with riders if they arrive early or late or if riders are not present?
- ☐ What do riders need to carry with them, luggage/storage requirements?
- ☐ What modes/services are AVs competing with?
 - ☐ How would current travel behavior change (and what modes are you shifting from, what are the benefits of that?)
- ☐ Special needs based on disabilities
 - ☐ Mobility devices
 - ☐ Assistance in entering/exiting
 - ☐ Assistance with orientation
 - ☐ Audio updates for visually impaired
 - ☐ Caregivers that ride along
- ☐ Other needs
 - ☐ Car seats

Worksheet 18 continued on the next page →

- ☐ Curb service
 - ☐ How close to the curb is needed?
 - ☐ Could the vehicle double park for entry and/or exit (assuming the vehicle could assess that it's safe to do so)?
 - ☐ Does it need to be near curb cuts?
 - ☐ Can vehicles pick-up and drop-off on private property (such as at the front door of a hospital or grocery store which may not be on the street) or only at the curb?
 - ☐ At the end of the block?
- ☐ Attitudes towards autonomous vehicles (trust/safety issues)
- ☐ In-vehicle support needs (help with loading bags, ask a question, etc)
- ☐ Accompanying passengers (aids, pets, companions, age of children, etc)
- ☐ Seasonality considerations (harsh weather conditions)
- ☐ Impact of price on use (i.e., cost elasticity, or what price point creates a burden/barrier for use)
- ☐ Typical barriers/hurdles
 - ☐ Wrong priority (to resolve transportation issues)
 - ☐ Challenging terminology
 - ☐ Flat out rejection ('not for me')

About the AV Service:

Refining initially proposed service model, use cases, and operation specifications.

- ☐ Service model
 - ☐ Taxi/Ride-hail service
 - ☐ Transit complement or surrogate
 - ☐ Sponsored service to/from specific location
- ☐ Spatial coverage of service (area, routes, PUDOs, etc.)
 - ☐ Origins/destinations (by categories, but also by specific locations in your service area)
 - ☐ Differentiate origins/destinations (where I want to go) and PUDO areas (where pick-up/drop-off could happen)
 - ☐ Question of on block, at curb of destination, at parking lot, at front door (not always at the curb)
 - ☐ Potential links to transit (if applicable)
 - ☐ Curb to curb vs door to door differences (and expectations/needs of riders)
 - ☐ Routes, network
 - ☐ Frequency of service, wait times, etc.
- ☐ Cost/fares (immediate and longer-term)
- ☐ Rider pool inclusion/exclusion criteria
- ☐ Booking procedures
 - ☐ How to book (app/call) –
 - ☐ What tech do riders have access to (smart phone, computers, regular phones) what is typically done to book rides, what constraints exist, what training might be needed (i.e., is this a structural barrier and people won't change what they do, or is this something that could change with support/training)
 - ☐ How do riders communicate if their plans to use the AV service change
 - ☐ Types of booking
 - ☐ Pre-booked (day before?)
 - ☐ On-demand (within a few minutes? An hour?)

WE HAVE A WINNER!



Design contest winner announcement via City of Detroit

The winning design was selected based on the following criteria:

- Captures Target Audience
- Infuses the Spirit of Detroit
- Storytelling Element of Detroit's history
- Connection to Detroit ADS Pilot Program

The project team was happy with the result and how the wrapping contest offered another way to tie the project to the local community. In their assessment, the artist's statement perfectly captured the essence of Detroit: "My design was inspired by the icons of Detroit. The Renaissance Center and The Spirit of Detroit are two of the most iconic structures that capture the city of Detroit and its spirit. Visualizing these icons and combining The City of Detroit's Brand identity colors captures the spirit of Detroit perfectly."

VEHICLE WRAPPING DESIGN CONTEST, DETROIT

To decide on the design for their AVs the City of Detroit launched the Detroit Automated Driving System (ADS) Vehicle Wrap Contest. Artists were invited to draft the vehicle design using a predefined template. The contest was open to anyone of age 8 years and older, and drew multiple entries. The winning artist was awarded \$300 and runner-ups received \$100.



Images via [Detroitmi.gov](https://detroitmi.gov) and the city of Detroit

RIDE-ALONG EVENTS, DETROIT

Prior to launching their AV service, the City of Detroit invited residents to ride along events to experience the vehicles first hand. The AV service, called Accessibili-D, was for people ages 62 and over and/or people with disabilities. Two of the three shuttles were wheelchair accessible. Interested community members and the press were able to get a sneak preview on a 10 minute loop around downtown. Participants were also asked to fill out a brief survey before and after the ride.



Images from IDEO CoLab's "The City's Book of Play"

A diverse range of engagement activities, several of which were quite playful and innovative, helped gain insights that would later shape the AV pilot project. A few examples are listed here:

"Walk-alongs": project members shadow residents' journeys, providing a realistic perspective on day-to-day challenges residents faced on their commutes and other trips.

"Corn Hole Polls": corn hole games were set up as polling stations at public events, where participants could express their preferences by aiming at the labeled holes they like the most.

"Door-to-door": canvassing to invite residents to public outreach events not only increased participation, it also provided opportunities for first conversations, gaining insights from people who may not typically show up at events.

Some other creative engagement efforts included imagining transportation visions and dreams, fridge magnet poetry, and a mini-golf race alongside more traditional mapping exercises, in-depth interviews, intercept surveys, expert interviews, and some desktop research.

A COMMUNITY ENGAGEMENT SPRINT, SAN JOSE

As part of their AV pilot project the City of San Jose engaged Ideo CoLab and Gehl to conduct a six-weeks long community engagement "sprint". Through a series of activities the project team engaged with residents of San Jose's Buena Vista neighborhood to explore urgent mobility needs and identify necessary actions, as well as activities to maintain a collaborative relationship between the city and residents.



3.07B DEVELOP UNIVERSAL TRUTHS & BREAKING POINTS FOR THE AV SERVICE

One goal of community consultation can be to derive “community-based universal truths”, or “non-negotiables” for the AV service piloted, which must apply universally to all use cases tested, and/or all users served. Such “universal truths” can help shape and refine the initial use case and help weed out versions of the pilot that would ultimately not address community needs. These may also be framed as “breaking points” or “deal breakers” and will differ from project to project. Examples of topic categories for “universal truths” and/or “breaking points” may include:

- ☐ Safety (AVs must be safer than human driven cars)
- ☐ Accessibility (AVs must be accessible to wheelchairs)
- ☐ Reliability (AVs must function in normal weather events such as rain, fog, and snow)
- ☐ Efficiency (state-of-the-art fuel efficient/electric vehicles)
- ☐ Environmental sustainability (AV must use 100% renewable energy)
- ☐ Data privacy and security (Riders will control their data privacy)

ACTION ITEMS:

- ☐ In collaboration with the community, develop a list of “universal truths”/“breaking points” that use cases must follow

3.07C MAINTAIN COMMUNITY ENGAGEMENT & INTEREST OVER TIME

A particular challenge of community consultation and collaboration around pilots focused on emerging technology is to build and maintain engagement over time. Emerging technology development is often uneven, with rushes of activity potentially mixed with long moments of pause as markets shift, investments falter, and/or corporate priorities change. Regular engagement activities- at least quarterly- are required to maintain public engagement and interest, but engagement fatigue is more likely to occur if the community cannot observe any tangible near-term effects of the project. Stakeholders will appreciate that their inputs help shape a project. Understand that the community members who may gain the most from a pilot may still be hesitant or cautious about it.

Concrete strategies to maintain the community engaged with the project include:

- ☐ Follow-up emails and newsletters (preferably from a trusted government department)
- ☐ Surveys and community feedback requests
- ☐ One-on-one community events, including “touch and feel events” with AVs present
- ☐ Roundtable event for sharing community findings
- ☐ Address skepticism and reluctance directly in community engagements
- ☐ Leverage existing community events and partnerships with partner organizations

ACTION ITEMS:

☐ **Hold community engagement activities regularly**

CASE STUDY

The City of Pittsburgh had strong community engagement early in their Knight AV pilot projects, in part because of extensive testing by AV companies taking place in the area and a consistent concern over imminent deployment. Over time, and with changes in the market and in company priorities, most AV testing stopped and companies pulled out of the area. While the impacts of AVs on the community was still not a resolved issue, community engagement became difficult to maintain without the presence and looming concern about AV deployment. The start/stop nature of AV development and testing can make it difficult to maintain consistent interest and engagement from community groups.

START/STOP NATURE OF AV DEPLOYMENT, PITTSBURGH

3.08 USE COMMUNITY EXPERTISE & EXISTING DATA TO IDENTIFY COMMUNITY NEEDS

The traditional transportation planning process provides a number of ways to understand a community's transportation needs, typically gathered through community meetings, household travel surveys, and demographic data (see section on Existing Data).

In addition to community engagement efforts previously discussed, community needs assessments are a well established tool for understanding the unique needs of underserved communities, particularly in the realm of transportation and mobility. These assessments help to gather qualitative and quantitative data and inform equitable transportation solutions that reflect the community's true needs and aspirations.

For best practices of community needs assessments, see [Worksheet 19](#).

ACTION ITEMS:

- ☐ **Create a community needs assessment**

WORKSHEET 19 | BEST PRACTICES FOR COMMUNITY NEEDS ASSESSMENTS

- ☐ Build relationships with Community-Based Organizations (CBOs) and leaders: Early and continuous involvement of CBOs ensures that the needs assessment is responsive and non-extractive. Engage in multiple meetings with community leaders to understand the local context and history.
- ☐ Integrate a multi-sector approach to evaluate broader needs: Consider intersecting issues like safety, housing, and health, which affect transportation preferences and needs.
- ☐ Compensate community members for their expertise and time: Offer monetary compensation, gift cards, transportation vouchers, or other incentives to empower sustained participation from traditionally under-resourced community members.
- ☐ Empower the community through exposure to new mobility technologies: Educate community members about various mobility options, allowing them to make informed decisions. This can be through surveys, informational events, or direct engagement.
- ☐ Integrate art and storytelling into visioning activities: Use interactive methods like mapping and visual storytelling to engage different demographics, particularly youth and multi-generational participants.
- ☐ Celebrate community involvement throughout the process: Recognize and uplift community input at every stage. Celebrations can help rally support and demonstrate the value of community voices.
- ☐ Share and collect feedback on final results: Ensure transparency and accountability by sharing assessment results with the community, and invite feedback on the findings.

3.09 IDENTIFY, ASSESS, & MANAGE RISKS & CONSEQUENCES FOR USERS

Pilots should mitigate risks, particularly for vulnerable populations which often have limited capacity to cope with unexpected disruptions. Both community engagement efforts and existing data can help to identify both risks, and potential solutions to mitigating those risks.

Some risks to consider include:

- Safety concerns related to vehicle operations, traffic, and crime.
- Reliability and timeliness of the AV service, including contingency plans if service is disrupted or severely delayed.
- Long-term business models and costs to ensure that AV services will remain affordable to people earning lower incomes
- Service end (either abrupt or planned) that could impede mobility and harm populations that rely on a service.

For more examples of risks associated with AV services, see [Worksheet 20](#).

ACTION ITEMS:

- ☐ Identify the most relevant risks and develop accompanying mitigation strategies

WORKSHEET 20 | RISKS AND CHALLENGES ASSOCIATED WITH AVS

- ☐ Safety Concerns:
 - ☐ Collisions due to insufficiently trained algorithms, software malfunctions, sensor failures, or unforeseen environmental conditions.
 - ☐ Vulnerability to cyberattacks, hacking, or malicious interference with AV systems.
 - ☐ Personal safety with other passenger where no operator is present
- ☐ User Impact:
 - ☐ Injury from abrupt or erratic vehicle maneuvers.
 - ☐ Lack of support provided in the AV, especially in assisting residents with mobility challenges.
- ☐ Dependency and Reliability:
 - ☐ Risk of service disruptions or outages, leading to inconvenience or stranded passengers.
 - ☐ Risk of discontinuation of AV service at the end of a pilot project.
- ☐ Data Privacy and Security:
 - ☐ Unauthorized access to personal data collected by AV sensors and onboard systems, raising concerns about surveillance, identity theft, and privacy breaches.
 - ☐ Risks associated with data sharing and aggregation, including potential misuse of sensitive information or manipulation of user behavior.
- ☐ Equity and Access:
 - ☐ Unequal access to AV services due to socioeconomic disparities; varied access to smartphones, data plans, or bank accounts; or geographic barriers, exacerbating existing transportation inequities.



3.10 IDENTIFY EXISTING DATA TO INFORM PILOT AND ENGAGEMENT EFFORTS

Publicly available, routinely collected data can provide valuable context to understand or define a population service area, set goals, or identify equity implications. Using publicly-available data can reduce the time or expense needed to collect new data to inform a pilot project. Recognizing the limits of existing data can also help tailor engagement efforts to identify what additional data are needed to shape the pilot; collecting original data can be incorporated into community engagement activities - although this is often a costly endeavor.

Community data may relate to the local built environment, land use, population characteristics, or transportation network. Spatial data may prove particularly valuable as it helps identify variable conditions, barriers, or opportunities across a pilot region.

Useful data may include:

- Popular origins and destinations (e.g., stores, hospitals, museums, schools, sports venues, employment centers)
- Demographic information (e.g., age, income, car ownership, gender, race/ethnicity, etc.)
- Mobility barriers including digital access/fluency, multilingual needs, physical access needs (limited mobility, etc), economic limits.
- Population and employment densities
- Area land use mix
- Transportation network data (e.g., transit routes, stops, and level of service; traffic patterns; collision locations; bicycle and pedestrian infrastructure)

Pilots may also consider mapping data as tools for planning and communication. Pilot maps may include:

- Demographics and equity criteria (age, race, income, disabilities)
- Origins and destination density maps
- Existing transportation services and infrastructure
- AV service routes, pick-up/drop-off locations, etc. (if applicable)
- Maps of community engagement events

For examples of existing data sources and potentially relevant data points, see [Worksheet 21](#).

ACTION ITEMS:

- ❑ **Identify data to understand context and define pilot goals** including: identify target populations, built environment and transportation system context

WORKSHEET 21 | DATA, VARIABLES OF RELEVANCE, & POSSIBLE SOURCES

Data sources used in following below:

- ☐ U.S. Census Bureau:
 - ☐ American Community Survey (ACS)
 - ☐ Decennial Census (DC)
- ☐ National Household Travel Survey (NHTS)
- ☐ Bureau of Labor Statistics:
 - ☐ Current Population Survey (CPS)
- ☐ Federal Transit Administration (FTA):
 - ☐ National Transit Database (NTD)
- ☐ Environmental Protection Agency:
 - ☐ Air Quality System (AQS)
- ☐ Centers for Disease Control and Prevention:
 - ☐ Behavioral Risk Factor Surveillance System (BRFSS)
- ☐ Local and State Transportation Departments (DOT):
 - ☐ Traffic Counts and/or Surveys (TCS)
 - ☐ Crash Data (CD)
- ☐ City and County Planning Departments:
 - ☐ Zoning Maps and Regulations (ZMR)
 - ☐ Comprehensive Plans and Transportation Plans (PLANS)
- ☐ Local and State Health Departments (HD)
- ☐ Open Data Portals (ODP)
- ☐ Nonprofit Organizations and Research Institutes (NGO)
- ☐ Transportation related GPS/trip data (GPS)
- ☐ Market Research (MR)
- ☐ Community Organizations and Meetings (COM)
- ☐ Custom Surveys (CS)
- ☐ Others (OTH):
 - ☐ Accessibility maps, various transportation related apps, property maps, etc.

Example data variables and sources to inform pilot projects:

Possible sources for the outlined variables are shown in parentheses or *italics*. Depending on the use, data may be required at the *individual* or *household level*, or aggregated to the community level.

Individual or household-level data (typically from population surveys)

- ☐ Socio-demographics (*DC, ACS, NHTS*):
 - ☐ Age
 - ☐ Gender
 - ☐ Household income
 - ☐ Household size and structure (e.g., children)
 - ☐ Ethnicity/race
 - ☐ Employment status

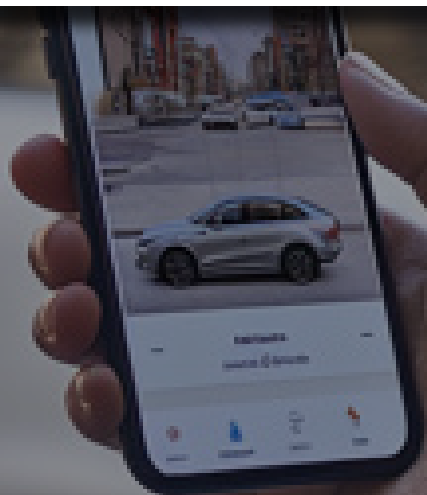
Data sources used in following below:

- ☐ Mobility Patterns/Needs (*NHTS, TCS, NTD, BRFSS, GPS, CS*):
 - ☐ Daily travel patterns (commute distance, destinations)
 - ☐ Modes of transportation
 - ☐ Frequency of travel
 - ☐ Travel purpose (work, school, shopping, healthcare, recreation)
 - ☐ Access to personal vehicles
 - ☐ Physical mobility constraints (disabilities, elderly population)
 - ☐ Dependence on public transportation
 - ☐ Household car (yes/no)
- ☐ Geographic Information (*DC, ACS, TCS, OPD, CS, ZMR, ODP, CS*):
 - ☐ Residential location or neighborhood (Census block group or tract; ZIP code)
 - ☐ Work/school location
 - ☐ Proximity to public transportation hubs
 - ☐ Accessibility to essential services (grocery stores, healthcare facilities)
- ☐ Technology Adoption/Access (*DC, MR, ODP, CS*):
 - ☐ Ownership and usage of smartphones or other smart devices
 - ☐ Data plan access
 - ☐ Internet access at home
 - ☐ Familiarity with and willingness to use AV technology
- ☐ Safety Concerns (*NHTS, ACS, CD, CS*):
 - ☐ Perception of safety regarding different transportation modes
 - ☐ Experience with accidents or safety incidents while traveling
- ☐ Community Engagement/Feedback (*COM, CS*):
 - ☐ Priorities and preferences for transportation services
 - ☐ Feedback on existing transportation infrastructure and services
 - ☐ Suggestions for improving accessibility and mobility options
- ☐ Environmental Considerations (*AQS, NGO, MR, CS*):
 - ☐ Environmental concerns (e.g., air quality, noise pollution, climate change)
 - ☐ Interest in environmentally friendly transportation options
- ☐ Social Factors (*COM, CS*):
 - ☐ Social connections and networks
 - ☐ Social isolation risk factors (e.g., living alone, lack of transportation options)
 - ☐ Community engagement levels
- ☐ Economic Factors (*MR, CS*):
 - ☐ Cost sensitivity to transportation expenses
 - ☐ Willingness to pay for transportation services
- ☐ Health and Wellness (*BRFSS, HD, PLANS, CS*):
 - ☐ Health conditions impacting mobility
 - ☐ Accessibility to healthcare services
 - ☐ Physical activity and exercise habits
- ☐ Cultural Considerations (*COM, CS*):
 - ☐ Cultural norms and preferences influencing transportation choices
 - ☐ Language preferences for communication and service delivery

Community-level data about the socio-demographic, economic and spatial/physical context to which to tailor the AV service to:

- ☐ Population Density (*DC, ACS, TCS, PLANS, ZMR*):
 - ☐ Residential population density by neighborhood or census tract
 - ☐ Population density variations throughout the day (e.g., daytime vs. nighttime)
 - ☐ Population density gradients (e.g., urban core vs. suburban areas)
- ☐ Demographic Characteristics (*DC, ACS, CPS*):
 - ☐ Socioeconomic indicators (e.g., income levels, employment status)
 - ☐ Age distribution of residents
 - ☐ Household composition (e.g., family households, single-person households)
 - ☐ Racial and ethnic composition of neighborhoods
 - ☐ Distribution of vulnerable populations (e.g., elderly, children, individuals with disabilities)
- ☐ Public Policy and Regulations (*ZMR, PLANS, NGO, COM, CS*):
 - ☐ Existing transportation policies and regulations affecting the community
 - ☐ Advocacy efforts for transportation equity and accessibility
- ☐ Economic Factors (*MR, CS*):
 - ☐ Affordability of transportation options
- ☐ Transportation Supply (*DOT, ZMR, PLANS, NTD, OPD, CS*):
 - ☐ Road network density and connectivity
 - ☐ Availability of public transit routes and stops
 - ☐ Distribution of bike lanes and pedestrian pathways
 - ☐ Level of service metrics for roads and intersections
 - ☐ Parking availability and pricing
- ☐ Land Use (*ZMR, PLANS, ODP*):
 - ☐ Zoning designations and land use classifications
 - ☐ Density of residential, commercial, and industrial areas
 - ☐ Mix of land uses (e.g., residential, commercial, recreational)
 - ☐ Presence of greenspace, parks
 - ☐ Locations of major employment centers and activity nodes
- ☐ Origins and Destinations (*NHTS, ACS, ODP, TCS, OTH, CS*):
 - ☐ Distribution of origin points (residential locations)
 - ☐ Distribution of destination points (workplaces, schools, shopping centers)
 - ☐ Patterns of trip generation and attraction in different areas
 - ☐ Commuting patterns and peak travel times
 - ☐ Locations of key destinations such as employment hubs, schools, hospitals, and retail centers
- ☐ Built Environment Features (*DOT, PLANS*):
 - ☐ Presence of traffic calming measures (e.g., speed bumps, traffic circles)
 - ☐ Roadway design elements (e.g., street width, sidewalk presence)
 - ☐ Intersection configurations (e.g., signalized intersections, roundabouts)
 - ☐ Locations of public amenities (e.g., bus shelters, benches, bike racks)
 - ☐ Accessibility features for pedestrians and cyclists (e.g., curb cuts, crosswalks)

- ❑ Environmental Factors (*AQS, ODP, TCS, NGO, OTH*):
 - ❑ Air quality levels and hotspots
 - ❑ Noise levels and sources
 - ❑ Locations of environmental justice communities and vulnerable populations
- ❑ Urban Form and Development (*ZMR, PLANS, NGO, ODP, OTH*):
 - ❑ Building heights and densities
 - ❑ Street frontages and building setbacks
 - ❑ Presence of mixed-use developments and transit-oriented developments
 - ❑ Neighborhood walkability scores and walkable amenities
- ❑ Accessibility and Connectivity (*NTD, DOT, PLANS, ODP, MR, CS*):
 - ❑ Proximity to public transportation hubs and multimodal transfer points
 - ❑ Access to essential services (e.g., grocery stores, healthcare facilities)
 - ❑ Connectivity to regional transportation networks (e.g., highways, airports, rail lines)
 - ❑ Distribution of barrier-free routes and ADA-compliant infrastructure
 - ❑ Digital connectivity and broadband access levels
- ❑ Land Ownership and Property Values (*OTH, PLANS, ODP, NGO, MR*):
 - ❑ Ownership patterns (e.g., public, private, institutional)
 - ❑ Property values and rental rates
 - ❑ Distribution of vacant land and redevelopment opportunities
 - ❑ Locations of affordable housing developments and subsidized housing units
 - ❑ Presence of real estate development projects and investment trends



3.11 COLLECT NEW DATA TO ENABLE PILOT EVALUATION

Pilot evaluation should build on a well coordinated, analytical process using robust data analytics, secondary research, and inputs from project partners and stakeholders. This may include collecting new data in addition to relying on readily available data. New data may help evaluate pilot goals or outcomes in ways that existing data cannot; for example, new data can reflect unique user demographics, barriers, and trip purposes of a pilot.

Data collection plans should be solidified before a pilot begins; doing so ensures that both pre-pilot data can be identified and collected as needed, and that sufficient data are collected throughout the pilot to support evaluation of pilot goals and objectives. Cities should consider partnering with a third-party organization such as a consultant or university to support data collection and evaluation efforts.

Collecting new data is not always easy. Project teams must consider the following in their data collection efforts:

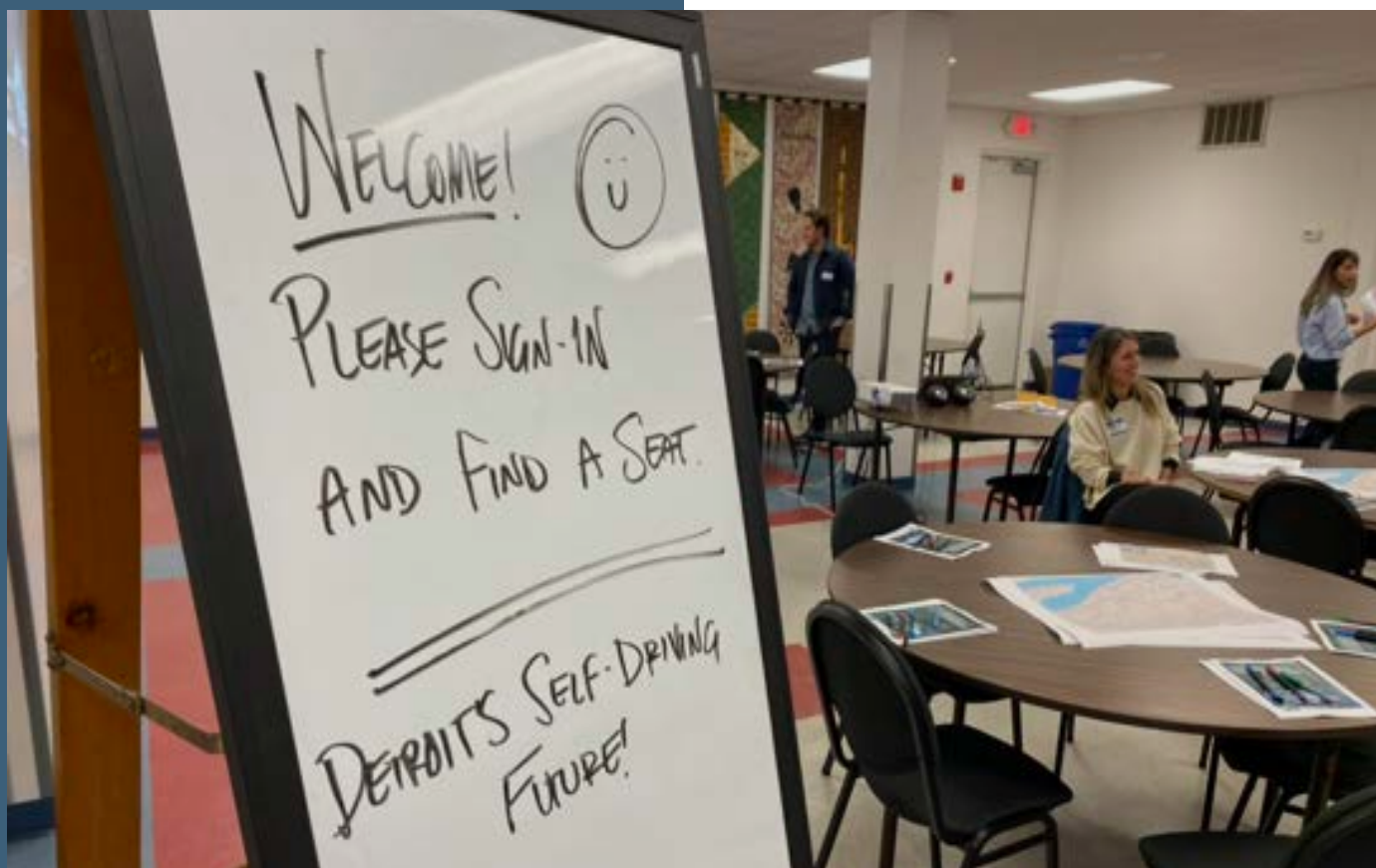
- ☐ **Need:** What program goals do these data help you evaluate? Do these data already exist from other sources?
- ☐ **Feasibility:** Is it possible to collect the data you seek?
- ☐ **Privacy:** Will data use or data sharing agreements need to be signed in order to collect or analyze AV data? Who is authorized from within the organization to sign data use agreements?
- ☐ **Data Management:** What guidelines are in place for collecting, storing, and using data while ensuring ethical use and compliance with privacy regulations? What data security measures are enabled to protect data from unauthorized access, breaches, and cyber-attacks, including encryption, access controls, and regular security audits.
- ☐ **Resources:** How much project team time will need to be dedicated to data collection and evaluation efforts? Are resources needed to support data collection efforts (e.g., compensate focus group or survey participants)?
- ☐ **Timeline:** What data need to be collected during each pilot phase? Will data be longitudinal (e.g., track the same people over time) or represent discrete points in time?
- ☐ **Equity:** How representative are data (e.g., survey responses or focus group participation) of the community and of equity focus groups? Dedicated methods and efforts such as random and oversampling, compensation of participants, or collaboration with community groups may be required to ensure data adequately reflect the range of experiences and needs present in a pilot area.

Original data helps to assess progress towards pilot goals. As such, it should be carefully designed as part of a comprehensive evaluation concept.

For examples of data collection methods see [Worksheet 22](#).

ACTION ITEMS:

☐ **Develop a data collection plan** including methods, technology, study design, and recruitment strategy



FOCUS GROUPS, DETROIT

The Detroit Accessibili-D pilot project for an AV shuttle service for older and/or disabled riders held eight focus groups to gain deeper understanding of the participants' knowledge about AV technology, their concerns, how they would use the service, and their general expectations about the service.

Focus group participants included volunteers identified through four community liaisons, each representing different user populations identified by the project team, namely parents, youth, elderly, and people with disabilities.

Through the focus groups, which met for one hour each, the project team gained insights about desired origins and destinations for the AV service, and how users would plan for such trips. This information was used to inform route selection and develop booking options for the service.

A good practice of using focus groups is to "close the loop" and let participants know how their inputs informed the project. This will also encourage stakeholders to stay engaged with the project.

WORKSHEET 22 | DATA COLLECTION METHODS

Example data collection methods:

Examples provided are from Detroit's Accessibili-D AV pilot project, a transit shuttle for elderly and disabled riders

☐ **Resident Surveys**

- ☐ Explore a person's choice, behavior, preference or priority. Surveys offer insight into what is occurring from an individual perspective, which can be further tracked by demographic trends. Surveying the same people over time can help assess how preferences, views, or behaviors change over the pilot period.

☐ **AV User Surveys**

- ☐ Surveys prior and after using the AV service can assess shifts in attitudes and perceptions.

☐ **Focus Groups**

- ☐ Gather a range of individuals from the community to learn about their hopes and concerns about AV deployment, and what they see as key barriers to their using the technology.

☐ **Community Engagement Events**

- ☐ Provide a neighborhood or community perspective, for example allowing comparison of mobility journeys by different residents.

☐ **Resident Interviews**

- ☐ Provide detailed insights and additional context or nuanced understanding about what participants shared in survey responses.

☐ **Social Media Analysis**

- ☐ Capture perceptions at a city-wide scale. Social media data help differentiate situations or experiences that may be unique to a single neighborhood versus occurring in a larger city-wide scale.

04

NAVIGATING CITY & OPERATOR RELATIONSHIPS

NAVIGATING CITY & AV OPERATOR RELATIONSHIPS

Aligning city and community-defined project requirements with AV technology capabilities and limitations requires a close and proactive relationship with the AV operator.

4.01 UNDERSTAND THE LEGAL CONTEXT OF THE COLLABORATION WITH AN AV OPERATOR

Various aspects of an AV pilot project touch on delicate legal issues, including regulations regarding AVs, contracting with an AV operator, liability issues around safety risks, data security and privacy issues.

For examples of issues to address prior to contracting see [Worksheet 23](#) and for issues to be specified as part of an operator agreement see [Worksheet 24](#).

ACTION ITEMS:

- ☐ **Involve the city or agency's legal department** to identify relevant federal, states and local legislation relevant to AV technology.
- ☐ **Discuss peculiarities related to AV projects with the contracting department and legal team**, particularly the possibilities of an AV operator companies' exiting the pilot, or the technology not delivering contracted requirements.

4.02 SELECT & CONTRACT WITH AN AV OPERATOR

When and how to select an AV operator has tremendous influence on the nature of the pilot. Selecting an AV operator in early vs. later stages of the pilot design process each comes with advantages and disadvantages. Committing to a partner early in pilot design phases allows an operator to shape the project according to their capabilities; by contrast, delaying the selection of an operator gives the city time to more fully understand its needs and refine contract requirements. Either way, a detailed understanding of the interdependencies between the city and the operator are critical to pilot success and should be developed prior to contracting. Depending on timing and preferences, the role of the operator can then be defined more as a "service provider delivering on pre-defined requirements", or more as a "project collaborator/consultant involved in developing requirements prior to delivering upon them".

Examples of requirements that may be considered in contracting can be found in [Worksheet 23](#).

ACTION ITEMS:

- ☐ **Include a list of pilot and operator requirements in the request for proposals (RFP)**
- ☐ **Create a list of requirements that must be defined/refined after contracting with an AV operator.**



CONTRACT CHALLENGES: PUBLIC VS. PRIVATE PROPERTY FOR PICK-UP & DROP-OFF LOCATIONS & OPERATING HOURS, DETROIT

Detroit's Accessibili-D pilot project provides a great example for how contract details can carry significant weight to the success of a pilot. As part of deciding on operational specifications based on the identified use cases, a number of unanticipated challenges arose related to identifying AV pick-up/drop-off locations and operating hours.

The planned AV service catered to older adults and people with disabilities. Key destinations on the planned routes included medical centers and grocery stores. However, driving on private property created a major barrier - AVs driving into private parking lots would require additional mapping and could create liability concerns for the AV provider. Dropping off passengers at the public curb nearest to their destinations, however, often required travelers to traverse a substantial distance to reach their destination; for example, travelers would often have to cross a large parking lot to reach the entrance to a hospital or grocery store.

Ultimately, the pilot was not able to resolve the legal concerns surrounding private property operations within the short planning timeframe, and pick-up/drop-off locations remained restricted to public grounds despite the mobility challenges created for target users.

A similar challenge arose around operating hours. The identified use cases called for operating hours on weekends, as well as for early morning and late night commutes. This caused considerable budgeting and logistical challenges related to permissible work hours of safety drivers (max. 8 hours shifts), which had not been anticipated during contracting.

WORKSHEET 23 | CONSIDERATIONS WHEN CONTRACTING WITH AV SERVICE PROVIDERS

Example topics to consider when drafting a contracting agreement with an AV service provider:

- ☐ Technology and Service Provision:
 - ☐ Autonomous vehicle technological minimum requirements:
 - ☐ Sensor requirements, i.e., LiDAR, cameras, and GPS for navigation.
 - ☐ Real-time communication capabilities with traffic management systems.
 - ☐ Vehicle size, capacity
 - ☐ Specifics on the deployment of autonomous vehicles:
 - ☐ Number of vehicles to be deployed
 - ☐ Routes and schedules to be followed, or overall distance/area to be covered by the service
 - ☐ Number of PUDO locations
 - ☐ Types of PUDO locations (or constraints on PUDO locations)
 - ☐ Need on-street and/or off-street PUDO locations
 - ☐ Operating hours and days
 - ☐ Integration of AV technology with existing transportation infrastructure.
 - ☐ Integration of AV technology with existing public transit.
- ☐ Safety and Regulatory Compliance:
 - ☐ Compliance with all relevant safety regulations and standards.
 - ☐ Safety protocols and emergency procedures.
 - ☐ Vehicle inspections and upkeep to ensure safe operations.
 - ☐ Clear protocols for vehicle and AV company engagement by emergency service providers.
 - ☐ Liability and insurance coverage for all AV-related accidents or incidents.
- ☐ Data Privacy and Security:
 - ☐ Measures to protect user data privacy in accordance with applicable laws.
 - ☐ Secure storage and handling of sensitive information collected during service operations.
 - ☐ Data security standards to prevent unauthorized access or breaches.
- ☐ Community Engagement and Participation:
 - ☐ Participation in community outreach and engagement activities.
 - ☐ Collaboration with local stakeholders to address concerns and gather feedback.
 - ☐ Transparency in project goals, progress, and impacts on the community.
- ☐ Equitable access to AV services:
 - ☐ Accessible vehicles and services for individuals with disabilities.
 - ☐ Geographic coverage
 - ☐ Reduced cost for qualified riders, cash payment options.
 - ☐ Smartphone requirements
 - ☐ Mitigation of potential negative impacts on underserved or vulnerable populations.

- ❑ Performance Metrics and Deliverables:
 - ❑ Establish key performance indicators (KPIs) to assess deliverables:
 - ❑ Service metrics (Route/network miles, trips provided)
 - ❑ Trip and ridership numbers
 - ❑ Reliability rates, and customer satisfaction scores
 - ❑ Define specifics around data requirements (see **Worksheet 21**)
 - ❑ Regular reporting on service metrics.
- ❑ Project Management and Governance:
 - ❑ Project manager or coordinator responsible for overseeing the work at the AV service provider.
 - ❑ Governance structure involving the city project team and the service provider.
 - ❑ Roles and responsibilities for each party involved in the project.
- ❑ Financial Considerations:
 - ❑ Funding sources and allocation for the contracted AV service.
 - ❑ Pricing structure, fare collection mechanisms, and revenue sharing arrangements.
 - ❑ Budgetary provisions for unexpected costs or contingencies during the pilot period.
- ❑ Flexibility and Adaptability:
 - ❑ Flexibility to adjust routes, schedules, and service parameters based on evolving needs and feedback.
 - ❑ Ability to scale up or down the AV service in response to demand and operational challenges.
- ❑ Termination and Transition:
 - ❑ Conditions for early termination or extension of the contract.
 - ❑ Transition of services at the conclusion of the pilot period.
 - ❑ Disposition of assets and data ownership rights upon contract termination.
- ❑ Additional Considerations:
 - ❑ Unpredictability of technical advancements and flaws.
 - ❑ Potential issues with private “venture” industries (e.g., companies may disappear, shut down plans, or decide to pilot elsewhere).
 - ❑ Be cautious of funding structures where constrained or limited transit operating budgets cross-fund AV research and development.

4.03 INTEGRATE THE AV OPERATOR IN THE PROJECT TEAM

It is important to clearly define roles and expectations for employees of the AV operator within the project organization. Private companies typically work under different business models than cities, and employees may have less flexibility to change project scope or wield decision making power. Defining clear roles and identifying contact persons, dedicated working groups, information channels and decision making processes will help establish a smooth collaboration between the city and the private operator.

ACTION ITEMS:

- ☐ **Identify AV operator liaisons** for the project
- ☐ **Define liaisons and working groups for key project areas** (technology, communications, etc.)
- ☐ **Develop a mutual understanding for decision making powers at higher** (strategic, management) and lower (day-to-day) levels
- ☐ **Develop a detailed operator agreement** which specifies responsibilities, deliverables, and other requirements (see [Worksheet 24](#)).

WORKSHEET 24 | OPERATOR AGREEMENT

Examples of various aspects of operation, maintenance, data collection, and community engagement which require specification as part of an operator agreement after contracting with an AV operator.

- ☐ Responsibility for operating the vehicles.
- ☐ Number of vehicles and operational details.
- ☐ Maintenance, cleaning, and sanitizing processes.
- ☐ Provision and management of storage facilities.
- ☐ Local support for operations and maintenance.
- ☐ Battery life, recharging, and weather impact.
- ☐ Infrastructure requirements for operation.
- ☐ Constraints related to weather conditions.
- ☐ Security issues and vandalism prevention.
- ☐ Planning, setting up, and deploying the pilot.
- ☐ Data collection, reporting, and access.
- ☐ Collection of infrastructure issues and conflicts.
- ☐ User demographics data collection.
- ☐ Measurement of customer satisfaction.
- ☐ Business partnerships and collaborations.
- ☐ Marketing and outreach activities.
- ☐ Community outreach and engagement.
- ☐ Services included in the recurrent monthly cost.



4.04 DEVELOP A MUTUAL UNDERSTANDING BETWEEN THE CITY & OPERATOR OF THE PILOT GOALS & LONG-TERM VISION FOR AVS

The long-term vision for AV technology does not necessarily have to be the same for an AV operator and the city; however, a mutual understanding of each party's vision, motivations, and goals are critical to a successful AV pilot will aid communications and decision making throughout the project. While a mutual understanding is important for all stakeholders and partners engaged in the project, it is of particular importance for the AV operator, who may seek to develop solutions for technical challenges suitable for much broader deployment rather than the specific pilot context. Cities should also understand that while AV operators may be interested in pilots, they may not be interested in longer term deployments in their area.

ACTION ITEMS:

- ❑ **Share “visions” for AV-technology** and identify alignment and disconnects
- ❑ **Identify envisioned “business models” for future, full-scale, long-term deployment** of the AV technology tested in the AV pilot project
- ❑ **Conduct a goal identification and alignment exercise**, e.g. as part of a workshop with the AV operator, and possibly other stakeholders or project partners.

AV companies may be less concerned with community engagement activities beyond typical marketing concerns. The city must therefore define and communicate the extent to which operators are expected to participate in community engagement and how insights from community engagement activities will affect pilot design and requirements.

ACTION ITEMS:

- ❑ **Define expectations about community engagement activities** involving AV operator in contract.
- ❑ **Define how initially contracted requirements may change** (and to what extent) based on community engagement (and other) insights



4.05 REFINE THE USE CASES AND OPERATIONAL SPECIFICATIONS

Refining the use cases and operational specifications (also see Use Cases) is a continuous theme throughout an AV pilot project. The AV operator needs to be included in this process, as most adaptations of the initially proposed use cases and operational specifications will translate into technical modifications implemented by the operator.

Examples for which aspects of a use case may be affected by refinements can be found in **Worksheet 7**.

ACTION ITEMS:

- ☐ **Invest early in identifying the technical parameters** defining the use cases and operational specifications.
- ☐ **Clearly define an iterative use case refinement process** which allows for consideration of inputs from stakeholders (particular community engagement), and presents the AV operator with a clear sense for when/how often to anticipate service changes or refinements.

Initially proposed AV network



Refined use case with stops and 3-phase implementation



REFINING THE AV ROUTE NETWORK, DETROIT

Refinement of the route network for Detroit's Accessibili-D AV shuttle provides a good example for the intricate details that need to be sorted out as part of use case refinements. Early on in the project it was clear that the shuttle was going to serve older people and people with disabilities to help them meet their day-to-day travel needs. An initially proposed route network identified key destinations in the downtown area. During implementation a number of "reality checks" required substantial revisions to the routes, including:

- Accessing private property, such as parking lots of major medical facilities or grocery stores, or private driveways, turned out to impose legal hurdles
- Challenging road and intersection designs had to be avoided
- Mapping out the routes, such as creating detailed high definition maps the vehicles use to assist navigation, turned out to be more time consuming than anticipated
- Vehicles reached maximum data storage capacity to store additional route information
- Route distance exceed the provider's capacity for route digitalization, though maximum route distance was not contractually regulated.

Fortunately, through an extended process of iterations and discussions between the project team and the AV provider, these obstacles were successfully overcome. The project team decided to implement the routes in three phases; the first route segment was successfully launched in June 2024.

GLOSSARY FOR AV PROJECTS

Accessibility Features: Accommodations in AVs to ensure accessibility for passengers with disabilities, such as wheelchair ramps and auditory announcements.

Automated Driving System (ADS): The hardware and software that enable an AV to operate without human intervention.

AV Service: Transportation service utilizing autonomous vehicles, which can be door-to-door, fixed route, or a combination.

Cybersecurity Measures: Protocols to protect AV systems from cyber threats, such as encryption and intrusion detection.

Dynamic Routing: Real-time optimization of AV routes based on traffic conditions and passenger demand.

Edge Cases: Rare or unusual scenarios that AV systems must be able to handle safely.

Equity: Ensuring fair access to AV services for all community members, including underserved populations.

Fare Structure and Pricing Models: Pricing schemes for AV services, including flat rates, distance-based pricing, and surge pricing.

Geofencing: Virtual boundaries that restrict AV movement within specific areas.

Geozone: The designated area where an AV service operates.

HD Maps (High-Definition Maps): Detailed digital maps that provide precise information to AVs about road geometry and traffic signs.

Mobility-as-a-Service (MaaS): Integrated transportation options, including AVs, public transit, and bike-sharing, offered through a single platform.

Multimodal: Combining different transportation modes in a single journey, such as taking a scooter to a bus.

Operational Specifications: Detailed criteria defining the operational capabilities and limitations of an AV service.

Operational Design Domain (ODD): A specific set of conditions under which an AV is designed to operate safely.

PUDO (Pick-Up/Drop-Off): Designated locations for passenger pick-up and drop-off.

Remote Monitoring/Control: Ability to oversee and intervene in AV operations remotely.

Ride-hailing: Service allowing passengers to request rides via a smartphone app.

Route types:

Dynamic: Routes optimized in real-time within a predefined geozone.

Fixed: Pre-defined routes with specific stops, can be on-demand or scheduled.

Fixed+: Fixed routes with potential diversions to serve specific locations on-demand.

Sensor Fusion: Integration of data from multiple sensors to create a comprehensive view of the AV's surroundings.

Service Model: The framework defining how AV services are offered, including types of services and operational models.

SMART Goals: Specific, Measurable, Achievable, Relevant, and Time-bound goals.

Use Case: The ways in which riders will use an AV service (defined by purpose and trip characteristics)

User Interface (UI) and User Experience (UX): Design and functionality of AV service applications, focusing on ease of use and passenger satisfaction.

